

**Evaluation of Erosion and Sediment Control and Stormwater Management
for Gas Exploration and Extraction Facilities in Pennsylvania under
Existing Pennsylvania Regulations and Policies to Determine if Existing
Safeguards Protect Water Quality in Special Protection Waters of the
Delaware Basin
for the Delaware River Basin Commission (DRBC)
Consolidated Administrative Hearing on Grandfathered Exploration Wells**

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Prepared for:

Delaware Riverkeeper Network

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EXECUTIVE SUMMARY

The construction and operation of Marcellus Shale Gas Extraction facilities, including wells intended for exploratory purposes, can have significant and adverse environmental impacts on the water quality of the Special Protection Waters of the Delaware River Basin. Specifically, impacts associated with erosion and sediment discharge and stormwater discharge during construction, operation, and after well closure can negatively and significantly impact water quality. The existing environmental regulations and policies of the Commonwealth of Pennsylvania, either as enacted by the Commonwealth or implemented by the Pennsylvania Department of Environmental Protection (PaDEP), do not provide adequate performance standards, review, implementation, or enforcement to protect the Commonwealth's water resources, including the Special Protection Waters of the Delaware River Basin. The Delaware River Basin Commission (DRBC) requirements for a Non-Point Source Pollution Control Plan are not sufficient to protect these water resources in lieu of adequate Pennsylvania requirements, leading to the possibility and likelihood of adverse environmental effects on water resources.

Additionally, the Pennsylvania erosion and sedimentation control and stormwater management regulations and policies, as applied to Oil and Gas facilities, are significantly less stringent and comprehensive and are subject to far less regulatory review than virtually any other construction or industrial activity in Pennsylvania. Construction and performance requirements and regulatory review requirements related to sediment control and stormwater management are far more rigorous for schools, highways, homes, and even geothermal energy wells than for Oil and Gas facilities.

By grandfathering the exploratory wells that were permitted by PaDEP prior to the June 14, 2010 and July 23, 2010 Supplemental Determinations of the DRBC, DRBC has effectively held these facilities to a lower environmental standard than that which is applied to other activities within Pennsylvania, as well as a lower standard than that which will presumably be applied to other oil and gas activities within the Delaware River Basin once its regulations are adopted. Since negative water quality impacts related to sediment discharge and stormwater

management from these facilities can and do impact existing water quality, these facilities cannot be exempt from the requirements to protect and maintain Special Protection Waters, or subject to lower regulatory requirements than other construction and industrial activities.

ANALYSIS AND OPINION

My name is Michele C. Adams, I am a professional engineer registered in the state of Pennsylvania and several other states. As indicated in the attached CV, I have twenty-six years of experience specializing in water resources, stormwater management, and site design engineering. I am one of the primary authors of the Pennsylvania Stormwater Best Management Practices Manual, and currently chair the calculations sub-committee for the Manual update. To form the opinions in this report, I reviewed the available Well Drilling Permit applications and supporting information for several of the exploratory wells in question, including but not limited to Davidson 1V, Woodland Management Partners 1 1, DL Teeple 1 1 and 1 2H, Geuther 1. I also reviewed a number of documents and reports that are listed at the end of this report as references.

It is my opinion, given with a reasonable degree of scientific certainty, that gas exploratory and extraction facilities can adversely impact water quality as a result of inadequate erosion and sedimentation control during construction and operation, and inadequate stormwater management for rate, volume, and discharge of pollutants. As discussed in this report, the current regulatory process for review, approval, and operation of these facilities, as administered by the Pennsylvania Department of Environmental Protection, fails to ensure design and implementation of both erosion control and stormwater management measures that are sufficient to protect water quality. The exploratory wells that have been permitted prior to the June 14, 2010 and July 23, 2010 Supplemental Determinations of the DRBC should not be held to lower standards than facilities that will be subject to the anticipated DRBC regulations.

Construction of Gas Exploratory and Extraction Facilities and Impacts to Water Quality as a Result of Inadequate Erosion and Sediment Control Measures

Impacts to water quality from the Gas Exploratory and Extraction facilities can occur during the construction of the facility, the operation of the facility, and as a result of inadequate restoration of the facility after operations have ceased.

During construction, the water quality impacts are related to the discharge of sediment-laden waters from disturbed areas and the increased amount and rate of runoff from disturbed areas. Disturbance is a result of:

- Construction of the pad site
- Construction of the entrance road
- Widening or paving of existing roads for access to the site
- Construction of pipeline facilities

The amount and type of area disturbed directly impacts the potential for erosive conditions and sediment discharge. Little specific information regarding the disturbed area is available in the permit application materials, for the specific wells in question as part of this Hearing that are less than five (5) acres in disturbance. However, 8-1/2" by 11" Well Location Plat diagrams provided within the PaDEP Well Permit applications (for two wells) indicate approximate areas of pad and entrance drive that can be measured from the diagrams. Based on these diagrams, the well pad and entrance driveway area are shown as 1.80 acres for the Teeple 1 1 well and 2.4 acres for the Woodland Management 1 1 well. In contrast, a page-sized copy of the Woodland Erosion & Sediment Control Plan (included as part of the "Preparedness, Prevention, and Contingency Plan") indicates approximately 4.7 acres of disturbance when this area is measured from the plan, significantly more than 2.4 acres. Approximately 1 acre of disturbance appears to be related to the entrance driveway. Because the Well Location Plat does not indicate the full area of disturbance, it provides virtually no information on the project's disturbance footprint. There is no information on the PaDEP "Permit Application for Drilling or Altering a Well" or available Well Location Plats regarding total acreage of disturbance. PaDEP would not have an estimate of the Total Area of Disturbance from the Well Location Plat. Facilities with less than 5 acres disturbance must prepare an

Erosion and Sediment Control Plan, but are not required to submit the Plan to PaDEP for review.

Information from the New York State Department of Environmental Conservation (NYSDEC), which regulates gas drilling in Marcellus Shale formations in New York State, (NY DEP) indicates that well sites generally involve two to five acres of disturbance per site, not including access roads. The area of disturbance is significant because it directly affects the potential amount of sediment-laden water that can occur if erosion and sediment control measures are not adequate.

In 2005, the U.S. Environmental Protection Agency (U.S. EPA) awarded a grant to the City of Denton, Texas, to monitor and assess the impact of gas well drilling on stormwater runoff. The results of this effort were published in December 2007 in a report titled “Demonstrating the Impacts of Oil and Gas Exploration on Water Quality and How to Minimize These Impacts Through Targeted Monitoring Activities and Local Ordinances”. With regards to the discharge of sediment during construction, this study determined that:

Gas well sites have the potential to produce sediment loads comparable to traditional construction sites.

- Total suspended solids (TSS) and turbidity event mean concentrations (EMC = pollutant mass / runoff volume) at gas sites were significantly greater than at reference sites (the median TSS EMC at gas sites was 136 times greater than reference sites).
- Compared to the median EMCs of storms sampled by Denton near one of their outfalls, the gas well site median EMC was 36 times greater.
- Gas site TSS EMCs ranged from 394 to 9898 mg/l and annual sediment loadings ranged from 21.4 to 40.0 tonnes/hectare/year (tonne = 1000 Kg; hectare = 10,000 square meters), and were comparable to previous studies of construction site sedimentation.

This study concludes that “Gas well sites have the potential to negatively impact surface waters due to increased sedimentation rates.” (US EPA ID No. CP-83207101-1, page 2).

In addition to the well pad site, roads that are constructed, widened, or altered for vehicle access to and from the well pad site can be a source of sediment and pollutants during both construction and operation. The U.S. EPA Publication

“Erosion, Sediment and Runoff Control for Roads and Highways” (EPA-841-F-95-008d) states that:

Runoff controls are essential to preventing polluted runoff from roads, highways, and bridges from reaching surface waters. Erosion during and after construction of roads, highways, and bridges can contribute large amounts of sediment and silt to runoff waters, which can deteriorate water quality and lead to fish kills and other ecological problems.

Heavy metals, oils, other toxic substances, and debris from construction traffic and spillage can be absorbed by soil at construction sites and carried with runoff water to lakes, rivers, and bays. Runoff control measures can be installed at the time of road, highway, and bridge construction to reduce runoff pollution both during and after construction. Such measures can effectively limit the entry of pollutants into surface waters and ground waters and protect their quality, fish habitats, and public health.

This publication (EPA-841-F-95-008d) identifies a number of pollutant types and sources related to Roads and Highways, as identified in Table 1.

Table 1. Typical pollutants found in runoff from roads and highways.

Erosion, Sediment and Runoff Control for Roads and Highways | Polluted Runoff | US EPA

	Pollutant	Source
Sedimentation	Particulates	Pavement wear, vehicles, the atmosphere and maintenance activities
Nutrients	Nitrogen & Phosphorus	Atmosphere and fertilizer application
Heavy Metals	Lead	Leaded gasoline from auto exhausts and tire wear
	Zinc	Tire wear, motor oil and grease
	Iron	Auto body rust, steel highway structures such as bridges and guardrails, and moving engine parts
	Copper	Metal plating, bearing and brushing wear, moving engine parts, brake lining wear, fungicides & insecticides
	Cadmium Chromium	Tire wear and insecticide application Metal plating, moving engine parts and brake lining wear

	Nickel	Diesel fuel and gasoline, lubricating oil, metal plating, bushing wear, brake lining wear and asphalt paving
	Manganese	Moving engine parts
	Cyanide	Anti-caking compounds used to keep deicing salt granular
	Sodium, calcium & chloride	Deicing salts
	Sulphates	Roadway beds, fuel and deicing salts
Hydrocarbons	Petroleum	Spills, leaks, antifreeze and hydraulic fluids and asphalt surface leachate

Based on these two studies, the construction of Gas Exploration and Extraction facilities and associated construction and/or improvement of roads can negatively impact water quality, and these facilities have the same potential as other construction activities to degrade water quality. However, Pennsylvania does not apply the same standards of performance or regulatory oversight to Gas Exploration and Extraction facilities as is applied to other construction activities, and therefore the DRBC's Supplemental Determination of June 14, 2010 is incorrect in determining that the "existing safeguards" applied to "wells subject to state regulation as to their construction and operation" is sufficient to prevent water quality impacts from construction.

Specifically, the "safeguards" applied in the Pennsylvania regulatory process for Gas Exploration and Extraction facilities fail to address a number of concerns, and this can be seen in the application requirements for Erosion and Sediment Control Permits.

Gas Exploration and Extraction facilities that result in disturbance of fewer than five (5) acres are not required to obtain an Erosion and Sediment Control Permit. For these facilities, a Permit Application for Drilling or Altering a Well (5500-PM-OG0001) is sufficient. An Erosion and Sediment Control Plan must be developed, but is not subject to regulatory review and approval before construction. This is in contrast to most other construction activities, which are subject to erosion and sediment control requirements at 1 acre under the Pennsylvania Chapter 102 requirements and NPDES requirements. For Oil and Gas facilities that are fewer than 5 acres in disturbance, an Erosion & Sediment

Control plan is required, but it is not subject to regulatory review prior to construction.

Significantly, the permit application requirements in the PaDEP “Application for an Erosion and Sediment Control Permit (ESCP)” for projects that are not already addressed under an NPDES permit, are different than the PaDEP application for Oil and Gas Facilities (Notice of Intent for Coverage under the Erosion & Sediment Control General Permit for Earth Disturbance Associated with Oil and Gas Exploration, Production, Processing or Treatment Operations or Transmission Facilities ESCGP-1). This is significant because the permit application is essentially for the same item, namely, an Erosion and Sediment Control Permit. There are also significant differences between the application for coverage under the General (PAG-02) NPDES Permit or Individual NPDES Permit for Stormwater Discharges Associated with Construction Activities. There is only a General Permit option for Oil and Gas facilities, regardless of whether or not the facility is located in Special Protection Waters. Other construction activities require an Individual Permit within Special Protection Waters.

A comparison of permit application requirements for non-oil and gas facilities, as compared to the permit application requirements for Oil and Gas facilities, is provided in Table 2. This table also indicates the comparable requirements for the permit application for Drilling or Altering a Well (for oil and gas projects disturbing fewer than 5 acres).

As can be seen from this table, the requirements for a “standard” ESCP REVIEW THIS application are significantly more stringent than the requirements for an Oil and Gas facility ESCP application for coverage under a general permit. For oil and gas facilities with fewer than five acres of disturbance, virtually no information is required related to the amount of area disturbed and erosion control measures.

Table 2. Comparison of Erosion and Sediment Control Permit Application Requirements for “Non” Oil and Gas Facilities, Oil and Gas Facilities, and Oil and Gas Facilities under 5 acres disturbance.

	NOI for Coverage under the General (PAG-02) NPDES Permit or Application for an Individual NPDES Permit for Stormwater Discharges Associated with Construction Activities	Application for Erosion & Sediment Control Permit	NOI for Coverage under the Erosion & Sediment Control General Permit for Earth Disturbance Associated with Oil and Gas Exploration, Production, Processing or Treatment Operations or Transmission facilities	Permit application for Drilling or Altering a well
Required Information		ESCP	ESCGP-1	5500-PM-OG001
Project Description	yes	yes	yes	no
Project Area	yes	yes	yes	no
Total Disturbed Area	yes	yes	yes	no
Timetable for Phases (with acreage disturbed by phase)	yes	yes	yes	no
Description of Site	yes	yes	no	no
Explanation of consideration of site's Natural Resources in Location and Design of the project, E&S Plan, PCSM Plan)	yes	no	no	no
Identification of geologic formations or soil conditions that may cause pollution and description of BMPs to minimize its impact	yes	no	no	no
Identification of Pollutants other than sediment in stormwater	yes	yes	yes	no
PPC Plan required for use or storage of chemicals, solvents, hazardous wastes or material with potential to cause accidental pollution during earth disturbance	no	yes	yes	no
Explain whether fill will be imported, exported or if the site will balance	yes	no	no	no
Site Contact information (name, firm, title, etc.)	yes	yes	yes	no
Consultant for Project (name, address, etc.)	yes	yes	no	no
Compliance Review - Listing by permit number of other environmental permits issued by Department	yes	yes	no	no
Narrative to address existing or past violations of any environmental regulations or permits	yes, within last 5 years	yes, current and past violations	yes, within last 5 years	no
Post Construction Stormwater Management (PCSM) Plan required	yes	yes	No calculations or measurements required if Section D, 2e indicated as yes to both questions	no
Consistency letters required for ACT 167 and Municipal Ordinances	yes	no	no	no
Off-Site Discharge Analysis	yes	no	no	no
PCSM BMPs must be consistent with...	Act 167 OR PA Stormwater Manual and/or Other Design Standard		Act 167, local ordinances, or BMPs will manage net increase in runoff volume resulting from 2-year/24-hour frequency storm	

There are a number of site-specific conditions that can directly affect the potential for erosion and pollutant discharge during construction activity, including the total area of disturbance, the soil type and potential for erosion, the topographic slopes, and the proximity to surface waters. None of this information is available for regulatory review before construction for Oil and Gas facilities of fewer than 5 acres. Additionally, there is no opportunity for regulatory reviewers to determine if measures such as reducing the area of disturbance and restoring disturbed areas promptly will be implemented.

The potential impacts to water quality can be seen in the existing D.L. Teeple 1 1 well, located in Manchester Township, Wayne County and owned by Newfield Appalachia PA LLC (permit # 37-127-20013, issued on April 23, 2010), shown as Figure 1. This well is located in the Shehawken Rattlesnake Creek, designated in Pennsylvania as High Quality (HQ). The permit application for this well indicates under Item 8 of the "Permit Application for Drilling or Altering a Well" that the well site is not within 100 feet (horizontally) of a stream, spring, or water body of water delineated on the most current 7-1/2 minute topographic map. As can be seen by the overlay of the Well Location Plat onto a USGS 7-1/2 minute quadrangle map, the well pad is not within 100 feet of a body of water as indicated on the USGS 7-1/2 minute quad, but it is situated at the top of a hill surrounded on three sides by streams and wetlands that are delineated on the quad map. The site is bordered on the western side by S.R. 191, and a wetland can be seen just over 100 feet downhill from the construction entrance.

Given the topography and surrounding surface waters at the Teeple 1 1 site, there is significant potential for discharge of sediment and other pollutants to surface waters if erosion and sediment control measures are not actively maintained and implemented.

This well location was cited on 5/26/2010 for a violation of Chapter 102. 4 for "Failure to minimize accelerated erosion, implement E&S Plan, maintain E&S controls. Failure to stabilize site until total restoration under OGA Sec 206(c)(d)." This violation was issued just over one month after the permit was issued. A second violation was also issued on 5/26/2010 under Pa Code 78 for an improperly lined pit.

The Pennsylvania Oil and Gas Act (58 P. S. § 601.205(b)) states that “no well site may be prepared or well drilled within 100 feet measured horizontally from any stream, spring, or body of water as identified on the most current 7-1/2 minute topographical quadrangle map of the United States geological survey or within 100 feet of any wetlands greater than one acre in size”. This question is asked in Item 8 of the PaDEP Permit Application for Drilling or Altering a Well. However, surface waters are defined in Chapter 93 as “Perennial and intermittent streams, rivers, lakes, reservoirs, ponds, wetlands, springs, natural seeps and estuaries...”. Many of these features will NOT be mapped on a USGS quad as blue lines, or they will not be mapped adequately. Luna B. Leopold, former Chief Hydrologist for the U.S. Geological Survey, writes in his book A View of the River (Harvard University Press, 1994) that the USGS instructions regarding blue lines on quad maps “do not reflect any statistical characteristic of streamflow occurrence. The specifications that the blue line terminate no higher than about 1,000 feet from the watershed divide does not reflect differences in hydrologic performance among various combinations of climate, topography, and geology” and “blue lines on a map are drawn by non-professional, low-salaried personnel ...they are drawn to fit a rather personalized aesthetic.” (page 228). In other words, blue lines on 7-1/2 minute USGS quads are not scientific representations of surface waters or even perennial or intermittent streams. Therefore, reliance of these “blue lines” does not represent adequate identification and setback from surface waters as defined under Pa Code Chapter 93. The current Pennsylvania permitting process for Oil and Gas facilities is not sufficiently protective of surface waters.

The preparation of an Erosion and Sediment Control Plan under the requirements for Oil and Gas facilities also does not guarantee that the measures represented on the plan will be adequate to protect water quality. For example, on the Erosion and Sediment Control permit application for Oil and Gas facilities (ESCGP-1), Section E: Special Protection Waters lists “cost effective best management practices (BMPs) that will be used to meet the requirements of Pa Code Chapter 93. Under this list is included “Roads stabilized with crushed rock and/or vegetation.” In other words, roads constructed of crushed rock are considered to be a “best management practice” adequate for protection of

Special Protection Waters. In virtually all other construction projects that are subject to Chapter 102 requirements, the construction of roads – including crushed rock roads – is considered earth disturbance that requires its own erosion and sediment control measures (as well as stormwater management measures).

The Pennsylvania Center for Dirt and Gravel Road Studies provides information on measures to maintain gravel roads in a manner to reduce the discharge of pollutants and protect water quality. Penn State's Center for Dirt and Gravel Road Studies (Center) recently completed a research project for the Chesapeake Bay Commission (Sheetz, Summary Statement) that begins to quantify sediment production from gravel roads and sediment reductions from several commonly used practices. This study found that:

Runoff Rates from Existing Roads:

The five “existing condition” tests done for this study found sediment production rates ranging from 0.7-12.2 pounds of sediment runoff in a single 30 minute, 0.55 inches simulated rainfall. The 0.7 pound event was generated from a flat narrow farm lane with grass growing between the wheel tracks. The 12.2 pound event was generated from a wider, mixed limestone/clay road at a 4-5% slope. This highlights the great variability in erosion rates based on specific site conditions. Using the average sediment runoff rate of 5.6 pounds per event, a single 30 minute 0.55 inch rain event moving across Pennsylvania can be conservatively expected to generate over 3,000 tons* of sediment from the State's 20,000+ miles of public unpaved roads.

In other words, gravel roads are a source of sediment pollution, rather than a “best management practice” for Special Protection Waters as listed on the ESCGP-1 application.

Review of the page-sized copy of the “Woodland Management Partners Well Pad Erosion & Sediment Control Plan” indicates that, for the approximately 850 linear feet of new entrance driveway to the well pad, there are no erosion and sediment control measures, i.e., no silt fence, compost sock, etc. Roads for other construction projects are subject to management requirements for erosion and sediment control, but under ESCGP-1, gravel roads are considered a “best management practice”.

Roads and gravel roads for gas exploration and extraction facilities are not the only construction items that are regulated differently for oil and gas facilities than they are for other construction sites, and that have significant potential to adversely impact water quality. Recently, PaDEP began imposing requirements on the construction of geothermal energy wells. Geothermal wells are generally not more than several hundred feet deep. PaDEP has begun imposing requirements for separate Erosion and Sediment Control Plans specific to the construction of geothermal wells and the handling of material from these wells. This includes requirements for dewatering material from the wells, protecting the water resources from discharge of pollutants, and reducing site disturbance. Gravel roads for geothermal well construction must also include measures such as silt fence or compost sock (and are not considered a best management practice). Detailed guidance for E&S measures related to the construction of geothermal wells will be included in the updated Erosion and Sediment Control Manual, and reflect that both well construction and gravel road construction and use are significant sources of nonpoint source pollutants. This is in stark contrast to the ESCGP-1 representation of gravel roads as a best management practice.

In summary, the current state regulations under which the wells in question were permitted do not guarantee that the measures designed or implemented are sufficient to protect water quality from construction-related impacts due to erosion and sedimentation. These wells should not be excluded under the June 14, 2010 and July 23, 2010 Supplemental Determinations.

Gas Extraction Facilities and Impacts to Water Quality as a Result of Inadequate Stormwater Management

The discharge of stormwater runoff and the pollutants conveyed in stormwater runoff also negatively impact surface water quality. Stormwater impacts at Oil and Gas facilities, including both exploratory and extraction well sites, are a result of:

- Increased runoff (volume and rate) from roads
- Increased runoff (volume and rate) from pad site areas
- Increased pollutants from truck movement
- Pollutants from pad materials

- Air deposition of pollutants
- Inadequate handling of drilling materials
- Decreased stormwater recharge
- Decline of adjacent vegetation
- Degradation of roads
- Erosion of pad
- Failure to restore site to natural conditions

The stormwater impacts on water quality and stream health include:

- Increased flooding as a result of increased stormwater flow rates and volumes of runoff
- Increased frequency of runoff discharges
- Thermal impacts from disturbed surfaces and removal of vegetation
- Changes in receiving water stream channel geometry, and corresponding increases in sediment loads
- Discharge of pollutants
- Decreased stream baseflow as a result of reduced recharge

In addition to sediment discharges, the December 2007 U.S. EPA report “Demonstrating the Impacts of Oil and Gas Exploration on Water Quality and How to Minimize These Impacts Through Targeted Monitoring Activities and Local Ordinances,” noted that discharges of stormwater from oil and gas facilities include a number of pollutants. The Summary Document for this report states:

Other pollutants in gas well runoff were found in high concentrations:

- EMCs of total dissolved solids, conductivity, calcium, chlorides, hardness, alkalinity and pH were higher at gas well sites compared to reference sites, and differences were statistically significant for all parameters except conductivity.
- Generally, the presence of metals was higher at gas well sites compared to reference sites and EMCs were statistically significantly greater for Fe, Mn and Ni.
- Overall, the concentrations of metals tend to be higher at gas well sites compared to both nearby reference sites and as measured in runoff from local mixed-use watersheds (EMCs were statistically significantly greater for Fe, Mn and Ni).
- Total petroleum hydrocarbons (TPH) were not detected in any of the samples collected at gas well sites or reference sites.

The Summary Document for this study further concluded that:

- Gas well sites have the potential to negatively impact surface waters due to increased sedimentation rates and an increase in the presence of metals in stormwater runoff.

- Pad sites also have the potential to produce other contaminants associated with equipment and general site operations.
- Gas wells do not appear to result in high concentrations of petroleum hydrocarbons in runoff, but accidental spills and leaks are still a potential source of impact.

Furthermore, the Summary Document noted that:

The proximity to surface water conveyances is an important consideration for minimizing water impacts, i.e., flat, heavily vegetated areas distant from surface waters are usually less of a concern than those areas close to waters that have highly erodible soils, steeper slopes and little vegetation.

Given the potential for stormwater impacts to water quality from Oil and Gas exploratory and extraction facilities, the requirements for stormwater management and water quality protection should be at least as rigorous as the requirements for other land development and industrial activities.

However, the Erosion and Sediment Control General Permit for Oil and Gas facilities (ESCGP-1) essentially provides these facilities with a waiver from providing stormwater management calculations and data. Specifically, Section D.2.e of ESCGP-1, titled "Site Restoration Plan and Post Construction Stormwater BMPs", requires the applicant to answer yes or no to two questions:

1. The approximate original contours of the project site will be maintained or replicated and the disturbed areas will be revegetated or otherwise stabilized with pervious material.
2. PCSM BMPs which: use natural measures to eliminate pollution, do not require extensive construction efforts, promote pollution reduction, and are capable of controlling the net increase in the volume and rate of stormwater runoff from a 2-year/24-hour storm event will be employed and the net increase in the volume of post construction runoff is infiltrated and/or dissipated away from surface waters of the Commonwealth.

If the answer to both of these questions is "yes," the applicant does not need to provide supporting calculations and data, essentially receiving a waiver of the

requirements for detailed stormwater management calculations and implementation of adequate stormwater management measures. Such waivers are not available for other industrial and commercial projects, which must design PCSM measures based on factors such as disturbed area, slopes, soil types, etc., and which must provide detailed calculations to determine that stormwater BMPs are correctly sized and located.

Even if one of these questions is answered as “no” and post construction stormwater calculations and data are required, that is not an assurance that the calculations and stormwater plan will protect water quality, or be subject to the same level of regulatory review as other construction projects.

For example, the permit application for the Davidson 1V Well Pad Site indicates that the site will NOT be returned to the original contours and revegetated with pervious material, and therefore, stormwater calculations are required. However, the accompanying stormwater calculations indicate that there will be less stormwater runoff after well pad construction than before. This is not a result of BMPs, but rather a result of applying engineering coefficients (Cover Complex values) that indicate that the site will be more pervious. It is shown in Figure 1 that Essentially, areas that are to be revegetated are calculated as “brush” that produces less runoff than woods in good condition. However, the “Brush Seed Mixture” that is specified is primarily a grass and groundcover seed mix, and does not represent established “brush”, which is shown in Figure 1. A more appropriate runoff coefficient that represents lawn and soils that have been graded would indicate a much greater volume of runoff than is presented. This is shown in Figure 2.

SITE STABILIZATION CHART:

BRUSH SEED MIXTURE			
BOTANICAL NAME	COMMON NAME	PERCENTAGE OF MIXTURE	APPLICATION RATE
LOLIUM MULTIFLORUM	ANNUAL RYEGRASS	35	20 LBS / ACRE
PHLEUM PRATENSE	TIMOTHY	25	
ANDROPOGON GERARDII	BIG BLUESTEM	10	
ELYMUS VIRGINICUS	VIRGINIA WILD RYE	10	
LESPEDEZA BICOLOR	BICOLOR LESPEDEZA	5	
HELIANTHUS ANNUS	COMMON SUNFLOWER	5	
LATHYRUS SYLVESTRIS	LATHCO FLAT PEA	5	
VIBURNUM DENTATUM	ARROW WOOD	3	
SAMBUCUS CANADENSIS	ELDERBERRY	2	

* SEEDING DATES: APRIL 1--JUNE 15 & AUGUST 16--SEPTEMBER 15

Figure 1. Brush Seed Mixture that is primarily grasses

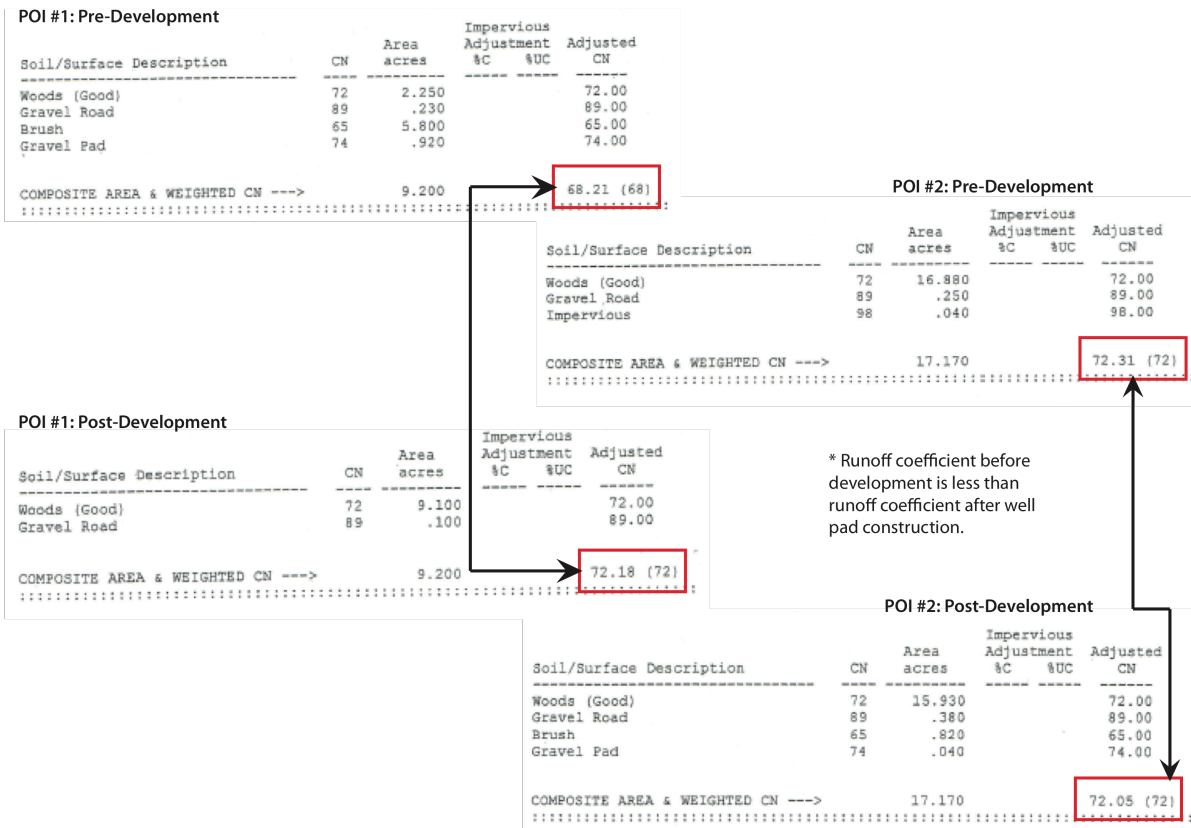


Figure 2: Runoff Curve Number for pre and post-development conditions exhibiting increased runoff after construction

Similarly, the well pad itself is given a very low runoff value, presumably since it is paved with a stone bed. However, the detail provided for the Davidson 1V Well Pad indicates that the stone is not appropriate for a stormwater bed as described in the Pennsylvania Stormwater Best Management Practices Manual, and additionally that the bed will be built partially on fill material, which is also not an acceptable technique in the Manual. The designs documented in the Post-Construction Stormwater Management Plan for Davidson 1V do not support the engineering calculations and assumptions that have been submitted. Therefore, the estimates of stormwater runoff rate and volume will be greater than documented within the Plan.

In addition, Section E of ESCGP-1, titled “Special Protection Waters” lists fourteen “cost effective best management practices that will be used to meet the requirements of 25 Pa Code Chapter 93.” These include:

1. Minimize earth disturbance
2. Earth moving activities limited during rainstorms and spring thaw
3. No direct discharge to surface water
4. Designed temporary and permanent BMPs for surface water diversion
5. Other
6. Alternative site analysis
7. Roads stabilized with crushed rock and/or vegetation
8. Immediate stabilization
9. Prompt site restoration
10. Stabilized upslope diversion
11. Permanently stabilized ditches and channels
12. Rock lined culvert inlets and outlets
13. Proper vegetative cover techniques
14. 100 ft riparian buffer

None of these measures are sufficient to provide stormwater management and protect water quality for sites that have 5 acres or more of disturbance, and as discussed earlier, measures such as stabilizing roads with gravel can create, rather than mitigate, pollution and increased runoff. The net effect of Section E

and Section D.2.e of ESCGP-1 is to waive stormwater management requirements for these facilities, or approve calculations that are technically incorrect. "Restoration" activities are not required to restore site soils to pre-construction levels of performance, and as a result of disturbance, altered vegetation, and soil compaction, "restored" sites will continue to generate increased volumes and rates of stormwater runoff.

Oil and Gas facilities are given a further exemption from environmental standards applied to other facilities under Pa 25 Code Chapter 102.14, which requires a 150 foot riparian buffer in Special Protection Waters. Oil and gas activities are given an exemption "so long as any existing riparian buffer is undisturbed to the greatest extent possible."

For Oil and Gas facilities with fewer than five acres of disturbance (and not required to apply for permit coverage with ESCGP-1), there are essentially no regulatory processes or safeguards in place to assure that stormwater management measures are adequate, and essentially no safeguards or consideration of factors such as slopes, soil types, amount of vegetation and protection of existing vegetation.

Conclusion

The Supplemental Determination of June 14, 2010 stated that:

[T]hese wells are subject to state regulations as to their construction and operation...In light of these existing safeguards...this Supplemental Determination does not prohibit any natural gas well project from proceeding if the applicant has obtained a state natural gas well permit for the project on or before the date of issuance set below.

A review of the regulatory safeguards applied to these wells, specifically the existing Pennsylvania regulations and PaDEP policies, indicates that the safeguards do not guarantee protection of the water quality of Special Protection Waters with regards to Erosion and Sediment Control and Stormwater Management. As such, these wells should have been included in the May 19, 2010 Determination of the Executive Director Concerning Natural Gas Extraction Activities in Shale Formations within the Drainage Area of Special Protection Waters.

The December 2007 EPA report “Demonstrating the Impacts of Oil and Gas Exploration on Water Quality and How to Minimize These Impacts Through Targeted Monitoring Activities and Local Ordinances” specifically recommended that “States or local governments should consider regulating sediment and associated pollutants in stormwater runoff” and suggested as a Recommended Approach to “develop regulations similar to current NDPES requirements for construction sites” for Oil and Gas facilities.

To the extent that the Executive Director’s decision making process relied upon the adequacy of Pennsylvania regulations to protect the water quality of the Basin, it was based upon a mistaken premise of fact.

The opinions expressed in this report are stated to a reasonable degree of scientific and professional certainty.

A handwritten signature in black ink, appearing to read "M. Ad", is positioned above a horizontal line.

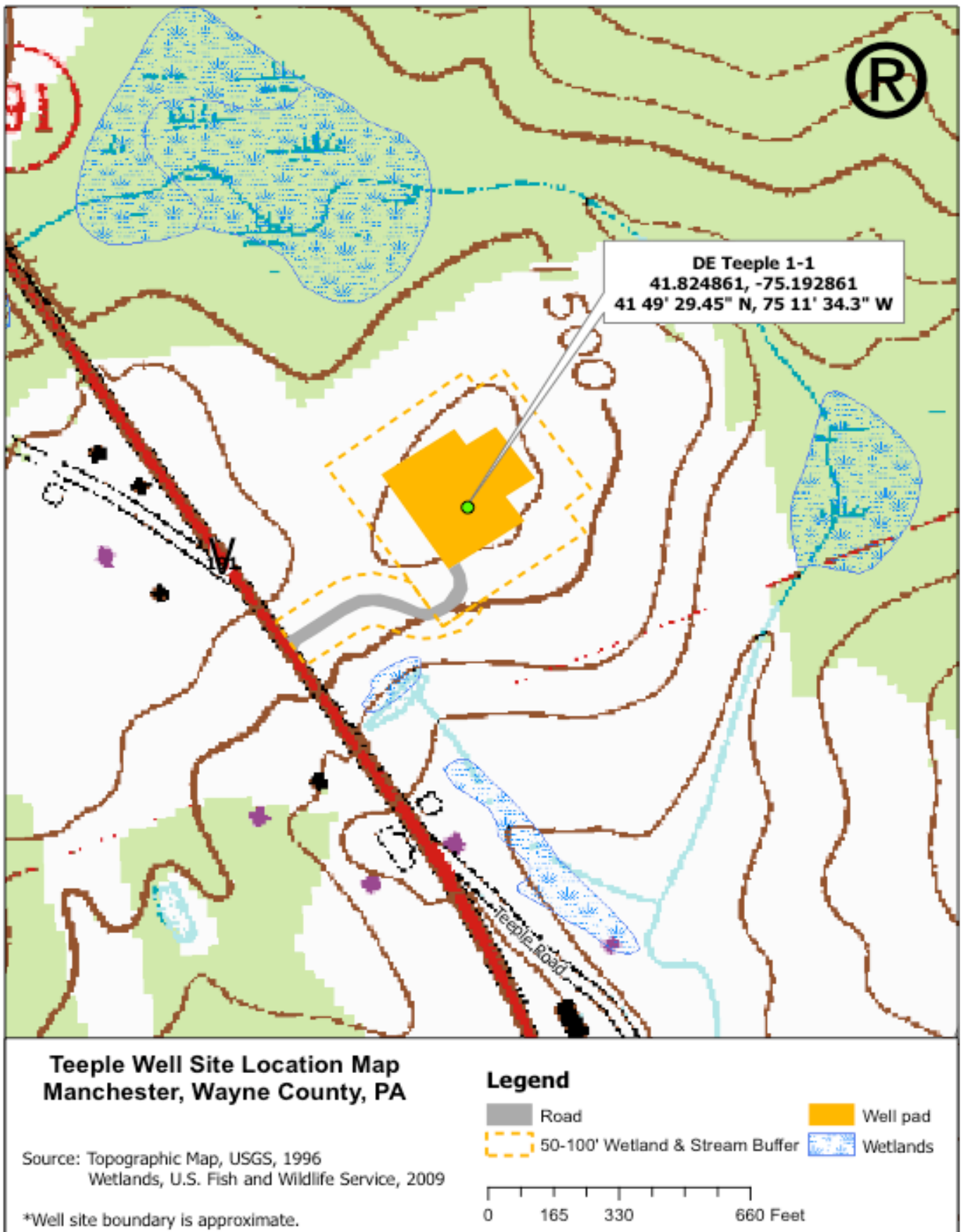
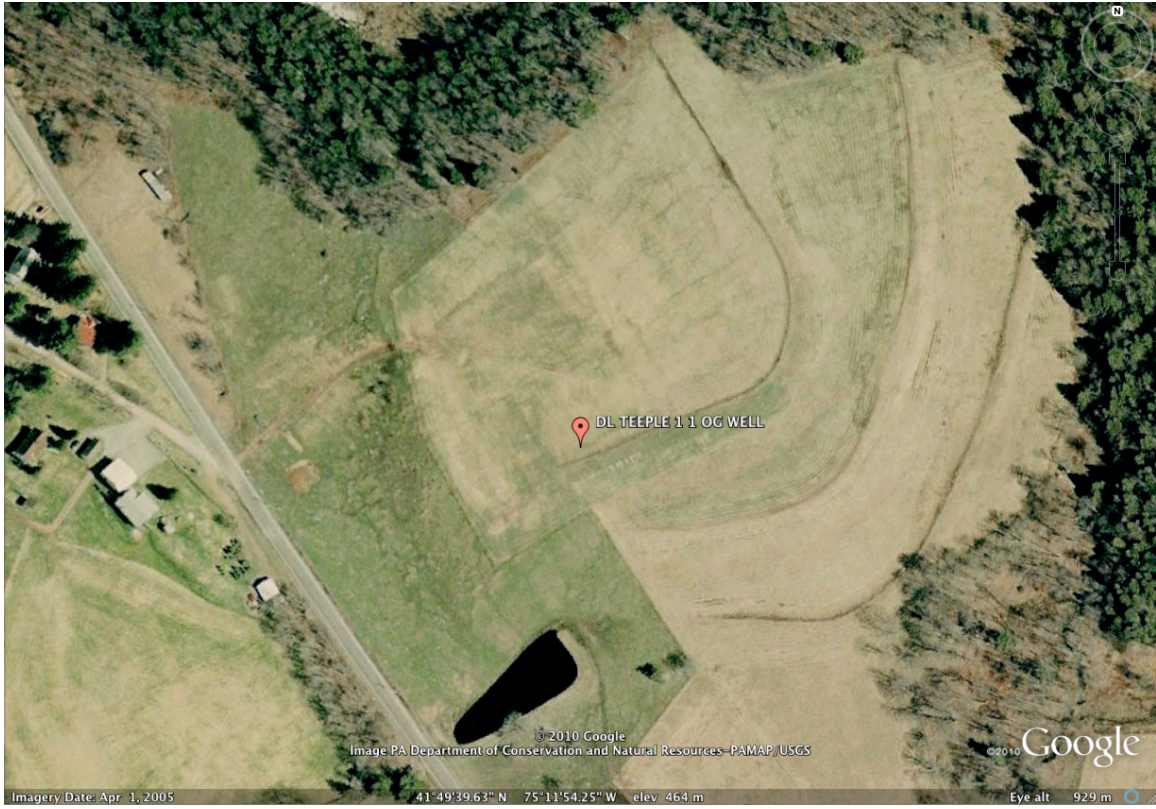


Figure 3. D.L. Teeple 1 1 well, located in Manchester Township, Wayne

County



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**League of Women Voters of Pennsylvania
Marcellus Shale Natural Gas Extraction Study
2009-2010
STUDY GUIDE V**

**REGULATION AND PERMITTING OF MARCELLUS SHALE
DRILLING**

OVERVIEW

Regulation of Marcellus Shale drilling operations is complex. It involves authorities at federal, state, and municipal levels. The regulatory enigma is perhaps best summed up by Dr. Roxana Witter of the Colorado School of Public Health, Denver, Colorado:

Natural gas is such a unique industry in that there are tens of thousands of point sources, hundreds of thousands across the country. They are essentially hundreds of thousands of factories. The industry is completely different in terms of monitoring or regulating it because it is not like a single, stationary factory or refinery. I don't think public-health researchers or the regulatory agencies have gotten their hands around that problem.
(Vaughn, 2009, October 4)

Because of the rapid push to develop natural gas from Marcellus Shale, various authorities and agencies have been forced to balance significant, long-term concerns with industry demands for expedient reviews and acceptance of drilling permits. Economic concerns, coupled with imperatives to reduce carbon dioxide and promote energy independence, accelerate the timelines required to achieve the essential goals of clear parameters and failsafe enforcement.

In Pennsylvania, the main regulatory entities include, but are not necessarily limited to:

Federal:

- U.S. Environmental Protection Agency (EPA)
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- U.S. Department of Interior - Bureau of Land Management
- Occupational and Safety Health Administration (OSHA)

State:

- PA Department of Environmental Protection (DEP) - Bureau of Oil and Gas Management,
Bureau of Air Quality
- PA Department of Conservation and Natural Resources (DCNR)
- PA Fish and Boat Commission
- PA Emergency Management Agency (PEMA)
- PA Department of Labor and Industry
- PA Department of Transportation (PennDOT)

Municipal/Regional:

- Susquehanna River Basin Commission (SRBC)

Delaware River Basin Commission (DRBC)
PA Municipalities
PA County Courts
PA County Conservation Districts (Note: DEP withdrew the involvement of Conservation Districts in the permitting and review process as of April 2009.)

The above agencies uphold numerous laws and regulations pertinent to Marcellus Shale gas operations including the following:

Federal

Clean Water Act (CWA) - regulates surface water quality, pollutant discharges, and storm water runoff; implements National Pollutant Discharge Elimination System (NPDES) permitting

Safe Drinking Water Act (SDWA) - regulates supply of public drinking water (but does not regulate private wells serving under 25 people); authorizes EPA to determine national standards for maximum allowed contaminant levels; regulates Underground Injection Control (UIC) program to protect ground water from injected contaminants; grants states authority (“primacy”) to implement the SDWA within their boundaries; provides funding for water system improvements

Energy Policy Act of 2005 - includes two exemptions relevant to shale gas drilling: (1) amended the SDWA by clearly excluding hydraulic fracturing from the definition of “underground injection” and (2) amended the CWA to effectively exempt “uncontaminated storm water discharges from oil and gas field activities” from federal NPDES permits (*U.S. Storm water rules*, 2006, January 4)

Clean Air Act - authorizes EPA to set limits on particular air pollutants; authorizes EPA to limit air pollutant emissions from point sources

Endangered Species Act - supports the conservation of threatened and/or endangered plants, animals, and their respective habitats

Resource Conservation and Recovery Act (RCRA) - authorizes EPA to manage the generation, transportation, treatment, storage, and disposal of hazardous waste (Certain oil and gas exploration and production wastes are exempt from Subtitle C of RCRA, but may be covered under Subtitle D or regulations other than RCRA.) (*Ground Water Protection . . .*, 2009, April, p. 38)

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also known as Superfund) - taxes chemical and petroleum industries; authorizes direct federal response in the event of releases or threatened releases of hazardous substances that may pose a danger to public health or the environment

Emergency Planning and Community Right to Know Act (EPCRA) - protects public health, safety, and the environment from chemical hazards through requirements for planning and reporting

Occupational Safety and Health Act - requires employers to maintain a safe and healthy work environment; administered by the Occupational Safety and Health Administration (OSHA)

Note: Some federal laws (including the SDWA, RCRA, and CERCLA) contain exemptions relevant to Marcellus Shale operations. These are usually very specific in nature and do not necessarily exempt

the industry from complying with other sections of the same law or act, nor do they preclude the states' rights to regulate the same.

Pennsylvania

Oil and Gas Act - regulates oil and gas exploration and production, including permitting, drilling, operating, casing, plugging, reporting, financial responsibility, registration, restoration, and gas storage

Oil and Gas Conservation Law – includes special regulations for “conservation wells” that are wells at least 3,800 feet deep and penetrate the Onondaga formation

Coal and Gas Resource Coordination Act - sets forth means of coordinating activities of coalmine and non-conservation gas well operators

Clean Streams Law - authorizes DEP to control water pollution, especially through regulation of discharges to state waters; provides for DEP's implementation of the federal NPDES program in the state; sets forth enforcement policies and penalties for violations

Solid Waste Management Act - authorizes DEP to regulate solid wastes, including municipal, residual (non-hazardous industrial), and hazardous wastes

Dam Safety and Encroachment Act - regulates activities in, along, or across bodies of water

Safe Drinking Water Act - authorizes DEP to enact the federal SDWA within Pennsylvania; authorizes DEP to set maximum allowable levels for contaminants which the EPA has not yet addressed; does not give the state authority to regulate underground injection wells as PA has opted for a direct federally implemented program (Pennsylvania Department of Environmental Protection, n.d., Ch. 2, p. 12)

Water Resources Planning Act – establishes a state water plan that periodically compiles data on how much water is available, how much is currently being used, how much will be used in the future, and where water use will exceed the available water supply (Swistock, B. & Blanchet, H., n.d.)

Worker and Community Right to Know Act - mandates that employers and chemical suppliers provide identification and hazard data for substances used in any workplace

Vehicle Code - sets forth weight restrictions on vehicles and roadways, as well as posting and bonding requirements

Municipalities Planning Code - addresses zoning, subdivision, and land development at the local level

The Role of the Pennsylvania Department of Environmental Protection

The bulk of Marcellus Shale gas regulatory authority in Pennsylvania falls on the State's Department of Environmental Protection and its Bureau of Oil and Gas Management. DEP's website describes this bureau as:

. . . responsible for the statewide oil and gas conservation and environmental programs to facilitate the safe exploration, development, and recovery of Pennsylvania's oil and gas reservoirs in a manner that will protect the Commonwealth's natural resources and the environment. The bureau develops policy . . . and programs for the regulation of oil and gas development and production, . . . oversees the oil and gas permitting and inspection programs; develops statewide regulation and standards; conducts training programs for industry; and works with the Interstate Oil & Gas Compact Commission and the Technical Advisory Board. (Pennsylvania Department of Environmental Protection, 2009, October 23)

In this capacity, DEP reviews and approves bond and well permits; inspects drilling operations, wells, and environmental controls; permits and inspects waste management; enforces state laws pertaining to resource management, well construction, and waste management; responds to complaints concerning water quality issues; and provides industry-relevant training programs.

To better guide operators in the state's requirements, DEP has created the *Oil and Gas Operators Manual*. This handbook summarizes statutes, regulations, DEP assistance, and procedures relevant to oil and gas operations. It contains information on permitting, drilling, best management practices (BMPs) for erosion and sediment control, environmental controls, waste management practices, plugging of wells, and associated activities. Copies of laws and regulations, forms, bonding guidelines, and information on oil and gas wastewater permitting are included as appendices (Pennsylvania Department of Environmental Protection, n.d.).

In its enforcement capacity, DEP has several tools at its disposal. For example, recently DEP has taken the following actions: issued a cease and desist order to U.S. Energy Development Corporation for numerous repeat violations; fined Gas Field Specialist Inc. for residual wastewater violations; and imposed a temporary stop order on all hydraulic fracturing operations by Cabot Oil and Gas in Susquehanna County after three spills occurred within one week. In each of these instances, accountability was clear-cut. However, this is not always the case. Whether from negligence or accident, violations will occur and, most likely, increase with the expansion of natural gas production. As in the case of Pennsylvania's coal legacy, circumstances can become aggravated over time or responsibility cannot easily be determined. Companies come and go, landowners sell their property, corporate officers transfer, and bankruptcies occur. These events make DEP's enforcement role most challenging.

PERMITS AND APPROVALS

Before drilling a Marcellus Shale well, an operator must obtain several permits and approvals. As of October 2009, these include:

- Well Drilling Application

- Water Management Plan (This supersedes former Application Addendum)

- Erosion, Sediment and Storm Water Control Plan or Permit

 - (A plan is allowable when earth disturbance occurs on fewer than five acres; permit is required if earth disturbance occurs on five or more acres.)

- Preparedness, Prevention and Contingency Plan

- Water Withdrawal Permits

- Obstruction and Encroachment Permit

- Water Quality Management Permit (This is for pit impoundments of a treatment facility.)

- Air Quality Permits (Depending on scope of project, separate permits may be needed for generators, compressors, gas flaring, and diesel trucks.)

In addition, a well site bond must be posted before any drilling activity occurs. This is one way "to ensure that the operator will adequately perform the drilling operations, address any water supply problems the drilling activity may cause, reclaim the well site, and properly plug the well upon abandonment" (Pennsylvania Department of Environmental Protection, 2009, October). To comply with state Vehicle Code regulations a roadway bond is usually required as well.

As interest in Marcellus Shale gas exploration and drilling has steadily climbed, so too has the DEP's related workload. Through August 2009, the number of Marcellus Shale drilling permits granted by the DEP showed a 45 percent gain over the total number of similar permits issued for the

entire 2008 year (Stouffer, 2009, September 1). A new fee structure took effect in April 2009. It raises the initial permit cost for a Marcellus Shale well from a flat \$100 to \$900. There is also a sliding scale surcharge based on well bore type and length. The higher fees help provide funding not only for the increased volume of permit reviews and site inspections but also for the addition of more than 30 new staff members to perform related duties.

Although the DEP handles most shale gas regulatory issues, two federal-interstate compact government agencies also have jurisdiction: The Susquehanna River Basin Commission (SRBC) and the Delaware River Basin Commission (DRBC) have legal authority over water quality and quantity regulation in their respective areas. Because of the large amount of water required for hydraulic fracturing and the equally high volume of industrial-classified wastewater resulting from drilling activities, these commissions are very concerned about natural gas extraction operations. As a result, to drill within SRBC or DRBC areas, operators must apply for and obtain additional approvals from these respective commissions and submit them to the DEP.

The Water Management Plan (listed above) is another important component of the permitting process. Developed through the cooperative efforts of the DEP, SRBC, and DRBC, this plan helps address the high volume of water necessary for drilling, particularly in areas that are not covered by the SRBC and DRBC, i.e., in the Ohio, Potomac, Erie, and Genesee Basins. It contains a set of statewide permitting rules for water withdrawal, usage, treatment, and disposal. Additionally, it requires operators to provide a description of anticipated impacts of drilling and water withdrawals on water resources.

The Role of Municipalities

Municipal regulation of shale gas drilling is extremely limited due to preemption by the Pennsylvania Oil and Gas Act. Aside from road bonding and maintenance agreements, local officials have very little control over the location of wells, on-site safety, water supply protection, permit notification, and well-site bonding. While zoning, subdivision, and/or land development ordinances may be used “to guide growth and development that results from the gas boom and to protect community assets” (Pennsylvania Department of Conservation and Economic Development, n.d.), they cannot be used to regulate gas operations already covered by the Oil and Gas Act. Attempts to clarify their authority, or lack thereof, have left municipalities without recourse except through court action.

For example, local officials have gone to court to reconcile their legislative powers as set forth in the state’s Municipal Planning Code with the largely preemptive state Oil and Gas Act. In February 2009, the Pennsylvania Supreme Court handed down decisions in two pivotal cases, *Huntley & Huntley v. Borough Council of the Borough of Oakmont* and *Range Resources-Appalachia, LLC v. Salem Township*. Although far from identical, both rulings validate some degree of municipal authority through traditional zoning ordinances that designate particular land uses. Not surprisingly, the rulings also leave room for interpretation. But, Holly M. Fishel of the Pennsylvania State Association of Township Supervisors (PSATS) pointed out, “These are important rulings for local government because oil and gas well drilling is now treated like every other use and subject to reasonable land use regulations” (2009, August 19). Elam Herr, a director of the same association further said, “We are not asking to regulate drilling, which would duplicate state regulations, but to have oversight of well locations, like other uses” (Hawbaker, 2009, January).

The PSATS has identified several other salient issues. These include: road damage caused by extensive heavy truck use and 30-year-old road bonding limits far below current repair costs; the lack of notification requirements to the appropriate municipalities and counties once DEP has granted a permit; possible contamination of private water wells; insufficient number of treatment facilities for wastewater; limited resources and expertise available to local and volunteer fire departments for handling well fires; and the current exclusion of oil and gas reserves from property tax assessment (coal and other minerals are allowed to be assessed with a property tax).

The Role of Conservation Districts

Pennsylvania's County Conservation Districts, dedicated to conserving the state's natural resources, are involved at the regional level. These districts are designated "to work in close cooperation with landowners and occupiers, agencies of Federal and State Government, other local and county government units and other entities . . ." Conservation District Law, n.d., Section 2, "Declaration of Policy"). Until April 2009, these well-informed agencies served an important role as part of the review and permitting process with oversight over erosion, sedimentation, and storm water control. As of that date, with virtually no advanced notice, DEP rescinded the involvement of conservation districts by creating a more "efficient" centralized system. Now all reviews are performed by one of DEP's own regional offices. Some question these revised procedures and believe that each conservation district had the local expertise needed for protecting public health and the environment. Others wonder if DEP's staff understands the limitation of the local areas and if recent staff increases are sufficient to manage the ever-increasing workload.

ISSUES AND CONCERNS

Federal Water Issues

Federal regulations address pertinent water issues involved in natural gas extraction from Marcellus Shale. Currently, Congress is considering two bills that address hydraulic fracturing. One is in the Senate (S. 1215) and the other is in the House (H.R. 2766). This Fracturing Responsibility and Awareness of Chemicals (FRAC) Act seeks, among other things, to require drilling companies to fully disclose all chemicals used in their hydraulic fracturing operations and places hydraulic fracturing under the jurisdiction of the federal government. It would remove an exemption from the federal Safe Drinking Water Act (SDWA) for hydraulic fracturing which was inserted in the Energy Policy Act of 2005. Currently, "the EPA does not have authority to investigate the fracturing process under the Safe Drinking Water Act" (Lustgarten, 2009, August 25). Opponents of the FRAC Act maintain that the states already adequately regulate hydraulic fracturing. Proponents argue that federal oversight is imperative to protecting the nation's water supply, especially as it will facilitate broad EPA impact studies. On October 29, 2009, the House approved an appropriations bill that provides for a new EPA study on hydraulic fracturing and its impacts on drinking water supplies. The bill is pending Senate approval and signature by President Obama.

State Water Issues

Compared to some states, Pennsylvania has relatively comprehensive hydraulic fracturing regulations (Wiseman, 2009, Spring) that require full chemical disclosure. A summary of Marcellus Shale fracturing solutions is available at the DEP's website. The specific quantities used in any given solution, however, are still considered proprietary information.

Despite the state regulations already in place, there is "one critical yet overlooked aspect in Pennsylvania, the lack of a requirement to monitor groundwater quality in a drilling zone" (McConnell, 2009, June 10). Testing for water quality before, during, and after drilling is voluntary. Although the state's Clean Streams Law would cover groundwater if pollution did occur, "this state law . . . does not require proactive water quality testing, including aquifers, making pollution detection difficult" (McConnell, 2009, June 10). Compounding the issue is the fact that groundwater contamination by hydraulic fracturing has not been definitively confirmed nor disproved (Gjelten, 2009, September 23).

Another area of growing concern is the elevated level of total dissolved solids (TDS) polluting Pennsylvania's waterways. Sources of TDS range from storm water runoff to sewage and industrial discharges, including gas well drilling. Pennsylvania's water systems are even less able to handle TDS

due to the chronic discharges from abandoned coal mines. Starting in the fall of 2008, samples taken at the Monongahela River exceeded water quality limits for TDS. Although remedial steps have been taken, the problem persists.

In April 2009, the DEP proposed new limits for high TDS wastewater discharges to be in place by January 2011. Until that date, the DEP plans to follow an interim Permitting Strategy that “will focus on those new sources that have the greatest potential to adversely affect the quality of Pennsylvania’s receiving streams. Currently, those sources are wastewaters generated from fracturing and production of oil and gas wells in the Marcellus Shale formation” (Pennsylvania Department of Environmental Protection, 2009, April 11, p.4). This plan addresses the important issue of cumulative effects:

. . . a strategy for permitting these discharges also must involve an allocation strategy to address those situations in which multiple discharges cause or contribute to downstream water quality standards violations, even if only predicted through modeling. An allocation strategy is the plan to allocate the assimilative capacity of the watershed (the acceptable loading in lbs/d of TDS and/or chlorides) among multiple sources. (Pennsylvania Department of Environmental Protection, 2009, April 11, p. 4)

If implemented, this provision would be a significant, new direction for state regulations. As Jan Jarrett, president and CEO of PennFuture testified, “Neither the Oil and Gas Act nor the Oil and Gas regulations in Chapter 78 require, or even contemplate, that DEP will assess the probable cumulative impacts of gas drilling on the natural resources . . .” (2009, March 31, p. 12). This DEP proposal for new limits on high TDS wastewater discharges is being studied and evaluated by the Chapter 95 Task Force. This special group, composed of representatives of industry, environmental, and state agencies, was formed under the guidance of the Water Resources Advisory Committee (one of several DEP advisory groups). Another joint effort is embodied in the Marcellus Shale Wastewater Partnership, a collaborative venture between the DEP and natural gas industry. However, unlike the Chapter 95 Task Force, no members from the environmental sector are involved in this partnership that primarily focuses on wastewater and new technologies designed for its treatment. With regard to erosion, sediment control and storm water management, the DEP has submitted relevant proposed changes. According to Acting Secretary of the DEP John Hanger, “We are shifting the focus of water quality protection from reviewing paperwork to holding permittees more accountable, conducting more on-the-ground inspections to verify that best management practices are being implemented and maintained, and increasing protections for our waterways” (Pennsylvania Department of Environmental Protection, 2009, August 31). One aspect of the proposal is a permit-by-rule option aimed at shortening the permit processing time for “eligible low-risk construction projects” (Pennsylvania Department of Environmental Protection, 2009, August 31). The 90-day public comment period on this particular proposal is scheduled to close November 30, 2009.

Air Quality Issues

Wells drilled after 1980 have been exempted from the National Emission Standards for Hazardous Air Pollutants (NESHAP), which falls under the Clean Air Act. NESHAP regulates small sources of toxic air pollution grouped in close proximity. With this exemption, natural gas and oil drill sites are not treated as an aggregated unit if they are located outside of areas with a population of one million or more (Horwitt, 2009, March; Mall, Buccino, & Nichols, 2007, October; Legal Information Institute, n.d.). Since most Marcellus Shale natural gas wells will not occur in urban areas of this population density, air quality permits will be granted per “point source,” e.g., a compressor engine, a dehydrator. Each of these point sources, basically pieces of mechanical equipment, typically meets the DEP administrative and technology standards. Permits are thus granted routinely within 30 days (Barbara

Hatch, personal communication, August 5, 2009). However, with multiple Marcellus wells likely being drilled in a restricted geographic area, the aggregate pollution of the many small sources of air pollution could become problematic. This has been the experience in Colorado (Earthworks, 2006). To underscore the importance of this issue, the National Park Service has warned its employees of this potential source of air pollution in the Eastern United States (National Park Service, 2008).

To determine the nature and extent of air pollution, air quality monitors are needed. Providing air quality monitors involves both the Federal EPA and the Commonwealth DEP. EPA sets the criteria for air quality monitor placement and the Commonwealth has the ability to place additional monitors in specific places. Currently, many of the counties in which natural gas is being extracted from Marcellus Shale have few, if any, such monitoring devices. As a result, there is no data regarding the nature of air quality prior to drilling, during drilling, and/or during production.

Streamlining the Process

Numerous application forms, coupled with long lead times, have become costly and frustrating to both companies and authorities alike leading to pressure to streamline the process. But streamlining only makes sense if it can be done without sacrificing regulatory integrity. A case in point occurred in August and September 2009 when the Chesapeake Bay Foundation filed appeals with the PA Environmental Hearing Board. The charges assert that the DEP granted drilling permits (for Fortuna Energy Inc. and Ultra Resources, Inc.) without adequately evaluating erosion and sediment control ramifications. The Foundation specifically cited an expedited permitting option implemented by the DEP in April 2009. Matt Royer, an attorney for the Chesapeake Bay Foundation, pointed out that this procedure does not require the DEP to do a technical review concerning “the environmental impacts on wetlands or streams . . . which is illegal under state and federal clean streams law” (Hopey, 2009, September 10). In response to the Chesapeake Bay Foundation's action, the DEP re-evaluated the questionable permits. Its investigation found enough deficiencies to warrant revocation of the permits. As a result of this action by a “watchdog” group, DEP also issued violation notices to several licensed professionals responsible for upholding regulations.

Within its jurisdiction, the SRBC has also addressed the need for expediency. One of its main objectives has been "to streamline the approval process for consumptive use, yet simultaneously require all consumptive water users in the basin to comply with monitoring, reporting, and mitigation requirements. This allows the SRBC to better manage the cumulative impact of such consumptive use" (Susquehanna River Basin Commission, 2009, January, p. 3).

CLOSING

Owing in part to its multi-tiered framework, Marcellus Shale gas drilling regulation is inherently problematic. On an extremely simplified level, much of the confusion and debate revolves around at least one of the following:

- the scope and content of the regulations themselves;
- the process creating the regulations;
- the enforcement of the regulations; and
- accountability for violations.

In addition to vigilant oversight and related enforcement, the nature of regulation and monitoring of natural gas extraction from Marcellus Shale will determine its legacy. It is imperative that all agencies – municipal, regional, state, and federal – work together to preserve the public good and provide clear guidance to the natural gas industry.

Reference 2

This DRAFT Docket has been prepared for the purposes of the scheduled public hearing and may be substantially modified as a result of the public hearing process prior to Commission action.
2/9/2010

DOCKET NO. D-2009-18-1

DELAWARE RIVER BASIN COMMISSION

Special Protection Waters

**Stone Energy Corporation, Matoushek 1 Well Site
Shale Gas Exploration and Development Project
Clinton Township, Wayne County, Pennsylvania**

PROCEEDINGS

This docket is issued in response to an Application submitted to the Delaware River Basin Commission (DRBC or Commission) by Stone Energy Corporation (Stone) on February 13, 2009 for review and approval of a Marcellus Shale natural gas exploration and development project referred to as the Stone-Matoushek Site (Well Site or Well Pad) which contains a single vertical shale gas well referred to as the Matoushek 1 Well (M1) in Clinton Township, Wayne County, Pennsylvania. On March 14, 2008, the Pennsylvania Department of Environmental Protection (PADEP) Oil and Gas Management Program approved its oil and gas Well Permit for the well (Well Permit No. 37-127-20006-00).

The Application was reviewed for approval under Section 3.8 of the *Delaware River Basin Compact*. The Wayne County Planning Commission and Clinton Township have been notified of pending action on this docket. A public hearing on this project was held by the DRBC on February 24, 2010.

A. DESCRIPTION

1. Purpose. The purpose of this project is for the approval of natural gas exploration and development activities of the M1 well from the Marcellus Shale Formation.

2. Natural Gas Well Location. The existing M1 well is located at latitude 41° 41' 6.39" North and longitude 75 ° 21' 58.21" West on the north central portion of an approximate 116-acre parcel (Tax Map Parcel Number 06-1-0212-0016) in Clinton Township, Wayne County, Pennsylvania. The M1 well is situated in the central portion of an approximate 250 foot by 300 foot existing well pad constructed in an agricultural

field between Bethany Turnpike (SR 670) to the north, Johnson Creek Road to the west, and Creamton Drive (SR 247) to the east and the south in Clinton Township, Wayne County, Pennsylvania. The well site is located approximately 0.8 miles southwest of Red Schoolhouse Corner (the intersection of Bethany Turnpike and Creamton Drive).

The M1 well is located in the outcrop area of the Upper Devonian-age Catskill Formation in the Johnson Creek and West Branch Lackawaxen River watersheds in Clinton Township, Wayne County, Pennsylvania. The surficial material at the site is mapped as Wisconsin Till.

3. Area Served. This Docket applies to natural gas exploration and development activities only to the M1 well located on the Well Site. For the purpose of this docket, natural gas exploration and development activities include or are associated with: Well site and associated access road construction, air rotary/mud rotary natural gas well drilling, natural gas well construction and testing, support vehicle tire cleaning, dust control on access roads, storage of fresh water, hydraulic fracturing well stimulation, hydraulic fracturing chemical storage, flow-back water storage, transport and disposal of all domestic and non-domestic wastewaters and site reclamation on the well pad surrounding the M1 well. Any additional wells proposed at the M1 well site or any property leased by Stone requires separate DRBC docket approval.

4. Definitions.

Conductor casing- A short length of large-diameter pipe used to stabilize the upper portion of the borehole.

Domestic wastewater- Sanitary waste collected in portable self-contained toilets.

Drill cuttings- Rock cuttings and related mineral residues generated during the drilling of an oil or gas well.

Flowback- Return of fluids used in the stimulation process to the surface. While a large proportion of flowback returns to the surface shortly after hydraulically fracturing a well, flowback may return to the surface along with produced water over the production life of the well.

Natural gas exploration and development activities- All activities necessary for the development of and extraction of natural gas including but not limited to well pad and associated access road construction, air rotary/mud rotary natural gas well drilling, natural gas well construction and testing, support vehicle tire cleaning, dust control on access roads, storage of fresh water, hydraulic fracturing well stimulation, hydraulic fracturing chemical storage, flow-back water storage, transport and disposal of all domestic and non-domestic wastewaters, and site reclamation.

Non-Domestic wastewater- Brines, produced water, hydraulic fracturing flowback and any water containing brines, drilling muds, stimulation fluids, well servicing fluids, oil, production fluids or drilling fluids, and cement mixer or cement truck washout water.

Produced water- Water and other fluids brought to the surface during production of oil or gas.

Production casing- A string of pipe other than surface casing and coal protective casing which is run for the purpose of confining or conducting hydrocarbons and associated fluids from one or more producing horizons to the surface.

Surface casing- A string of pipe which extends from the surface and that segregates and protects fresh groundwater and stabilizes the hole.

Tophole water- Water that is brought to the surface while drilling through the strata containing fresh groundwater and water that is fresh groundwater or water that is from a body of surface water. Tophole water may contain drill cuttings typical of the formation being penetrated but is not polluted or contaminated by additives, brine, oil or man induced conditions.

Well site- The area occupied by the equipment or facilities necessary for or incidental to the drilling, production or plugging of a well.

5. Physical Features.

a. **Site Description.** The M1 well site is located in the Glaciated Low Plateau Section of the Appalachian Plateaus Physiographic Province. This area is characterized by rounded hills and valleys of low to moderate relief. The well pad is located in the northern portion of an open field with wooded areas to the north and west of the drilling site. Access to the drilling site is provided by an improved existing farm road located along the perimeter of the open area with an entrance to Creamton Road.

The drilling site is located on a crest of a low-relief ridge at an approximate elevation of 1,545 feet above mean sea level (MSL). Drainage at the drilling site slopes west toward Johnson Creek, located approximately 3,000 feet from the drilling site, and south toward an unnamed tributary of the West Branch Lackawaxen River, located approximately 1,400 feet from the drilling site. Slopes in the immediate area surrounding the drilling site range from approximately 2 to 4 percent. Based on U.S. Fish and Wildlife Service (FWS) National Wetlands Inventory database, the closest mapped wetlands are located at the headwaters of the unnamed tributary of West Branch Lackawaxen River, approximately ¼ mile east of the well location. The well location conforms to the setback limitations from existing buildings, water wells, streams, springs, bodies of water, and wetlands greater than 1 acre in size as required by Pennsylvania Oil and Gas Act Chapter 2 Section 601.205 *Well Location Restrictions*.

b. Well Pad and Well Description. The existing well pad is an approximate 250 foot by 300 foot level area containing an existing well and a lined fresh water impoundment. The perimeter of the well pad contains an earthen berm. The pad area and access roads were first stripped of topsoil to expose firm sub-base material. The topsoil has been stockpiled around the well pad. Coarse aggregate was used where additional stabilization was necessary. In order to control runoff and minimize soil erosion, a diversion swale was constructed on the upslope (north) side of the drilling pad and filter fabric fencing was used on the down-slope sides of the well pad. The docket holder indicated that design and construction of the drilling pad incorporated non-structural and structural best management practices (BMPs). BMP's utilized at the site included siting the well/disturbed area outside of sensitive and special value features and minimizing total disturbed area during clearing, grading, and grubbing. Structural BMP's included, silt fencing, road stabilization with geosynthetics and coarse aggregate, seeding and mulching, straw bail barriers, and temporary drains and swales. The Erosion and Sediment Control Plan was posted at the entrance of the site during well construction.

The M1 well is a vertical well drilled between May 9, 2008 and June 2, 2008 to a total depth of 8,350 feet below ground surface for the purpose of natural gas extraction. The well was air drilled from the ground surface to a depth just above the Marcellus Shale. The Marcellus Shale was cored with 3 % potassium chloride (KCl) water. Drilling muds were not used in the construction of the well. The deepest freshwater was encountered in the Devonian-age Catskill Formation at a depth of approximately 665 feet. Drill cuttings and fluids were captured in a lined drill pit excavated in the drilling pad in proximity to the well. Tanks were used to store tophole water during the drilling of the gas well. After drilling, the cuttings were solidified by mixing with cement and disposed of in the lined drill pit in accordance with PA Code § 78.61.

The M1 well log included as part of the Application indicates that the well was constructed in accordance with PADEP Chapter 78 Subchapter D regulations. The well contains a total of three (3) strings of nested casing (conductor casing, surface casing, and production casing). The conductor casing (13 3/8-inch diameter) was installed in a 17 1/2 inch borehole and extends from the ground surface to a depth of 710 feet. The entire annular space was filled with cement. The surface casing (9 5/8-inch diameter) was placed in a 12 1/4-inch diameter borehole and extends from the ground surface to a depth of 1,964 feet. The entire length of the annular space was filled with cement. The surface casing was pressure tested to a maximum pressure of 1,500 pounds per square inch (psi) for 5 minutes. The purpose of the pressure test is to ensure the integrity of the cemented surface casing to effectively isolate fresh water bearing zones from the wellbore prior to drilling through deeper, non-fresh water or other fluid-bearing zones. The production casing (5 1/2-inch diameter) was placed in an approximate 8-inch diameter borehole from the ground surface to a depth of 8,350 feet (bottom of the drilled well). The annular space was filled with cement from the production casing seat at 8,350 feet up to a depth of 5,500 feet.

The M1 well and well site were constructed in accordance with PA Chapter 78 and PADEP Permit No. 37-127-20006-00.

c. **Access Roads.** An improved existing farm road was used to access the well site containing M1. The improved access road is approximately 30 feet in width and 1,200 feet in length and stabilized with compacted crushed stone aggregate. Silt fencing was installed along the length of the road. The total acreage of the access road is approximately 0.8 acres.

d. **Drill Cuttings and Water Containment/Disposal.** During drilling, drilling fluids and cuttings were contained in a drill pit excavated and maintained in accordance with PA Chapter 78 Subchapter C. The water generated during drilling was removed from the drill pit and disposed of at Valley Joint Sewer Authority in Athens, PA. The drill cuttings were solidified and disposed of in the M1 Well drilling pit in accordance with the requirements of PA Chapter 78 Subchapter C.

e. **Water Source/Water Storage Facility.** The docket holder will only utilize water from the DRBC approved surface water withdrawal located on the West Branch Lackawaxen River (WBLR) to support the natural gas exploration and development project at the M1 well. The surface water withdrawal project (Docket No. D-2009-13-1) is being processed concurrently with the M1 Well docket. Fresh water used for site activities will be stored in a 0.8 million gallon capacity, lined, earthen impoundment constructed and maintained in accordance with PA Chapter 78.

f. **Onsite Chemical Storage Facilities.** All chemicals, fuels, lubricants, etc. required for natural gas exploration and development at the site will be properly stored on the well pad in accordance with the Preparedness Prevention and Contingency Plan (PPC Plan) as required by 25 PA Code Chapters 91.34 and 78.55.

g. **Wastewater Containment, Sampling, Transport, Treatment and Disposal.**

i. **Non-Domestic Wastewater.** Non-domestic wastewater shall be stored on site in a manner to prevent its release except in accordance with this docket. Approximately 6,200 barrels of non-domestic wastewater and top-hole water generated during the drilling of the well was removed from the drill pit via vacuum-truck and transported to a disposal facility. Stone informed the Commission that hydraulic fracturing flowback generated from additional work at the site shall be transferred to steel tanks for storage, reuse, or disposal. As such, the use of steel tanks for non-domestic wastewater storage is required at the M1 Well Site as stated in Condition No II.u. in the Decision Section of this docket. The docket holder is encouraged to reuse the flow-back water for well stimulation in accordance with Condition II.m. in the Decision section of this docket. Non-domestic wastewater that cannot be reused for well stimulation will be removed from the site via tanker truck and conveyed to treatment and disposal facilities approved by the DRBC (if in the DRB and subject to Commission approval) as

well as by the applicable state/Federal agency (if inside or outside of the DRB). No on-site discharge of such non-domestic wastewaters, other than as allowed in this docket is permitted.

ii. Domestic Wastewater. Domestic wastewater shall be stored on site in portable self-contained toilets and in a manner to prevent its release onsite. All domestic wastewater shall be conveyed to treatment and disposal facilities approved by the DRBC (if in the DRB and subject to Commission approval) as well as by the applicable state/Federal agency (if inside or outside of the DRB).

iii. Sampling and Record Keeping. Prior to removal from the M1 Well Site, all non-domestic wastewater shall be sampled and the results recorded in accordance with the Operation Plan required by Condition No. II.e. in the Decision section of this docket. Samples shall be representative of the non-domestic wastewater that shall be transported to the DRBC and State-approved off-site treatment and disposal facility. The chemical analysis of non-domestic wastewater must include the following: acidity, alkalinity (total as CaCO_3), aluminum, ammonia nitrogen, arsenic, barium, benzene, beryllium, biochemical oxygen demand, boron, bromide, cadmium, calcium, chemical oxygen demand, chlorides, chromium, cobalt, copper, ethylene glycol, gross alpha, gross beta, hardness (total as CaCO_3), iron-dissolved, iron-total, lead, lithium, magnesium, manganese, MBAS (surfactants), mercury, molybdenum, nickel, nitrite-nitrate nitrogen, oil & grease, pH, phenolics (total), radium-226, radium-228, selenium, silver, sodium, specific conductance, strontium, sulfates, thorium, toluene, total dissolved solids, total kjeldahl nitrogen, total suspended solids, uranium, and zinc. Domestic wastewater can be transported offsite without sampling; however, it may be subject to sampling at or by the treatment facility.

iv. Wastewater Treatment and Disposal. All wastewater, domestic and non-domestic shall be conveyed to the treatment facility designated in the M1 Well Site Operation Plan or as otherwise approved in writing by the DRBC Water Resource Branch Manager as well as by the applicable state/Federal agency (if inside or outside of the DRB).

h. Supporting Ancillary Facilities. The proposed ancillary facilities include Stone's WBLR surface water withdrawal point and the off-site wastewater treatment facilities that will accept the domestic and non-domestic wastewater. Additional facilities will be required to convey and process the natural gas from M1 Well Site including pipelines, compressor stations, separators/liquid storage tanks, etc, however, the locations of these facilities have not been specified.

i. Cost. The overall cost of this project is estimated to be \$3,000,000.00.

B. FINDINGS

This docket is issued in response to an Application submitted to the Delaware River Basin Commission (DRBC or Commission) by Stone Energy Corporation (Stone) for review and approval of a natural gas exploration and development project at its M1 Well site in Clinton Township, Wayne County, Pennsylvania. The Commission recognizes that each natural gas well also will be subject to the review of the environmental agency of a signatory state in which the project is located. The Commission staff coordinates with and, where feasible, will utilize the review process and approvals of the applicable state or federal agency to minimize duplication of effort and redundant requirements imposed on project sponsors.

On June 6, 2008 the Executive Director of the DRBC issued a determination to Stone by certified letter that natural gas exploration and development at the M1 Well site may have substantial impacts on the water resources of the Delaware River Basin (DRB). As such, the DRBC requested that an Application for the M1 Well Site be submitted to the Commission for review and approval.

Stone drilled and cased the M1 well without Commission approval. On December 10, 2008, a settlement agreement between Stone and the Commission required Stone to submit an application to the DRBC for review and approval of the well and to pay a fine as specified in the settlement agreement.

On February 13, 2009, Stone submitted an application to the Commission for approval of the M1 Well. Additional information pertaining to the Application was submitted to the Commission on June 11, 2009.

On May 19, 2009, the Executive Director issued the “*Determination of the Executive Director Concerning Natural Gas Extraction Activities In Shale Formations Within The Drainage Area of Special Protection Waters*” that clarified which natural gas related activities require Commission review and approval (EDD).

SPECIAL PROTECTION WATERS

The project is located in the area of the Delaware River Basin that is designated by the Commission as Special Protection Waters (SPW) as set forth in the DRBC *Water Quality Regulations* (WQR). The SPW designation and associated regulations are designed to protect waters with exceptional value including without limitations existing high water quality in applicable areas of the Delaware River Basin. Article 3.10.3A.2.e.1). and 2). of the *WQR, Administrative Manual - Part III*, requires that projects subject to review under Section 3.8 of the Compact that are located in the drainage area of Special Protection Waters must submit for approval a Non-Point Source Pollution Control Plan (NPSPCP) that controls the new or increased non-point source loads generated within the portion of the docket holder’s service area which is also located within the drainage area of Special Protection Waters.

The M1 Well Site is located within the drainage area to SPW. Therefore, the NPSPCP plan requirement is applicable to this project. This project includes the constructed well pad (completed), well drilling (completed), and well stimulation through hydraulic fracturing. Water necessary for the well stimulation at the M1 Well Site is being processed concurrently with this docket (Docket No. D-2009-013-1). The docket holder submitted a general NPSPCP with the Application. However, no additional site construction activities, well stimulation, or water staging approved by this docket shall take place at the M1 Well Site until a site specific NPSPCP including measures to control stormwater both during and post construction on the site has been submitted to the Commission and approved by the Executive Director and any other necessary federal, state, and local authorizations have been issued.

WATER STORAGE

Water brought to the M1 Well Site from the Commission-approved West Branch Lackawaxen River site will be stored in a lined impoundment constructed and maintained in accordance with PADEP Chapter 78. Under no circumstances shall any material other than surface water originating from a Commission-approved source or precipitation be stored or be allowed to enter the impoundment. If water in this storage facility or the storage facility comes into contact with hydraulic fracturing chemicals, flow back water, or other chemicals and contaminants, all water in the storage facility shall be considered non-domestic wastewater and handled as discussed below.

Unused water from any of the docket holder's Commission approved M1 well natural gas development and extraction site activities in the DRB may be transported to and used at other Commission-approved well pads targeting shale formations controlled by the docket holder in the DRB, with the written approval of the Executive Director. Such transfers shall also be reported to the Commission.

No water, fracturing fluids, flowback water, or otherwise (e.g. cement mixer wash-out, truck wash water, etc.) shall be discharged to waters of the DRB except in accordance with written approvals from the Executive Director and/or the appropriate state agency (Condition II.g. in the Decision section of this docket).

WELL STIMULATION

The docket holder has indicated that the vertical Marcellus shale gas well at the M1 Well Site will be stimulated for production through slick-water hydraulic fracturing. The docket holder has advised the Commission that the well stimulation will involve the injection of approximately 1.0 million gallons (mg) of water with propping agents (i.e. sand of various grain sizes) and hydraulic fracturing additives through the steel production casing into the Marcellus Shale formation underlying the lease holding(s) at approximately 8,200 feet below land surface (elevation 6,655 feet below mean sea level).

The injection will occur at the M1 Well over a period of approximately three days at injection pressures from 5,500 pounds per square inch (psi) to 7,000 psi. Injection of the hydraulic fracturing additives and solutions detailed in the Application into the target formation is acceptable to the Commission as the M1 well was installed by the docket holder in accordance with PA Chapter 78 Subsection D, and approved by the PADEP in Permit No. 37-127-20006-00.

WASTEWATER

Flowback Water

Following well stimulation, Stone estimates that approximately 30% of the estimated 1.0 million gallons of water used for hydraulic fracturing will be returned to the surface as flowback. Flowback from the M1 Well will be piped from the wellhead directly into steel frac tanks for temporary storage on the M1 Well Site, in accordance with Condition II.u. in the Decision Section of this docket.

Treatment and Reuse of On-site Generated Wastewaters

Treatment and reuse of onsite generated non-domestic wastewaters is not proposed at this site. However, the docket holder is encouraged to use the flowback water for well stimulation in accordance with Condition II.m. in the Decision section of this docket.

Recovered fracturing fluids may be recycled for use in natural gas well stimulation activities at the docket holder's Commission-approved natural gas well pads in the DRB with written approval of the Executive Director. Any reuse shall also be reported to the Commission in accordance with the reporting requirements in the Decision Section of this docket. Otherwise, no recovered fracturing fluids shall be used for any purpose other than hydraulic fracturing at natural gas wells targeting shale formations.

Wastewater Disposal

The docket holder has indicated that all non-domestic wastewater including flowback water will be removed from the site via tanker truck and conveyed to treatment and disposal facilities located outside of the DRB. Such disposal is an exportation of wastewater subject to review and approval under Article 2.3 of the Commission's Water Code. Currently, there are no wastewater treatment and disposal facilities within the DRB that are approved to accept these non-domestic wastewaters. In addition docket Condition No. II.m. in the Decision section of this docket requires the docket holder to implement a continuous program to encourage water conservation in all types of use within the facilities served by this docket including the reuse and recycling of flowback waters. The Decision section of this docket also contains conditions concerning the offsite disposal location and the tracking and reporting of non-domestic wastewaters transported from the project site. Therefore, the Commission staff recommends approval of the proposed exportation of non-domestic wastewater. No on-site discharge of such non-domestic wastewaters, other than as allowed in this docket is permitted. Any such

discharge shall be reported to the Project Review Section of the DRBC in accordance with Condition No. II.q. in the Decision Section of this docket.

The docket holder has indicated that domestic wastewater shall be collected in portable, self-contained toilets. When necessary, the toilets will be transported to the sewage treatment facility approved in the Operation Plan (described below). No on-site discharge of such domestic wastewaters is permitted.

The project is designed to conform to the requirements of the *Water Code* and *Water Quality Regulations* of the DRBC.

The natural gas well associated with this project was designed and constructed to conform to the casing and cementing requirements of Sections 78.81-.87 of the PADEP Oil and Gas Regulations. It has been determined by the Commission that these casing and cementing requirements satisfy the Basinwide Groundwater Requirements located in Section 3.40 of the Commission's Water Quality Regulations. These casing construction requirements are designed to sufficiently protect the designated uses of the ground waters of the Delaware River Basin.

The cuttings generated during drilling of the M1 well were solidified and buried in a lined pit on-site in accordance with PA Chapter 78 regulations. Non-domestic wastewater generated during drilling of the M1 well was removed from the site and disposed of at Valley Joint Sewer Authority in Athens, PA.

The DRBC estimates that the well stimulation through hydraulic fracturing, results in a consumptive water use of 100 percent of the total water used. The DRBC definition of consumptive use is defined in Article 5.5.1.D of the *Administrative Manual – Part III – Basin Regulations – Water Supply Charges*.

M1 WELL SITE OPERATION PLAN

In accordance with Condition II.e. of the Decision section of the docket, at least 45 days prior to the scheduled initiation of any activity at the M1 Well Site, the docket holder shall submit an Operation Plan (OP) for the M1 Well Site to the Executive Director. The OP shall include the specifics of the site operations, detailing at a minimum, the procedures necessary to comply with the conditions in the Decision section of this docket. In accordance with Condition II.e., no additional construction or natural gas development and extraction activities at the M1 Well Site is permitted until the OP is approved in writing by the Executive Director. The following shall also be included in the M1 Well Site Operations Plan:

Pre-Alteration Groundwater Quality Survey Plan. Prior to initiation of hydraulic fracturing at the M1 Well, the docket holder will submit a pre-hydraulic fracturing groundwater quality survey plan, receive Executive Director approval, and conduct the groundwater quality survey. The plan shall include an inventory and the locations of any

artificial penetrations including groundwater wells within a 1,000 ft radius of the project well. If no existing wells are identified within this distance, the search radius should be extended up to 2,000 feet from the gas well. The plan shall indicate the proposed sampling procedures to be conducted at a representative number of identified wells spaced around the proposed natural gas well. Prior to hydraulic fracturing at the M1 Well, water samples shall be collected and the samples submitted to a PADEP-certified laboratory for analysis of the following parameters: acidity, alkalinity (total as CaCO₃), aluminum, ammonia nitrogen, arsenic, barium, benzene, beryllium, boron, bromide, cadmium, calcium, chlorides, chromium, cobalt, copper, ethylene glycol, gross alpha, gross beta, hardness (total as CaCO₃), iron-dissolved, iron-total, lead, lithium, magnesium, manganese, MBAS (surfactants), mercury, molybdenum, nickel, nitrite-nitrate nitrogen, oil & grease, pH, phenolics (total), radium-226, radium-228, selenium, silver, sodium, specific conductance, strontium, sulfates, thorium, toluene, total dissolved solids, total kjeldahl nitrogen, total suspended solids, uranium, and zinc.

Wastewater Storage and Handling Details. The OP shall include the details of how domestic and non-domestic wastewater will be stored and handled on the project site.

Wastewater Disposal Locations. The OP shall include a list of the treatment sites where these domestic and non-domestic wastewaters will be disposed. The facility locations, state permit numbers, and acceptance agreements shall be included in the OP.

Measuring, Recording, and Records Maintenance System. The docket holder shall develop and submit with the OP a measuring, recording, and records maintenance system. The measuring, recording, and records maintenance system will include the proposed means with which to measure and record the amount of all water transported to the site by truck or any other means, the amount of water used at the site, the amount of water and fracturing fluids/ chemicals used in the natural gas well stimulation process, the amount of flowback recovered after stimulation, the amount and chemical composition of non-domestic wastewaters produced and stored at the site, and the amount and chemical composition of non-domestic wastewaters transported off-site for treatment and disposal. The method of sampling and analysis of non-domestic wastewater shall also be detailed in this plan. Measuring and record keeping activities shall be required for all non-domestic wastewater including produced water and flowback separated from the natural gas during the operational life of the natural gas well. The system will also record the truck number, license plate number and disposal location for each truck load of non-domestic wastewater transported off site.

Reporting System. The docket holder shall include in the OP the method for complying with the reporting requirements in accordance with docket conditions II.k. and II.l. in the decision section of the docket.

Preparedness Prevention and Contingency Plan (PPC Plan). The docket holder shall submit with the OP the PPC Plan that is required for Oil & Gas Wells as outlined in 25 PA Code Chapters 91.34 and 78.55.

The project does not conflict with the Comprehensive Plan and is designed to prevent substantial adverse impact on the water resources related environment, while sustaining the current and future water uses and development of the water resources of the Basin.

C. DECISION

I. Effective on the approval date for Docket No. D-2009-18-1 the project and the appurtenant facilities described in the Section A “Description” shall be added to the Natural Gas Database maintained by the DRBC.

II. The project and appurtenant facilities as described in the Section A “Description” are approved pursuant to Section 3.8 of the *Compact*, subject to the following conditions:

a. Docket approval is subject to all conditions, requirements, and limitations imposed by the PADEP in Well Drilling Permit No. 37-127-20006-00, and such conditions, requirements, and limitations are incorporated herein, unless they are less stringent than the Commission’s.

b. The lease holding, well pad site, and natural gas well, and operational records shall be available at all times for inspection by the DRBC.

c. The docket holder shall submit a Non-Point Source Pollution Control Plan (NPSPCP) for the M1 Well Site in accordance with Section 3.10.3.A.2.e, of the DRBC Water Quality Regulations to the Executive Director of the DRBC at least 45 working days prior to the scheduled initiation of any additional site clearing or construction at the well pad site. The NPSPCP and erosion and sedimentation control plan shall be designed in accordance with the more stringent of Commission and PADEP requirements. Prior to commencing any site clearing or construction work at the M1 Well Site, the docket holder shall obtain Executive Director’s written approval for the NPSPCP, as well as, any other necessary federal, state, and local authorizations. The NPSPCP shall describe erosion and sedimentation controls to be implemented at the site and shall include measures to control stormwater both during and post construction. The post-construction portion of the plan shall describe the final site conditions including a pre- and post-construction project hydrograph analysis, permanent facilities, equipment, access roads, and all sediment and erosion and stormwater control structures necessary after final site restoration has been achieved.

d. Sound practices of excavation, backfill and reseedling shall be followed at the well pad site and any associated appurtenances to minimize erosion and prevent non-point source pollutants from leaving the site. The docket holder shall abide by all state and local erosion and sediment control and storm water management control legislation.

e. **M1 WELL SITE OPERATION PLAN (OP).** As described in the Findings section of this docket, the docket holder shall submit the OP for approval in writing by the Executive Director. No activities other than those required to maintain or correct existing erosion and sedimentation controls shall be conducted at the M1 Well Site until the OP plan has been approved. The OP plan shall include the following:

- i. Pre-alteration groundwater quality survey plan.
- ii. Wastewater storage and handling details.
- iii. Wastewater disposal locations.
- iv. Measuring, Recording, and Records Maintenance System.
- v. Reporting system.
- vi. Preparedness Prevention and Contingency Plan (PPC Plan).

f. The docket holder shall demonstrate to the satisfaction of the Commission that all surface waters that are withdrawn for the purposes of hydraulic fracturing this well including, but not limited to flow-back fluids, produced brines, and drilling fluids have been treated and disposed of in accordance with applicable state and federal law.

g. No unused water withdrawn from the source approved for use at this well site, fresh or otherwise shall be discharged to waters of the DRB without the written approval of the DRBC and the appropriate state agency. All domestic and non-domestic wastewaters shall be treated at an approved treatment and discharge facility as provided for in the OP in Condition II.e. above.

h. Nothing herein shall be construed to exempt the docket holder from obtaining all necessary permits and/or approvals from other State, Federal or local government agencies having jurisdiction over this project or activities conducted under this project.

i. Upon completion of construction of the approved project, the docket holder shall submit a statement to the DRBC, signed by the docket holder's engineer or other responsible agent, advising the Commission that the construction has been completed in compliance with the approved plans, giving the final construction cost of the approved project and the date the project is placed in operation.

j. This docket approval shall expire three years from date below unless prior thereto the docket holder has commenced operation of the subject project or has expended substantial funds (in relation to the cost of the project) in reliance upon this docket approval.

k. The project natural gas well hydraulic fracturing volume and flow-back discharge volume shall be metered with an automatic continuous recording device

or equivalent that measures to within 5 percent of actual flow. An exception to the 5 percent performance standard, but no greater than 10 percent, may be granted if maintenance of the 5 percent performance is not technically feasible or economically practicable. A record of hydraulic fracturing stimulation volume and flow-back discharge volume from the project natural gas well shall be maintained, and monthly totals shall be reported to the DRBC after completion of natural gas well stimulation activities and shall be available at any time to the Commission if requested by the Executive Director.

l. The volume of all non-domestic wastewaters removed from the M1 Well Site shall be recorded and maintained and monthly totals shall be reported to the DRBC in accordance with the approved OP.

m. The docket holder shall implement to the satisfaction of the Commission, the continuous program to encourage water conservation in all types of use within the facilities served by this docket approval. This includes the reuse and recycling of flow-back waters to the greatest extent possible at the site. The docket holder will report to the Commission on the actions taken pursuant to this program and the impact of those actions as requested by the Commission.

n. No brines, flowback, produced waters or any other waste shall be used for any well, well pad site, or lease area not contained within this docket unless approved in writing by the Executive Director.

o. A complete application for the renewal of this docket, or a notice of intent to cease the operations (withdrawal, discharge, etc.) approved by this docket by the expiration date, must be submitted to the DRBC at least 12 months prior to the expiration date below (unless permission has been granted by the DRBC for submission at a later date), using the appropriate DRBC application form. In the event that a timely and complete application for renewal has been submitted and the DRBC is unable, through no fault of the docket holder, to reissue the docket before the expiration date below, the terms and conditions of this docket will remain fully effective and enforceable against the docket holder pending the grant or denial of the application for docket approval.

p. The issuance of this docket approval shall not create any private or proprietary rights in the water of the Basin, and the Commission reserves the rights to amend, alter or rescind any actions taken hereunder in order to insure the proper control, use and management of the water resources of the Basin.

q. The docket holder shall report to the Commission Project Review Section Supervisor any violation of the docket conditions within 48-hours of the occurrence or upon the docket holder becoming aware of the violation. In addition, the docket holder shall report in writing any violations of the approved operations plan or any other docket conditions to the DRBC Project Review Section Supervisor within three days of reporting the incident. The docket holder shall also provide a written explanation of the causes of the violation within 30 days of the violation and shall set forth the

action(s) the docket holder has taken to correct the violation and protect against a future violation.

r. If the monitoring required herein, or any other data or information demonstrates that the operation of this project significantly affects or interferes with any designated uses of ground or surface water, or if the docket holder receives a complaint regarding this project, the docket holder shall immediately notify the Executive Director of any complaints and unless excused by the Executive Director, shall investigate such complaints. The docket holder shall direct phone call notifications of complaints involving water resources to the DRBC Project Review Section at 609-883-9500, extension 216. Oral notification must always be followed up in writing directed to the Executive Director. In addition, the docket holder shall provide written notification to all potentially impacted users of wells or surface water users of the docket holder's responsibilities under this condition. Any ground or surface water user which is substantially adversely affected, rendered dry or otherwise diminished as a result of the docket holder's project withdrawal, shall be repaired, replaced or otherwise mitigated at the expense of the docket holder. A report of investigation and/or mitigation plan prepared by a hydrologist shall be submitted to the Executive Director as soon as practicable or within the time frame directed by the Executive Director. The Executive Director shall make the final determination regarding the validity of such complaints, the scope or sufficiency of such investigations, and the extent of appropriate mitigation measures, if required.

s. The Executive Director may modify or suspend this approval or any condition thereof, or require mitigating measures pending additional review, if in the Executive Director's judgment such modification or suspension is required to protect the water resources of the Basin.

t. For the duration of any drought emergency declared by either Pennsylvania or the Commission, water service or use by the docket holder pursuant to this approval shall be subject to the prohibition of those nonessential uses specified by the Governor of Pennsylvania, the Pennsylvania Emergency Management Council, PADEP, or the Commonwealth Drought Coordinator to the extent that they may be applicable, and to any other emergency resolutions or orders adopted hereafter by the Commission.

u. All non-domestic wastewaters including, but not limited to, brines, flow-back water, produced waters, etc. must be temporarily stored on-site in steel, water-tight tanks at a minimum unless the docket holder has received written approval from the Executive Director to use an alternative method of storage. All wastewaters will be removed from the site in accordance with the approved OP.

v. The Commission has determined that the review of the reports and requests for modifications and approvals developed under the above docket and any amendments or changes thereto will continue to cause the Commission to expend exceptional efforts and costs. As such, Commission staff will continue to maintain a record of all time and expenses associated with the post-docket approval reviews of the project and associated deliverables. A fee in the amount of 100% of these costs will be

assessed on a quarterly basis. In the event of a docket amendment or renewal, the larger of actual project review costs or the calculated project review fee will be charged.

w. The docket holder and any other person aggrieved by a reviewable action or decision taken by the Executive Director or Commission pursuant to this docket may seek an administrative hearing pursuant to Articles 5 and 6 of the Commission's *Rules of Practice and Procedure*, and after exhausting all administrative remedies may seek judicial review pursuant to Article 6, section 2.6.10 of the *Rules of Practice and Procedure* and section 15.1(p) of the Commission's *Compact*.

BY THE COMMISSION

APPROVAL DATE: , 2010

EXPIRATION DATE: , 2020

DRAFT

Reference 3

Robson 1 Gas Well Chesapeake Appalachia, LLC
Pennsylvania State Department of Environmental Protection
Permit 37-127-20008-00, Issued 2/26/09

March 15, 2009

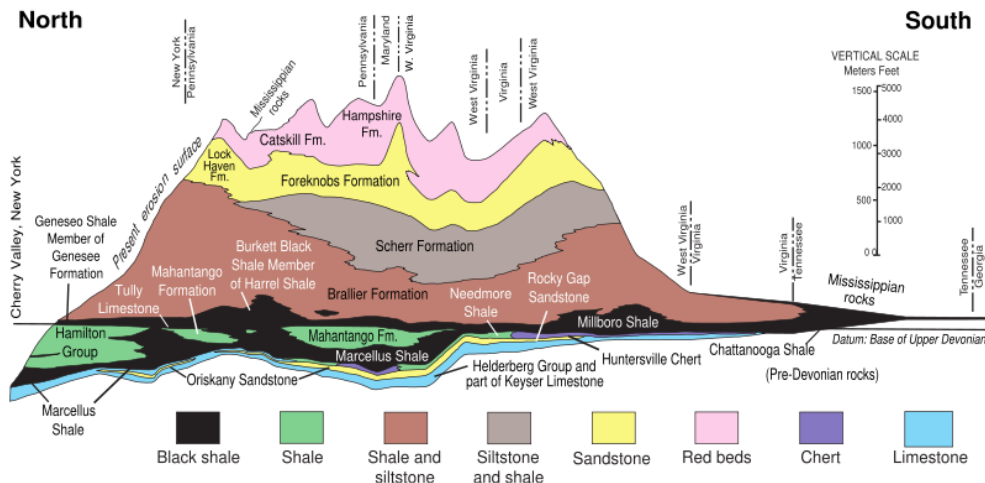
1. At the particular GIS location of the Robson well, at what depth (top and bottom) is the Marcellus? At what depth (top and bottom) is the Oriskany?

Well Location: Chesapeake Appalachia, LLC's permit application requested to drill a 8898 ft. True Vertical Depth (TVD) well into the Oriskany formation at latitude 41° 37' 39.52" N, and longitude 75° 12' 11.68" W, in Wayne County, Oregon Municipality, Pennsylvania. See attached Google Earth Maps that show the actual well location. The well is proposed to be drilled 4.55 miles NE of Honesdale, Pennsylvania.



The application provided no information on geologic formation depths, well design or wellbore construction path. This lease was unitized, and in doing so, geologic information would have been submitted to the State of Pennsylvania. I was not able to locate the unit application on the web (if needed this could be requested and would likely provide more detailed, site specific geologic information).

However, general geologic stratigraphy is available for this region from the State of Pennsylvania and the USGS, showing the Oriskany Sandstone lies beneath the Marcellus Shale in Wayne County.



The Oriskany Sandstone and the Marcellus Shale are both Devonian aged formations. The Marcellus Shale lies above the Oriskany Sandstone and is believed to be the source rock for the Oriskany Sandstone gas accumulations in places where the Oriskany Sandstone geology created a good structural trap such an anticline to contain the gas. In general, shales are believed to be a common source rock for gas. Gas from shale accumulations may migrate in the subsurface and be stored in more porous sandstone formations, if a structural trap is available in the sandstone formation to contain the gas. The Needmore Shale (which lies above the Oriskany Sandstone, and below the Marcellus Shale) is also believed to be a potential gas source rock (see USGS Figure 47).

This area of Wayne County is known to be Oriskany structural play (see USGS Figure 48). Although the Oriskany Sandstone is known to be present in Wayne County, whether it contains gas is not well known. Most of the Oriskany gas fields developed to date are located several hundred miles to the west.

The bottom of the Devonian Formation at the Robson 1 Well area is approximately 10,000' deep (see USGS Figure 4). In this area, the USGS predicts the Marcellus Shale to be a mature gas source rock (see USGS Figure 31), rather than a gas development source itself (see USGS Figure 13). While Marcellus Shale in Wayne County may provide the source rock for gas stored in the Oriskany Sandstone, it is not predicted by the USGS to be a good area shale gas recovery itself (see USGS Figure 15).

The State of Pennsylvania oil and gas field map of 2007 (see Map 10) shows no known deep gas fields in the Wayne County area. Thus, I assume this well must be an exploratory well, seeking to determine if the Oriskany deep gas play extends east of known western gas fields in Pennsylvania.

I was not able to locate any maps showing the exact depth of the Oriskany or Marcellus formations, but the Devonian formation is believed to be at least 10,000 feet deep. The Oriskany is not the deepest formation in the Devonian. There are other shale and limestone formations in the Devonian that underlie the Oriskany. Thus, if the Devonian is at least 10,000 feet deep in Wayne County, it would make sense that the Oriskany would be shallower at a depth of 8898' TVD.

The State of Pennsylvania maps show the Marcellus Shale is approximately 150-250 thick and overlies the Oriskany sandstone formation in the Wayne County area.¹

2. Description of the Oriskany as a porous sandstone layer - is this an accurate description for it wherever the Oriskany label is applied? Is this an accurate description for it at the Robson site?

Yes. The USGS characterizes the Oriskany as a lower Devonian sandstone formation.

The Oriskany Sandstone is a white to light gray, texturally mature, coarse-grained to medium-grained quartz sandstone (Edmunds and Berg, 1971; Patchen and Harper, 1996), whose type section is located at Oriskany Falls, New York (Vanuxem, 1839). The

¹ *Pennsylvania* Geology, Bureau of Topographic and Geologic Survey, Pennsylvania Department of Conservation and Natural Resources, Vol. 38, No. 1, Spring 2008

Oriskany Sandstone and equivalent stratigraphic units are more quartz-rich and coarser-grained to the east, and intergranular cement is more abundant to the east (Patchen and Harper, 1996). In most places, the sandstones are cemented by calcite, and silica cement is common near the top of the formation at some locations (Edmunds and Berg, 1971; Patchen and Harper, 1996).²

The State of Pennsylvania reports that the Oriskany Sandstone was a significant source of commercial natural gas in New York and Pennsylvania in the 1930s.³ The Oriskany gas was typically developed several hundred miles west of Wayne County.

The U.S. Geological Survey (USGS) recently completed an assessment of the technically recoverable undiscovered hydrocarbon resources of the Appalachian Basin Province. The assessment province includes parts of New York, Pennsylvania, Ohio, Maryland, West Virginia, Virginia, Kentucky, Tennessee, Georgia and Alabama. The assessment was based on six major petroleum systems, which include strata that range in age from Cambrian to Pennsylvanian. The USGS reports that Devonian Shale-Middle and Upper Paleozoic TPS contains some of the more productive source rocks and reservoirs for hydrocarbons in the Appalachian Basin Assessment Province. USGS notes that Devonian shale (such as the Marcellus Shale) may contain gas in the eastern part of Pennsylvania because they are autogenic (self-sourced) gas reservoirs, however, the gas may have migrated and been stored in sandstone formations such as the Oriskany Sandstone, a mature, quartzose sandstone, which is known to be up to 360' thick. The USGS characterizes the Oriskany formation as a sandstone formation that collected gas in structural traps located along the crests of anticlines.⁴

² U.S. Department of the Interior, U.S. Geological Survey, Open-File Report Series 2006-1237, Assessment of Appalachian Basin Oil and Gas Resources: Devonian Shale–Middle and Upper Paleozoic Total Petroleum System, by Robert C. Milici and Christopher S. Swezey. 2006.

³ *Pennsylvania Geology*, Bureau of Topographic and Geologic Survey, Pennsylvania Department of Conservation and Natural Resources, Vol. 38, No. 1, Spring 2008

⁴ U.S. Department of the Interior, U.S. Geological Survey, Open-File Report Series 2006-1237, Assessment of Appalachian Basin Oil and Gas Resources: Devonian Shale–Middle and Upper Paleozoic Total Petroleum System, by Robert C. Milici and Christopher S. Swezey. 2006.

**Reference 4
(Excerpt)**



The Oil and Gas Industry's Exclusions and Exemptions to Major Environmental Statutes



The Oil and Gas Industry's
Exclusions and Exemptions to
Major Environmental Statutes

Renee Lewis Kosnik, MSEL, JD
Research Director, Oil and Gas Accountability Project

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A PROJECT OF EARTHWORKS
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OGAP P.O. Box 1102 ■ Durango, CO 81302 ■ www.ogap.org
Earthworks 1612 K St. N.W., #808 ■ Washington DC 20006
www.earthworksaction.org

Executive Summary

The oil and gas industry enjoys sweeping exemptions from provisions in the major federal environmental statutes intended to protect human health and the environment. These statutes include the:

- **Comprehensive Environmental Response, Compensation, and Liability Act**
- **Resource Conservation and Recovery Act**
- **Safe Drinking Water Act**
- **Clean Water Act**
- **Clean Air Act**
- **National Environmental Policy Act**
- **Toxic Release Inventory under the Emergency Planning and Community Right-to-Know Act**

This lack of regulatory oversight can be traced to many illnesses and even deaths for people and wildlife across the country. There are a variety of chemicals used during the many phases of oil and gas development. These chemicals also produce varying types of waste throughout these processes. Because of the exemptions and exclusions, toxic chemicals and hazardous wastes are permeating the soil, water sources and the air threatening human health to an alarming extent. In order to adequately remedy the negative impacts on human health and the environment, the following recommendations must be addressed:

- 1) Crude oil and petroleum must be covered under the *Comprehensive Environmental Response, Compensation, and Liability Act* in order to protect human health and the environment from spills and leaks of hazardous and carcinogenic materials on well sites. This is the only way to currently assist overburdened federal and state programs in light of the exponential growth of oil and gas development in the United States.
- 2) To protect human health and the environment, oil field wastes must be regulated under the *Resource Conservation and Recovery Act* in order to ensure the proper handling and disposal of hazardous and carcinogenic wastes generated by oil and gas development. Otherwise, the petroleum industry will continue to dispose of oil field waste in ways that can pollute soil, surface and groundwater.
- 3) Hydraulic fracturing must be regulated by the Environmental Protection Agency under the *Safe Drinking Water Act* in order to adequately protect the United State's drinking water supply from the harmful chemicals used during this process. This recommendation includes a total ban on the use of diesel fuel as one of the additives in the hydraulic fracturing process.
- 4) Stormwater discharges from all oil and gas development must be regulated under the *Clean Water Act* by the federal government in

order to provide the states with a proper foundation from which to build adequate stormwater programs that will protect human health and the environment from expanding oil and gas development.

Emissions from all oil and gas facilities must be aggregated under the *Clean Air Act* in order to ascertain the true hazardous effect on air quality. Also, hydrogen sulfide must be re-established as a hazardous air emission under the Clean Air Act in light of the current available data regarding its negative impacts on human health and the environment.

Because of the disruptive nature of oil and gas activities on human health and the environment, none of these activities ought to qualify for the categorical exclusion under the *National Environmental Policy Act*. All oil and gas activities must be assessed for impacts on the environment under the more comprehensive environmental assessment and environment impact statement in order to properly fulfill the intentions of the statute.

The petroleum industry must be made to disclose the chemicals used during the development stages under the *Toxic Release Inventory within the Emergency Planning and Community Right-to-Know Act*, in order to ensure that human health and the environment can be protected from these often-hazardous and carcinogenic substances.

One of the goals for the Oil and Gas Accountability Project is to help communities and citizens better understand and protect themselves from the health and environmental impacts associated with toxic oil and gas chemicals and wastes. The following report explains these exemptions, how they apply to oil and gas development, and the consequences to human health and the environment that are left behind. To learn more about the devastating impacts of oil and gas development, read *Oil and Gas at Your Door? A Landowner's Guide to Oil and Gas Development* and *Our Drinking Water At Risk: What EPA and the Oil And Gas Industry Don't Want Us to Know About Hydraulic Fracturing*, available at: www.ogap.org.

Reference 5

Subject: Cabot #2 Well
From: David Kovach <David.Kovach@drbc.state.nj.us>
Date: Tue, 04 Aug 2009 17:05:30 -0400
To: jimmy@arbor-resources.com

Dear Mr. Eichstadt,
I am writing concerning the application for the Cabot #2 well submitted to the Commission by Arbor Operating, LLC (Arbor) on April 16, 2009. As you are aware, on May 19, 2009, the Executive Director of the DRBC issued a determination concerning proposed and existing natural gas wells and associated appurtenances completed in the Marcellus Shale and other shale formations in the drainage area of Special Protection Waters in the Delaware River Basin. As the Cabot #2 natural gas well that Arbor has proposed lies within the drainage area to the special protection waters known as the Lower Delaware and is proposed to be drilled into a shale formation, it is covered under the Executive Director determination. As Arbor has stated that they propose to develop the well if a viable quantity of natural gas is discovered, the well is not therefore being drilled solely for exploratory purposes and is again covered under the Executive Directors Determination. The well may not be covered under the determination if a cap and plug plan is submitted to the Commission and it is affirmed that the well will be properly abandoned upon completion and collection of necessary exploratory data. The groundwater withdrawal rate of significantly less than 100,000 gpd during any consecutive 30-day period detailed in the application is not specifically covered by DRBC regulations, but all water supplies, no matter what the withdrawal volume, will be considered from a potential impact/interference standpoint when an application for a natural gas well in Marcellus or other shale proposed in special protection waters is being reviewed.

The application for the Cabot #2 well as submitted requires additional information if natural gas development at the well is to be considered for DRBC approval. These include, but are not necessarily limited to the following:

- 1) A revised applicant statement and appropriate fee, related to the actual total project costs that would include the drilling and construction of the Cabot #2 well.
- 2) The necessary information included in the attached draft natural gas project submission requirements word document.

If the well will be used solely for exploratory purposes, then an appropriate cap and plug plan must be submitted to the Commission affirming that the well will be properly abandoned upon completion and collection of necessary scientific data.

Please contact me if you have any further questions,
Dave

--
David Kovach, P.G.
Geologist, Project Review Section
Delaware River Basin Commission
(p) 609-883-9500 ext 264
(f) 609-883-9522
(e) david.kovach@drbc.state.nj.us

Shale gas drilling project submission requirements.doc

Content-Type: application/msword
Content-Encoding: base64

**Reference 6
(Excerpt)**

A View of the River

Luna B. Leopold

*Harvard University Press
Cambridge, Massachusetts
London, England*

of the stream systems throughout the year. The most useful supporting evidence is the information obtained from local residents.

. . . All perennial streams are published regardless of length.

All intermittent streams are published that are longer than 2,000 feet. . . . In applying these rules they should be modified where necessary to produce a consistent portrayal, especially in the extension of streams in headwater drainage.

. . . Streams at the source and upper part of a drainage system are an integral and important part of a complete drainage system. In general, headwater drainage shown on the published map should terminate no higher than about 1,000 feet from the divide, or at the upper confluence of streams, whichever appears most appropriate.

These instructions to the staff preparing a topographic map show that the headward limits of the blue lines do not reflect any statistical characteristic of streamflow occurrence. The specification that the blue line terminate no higher than about 1,000 feet from the watershed divide does not reflect differences in hydrologic performance among various combinations of climate, topography, and geology. Rather, the choice of what is to be shown as an interrupted blue line is based on "consistent portrayal," as the instructions state. The geomorphologist must provide a personal rationale and evidence for designation of first-order tributaries in any given area.

It would be desirable to have some criteria resulting from field studies that would give specific statistical or physical significance to the type of line used on a topographic map. The criteria might stem from a study on the frequency or duration of flow in channels of different sizes or drainage areas. For example, it would be useful if one knew that the solid blue line became dash-dot where a streamflow changed from 90 percent of the time to 80 percent. This change might be a function of drainage area within a given physiographic or lithologic unit. The determination would have to be specific, but also easy in mapmaking practice.

I tried to devise a way of defining hydrologic criteria for the channels shown on topographic maps and developed some promising procedures. None were acceptable to the topographers, however. I learned that the blue lines on a map are drawn by nonprofessional, low-salaried personnel. In actual fact, they are drawn to fit a rather personalized aesthetic. It is surprising that geographers, long interested in mapmaking, have not considered this problem and devised some useful and simple rules based on generalizations from field facts.

In Figure 12.6 appear three versions of the drainage network of Watts Branch above Viers Pasture near Rockville, Maryland. The first map

Figure 12.6
1965 topographic map of
the contour interval
Maryland

shows the
topographic
lines, in
the

The
contour
channel
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Final
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The
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most d
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map is
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Europe

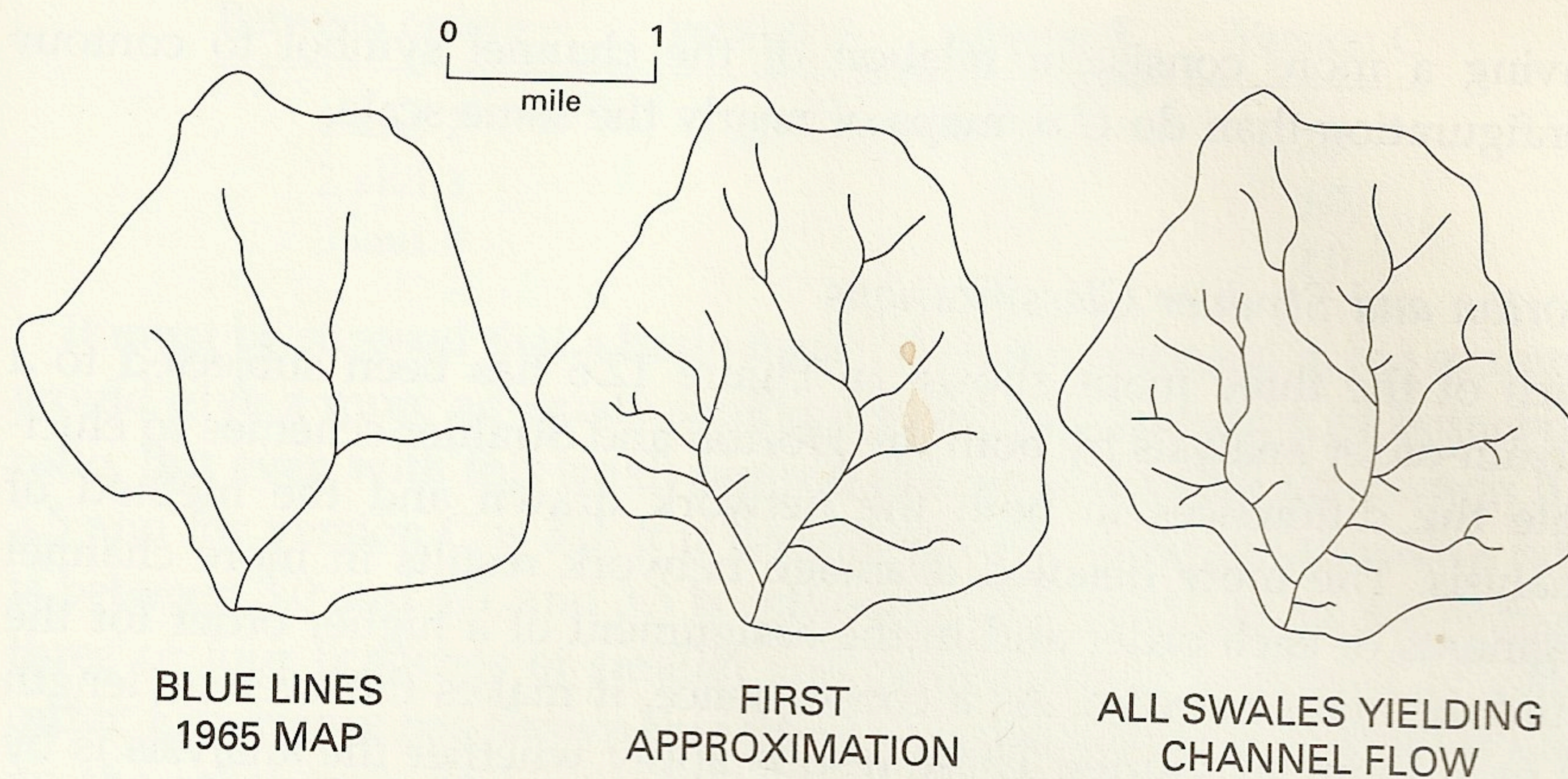


Figure 12.6 Three versions of the channel network. At left, blue lines printed on a 1965 topographic map; at center, a more detailed net; at right, careful analysis of the contour pattern to include all significant swales or draws. Watts Branch, Maryland; drainage area 3.7 square miles.

shows the drainage net depicted by blue lines on the 1965 edition of the topographic map. This net includes both solid blue and dot-dash blue lines, indicating streams as depicted on the published quadrangle map.

The middle version is the drainage net derived from study of the contour lines of the topographic map, in an effort to draw a stream channel in the principal contour reentrants. The channels are drawn in a consistent manner, so that the same contour configuration applies to each draw or swale considered important enough to be represented as a channel.

Finally, the third version is an attempt to add to the drainage net all swales considered prominent enough to yield channel flow during storms, an admittedly subjective choice. For consistency, headwater tips of tributaries shown in the second version are extended headward to be comparable in drainage area and distance from divide to the smallest newly added channels.

The three maps show the differences in drainage network that might logically be derived from the same topographic map. From both field experience and network analysis, preference would be for the third or most detailed version. To construct such a complete map, however, requires considerable time in excess of what is needed for the second, intermediate version. Such extra effort may be precluded if a network map is required for a large area. Either the second or the third version is preferable for nearly all purposes to the first. Comparable maps for some European countries, especially Belgium, are close to the second version,

Reference 7



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED MANAGEMENT
BUREAU OF OIL AND GAS MANAGEMENT

OFFICIAL USE ONLY
ID # _____
Date Received _____

**NOTICE OF INTENT FOR COVERAGE
UNDER THE EROSION AND SEDIMENT CONTROL GENERAL PERMIT (ESCGP-1)
FOR EARTH DISTURBANCE ASSOCIATED WITH OIL AND GAS EXPLORATION,
PRODUCTION, PROCESSING OR TREATMENT OPERATIONS OR TRANSMISSION FACILITIES**

READ THE STEP-BY-STEP INSTRUCTIONS PROVIDED IN THIS PERMIT APPLICATION PACKAGE BEFORE COMPLETING THIS FORM.
PLEASE PRINT OR TYPE INFORMATION IN BLACK OR BLUE INK.

APPLICATION TYPE	NEW <input type="checkbox"/>	RENEWAL <input type="checkbox"/>	REVISED <input type="checkbox"/>	EXPEDITED <input type="checkbox"/>	
SECTION A. E&S PLANNING REQUIREMENTS					
1. Total Project Area (Acres): _____ Total Disturbed Area (Acres): _____					
2. Project Name					
3. Project Type					
<input type="checkbox"/> Oil/Gas Well <input type="checkbox"/> Pipeline/Transmission Facility <input type="checkbox"/> Processing Facility <input type="checkbox"/> Treatment Facility					
<u>Project Description</u>					

4. Please provide the latitude and longitude coordinates for the center of the project. The coordinates should be in degrees, minutes and seconds (dd mm ss.ss)					
Latitude ____degrees ____minutes ____seconds Longitude ____ degrees ____ minutes ____ seconds					
Reference Datum: <input type="checkbox"/> North American Datum 1983 <input type="checkbox"/> North American Datum 1927 <input type="checkbox"/> World Geodetic System 1984					
Horizontal Collection Method: <input type="checkbox"/> GPS <input type="checkbox"/> Interpolated from U.S.G.S. topo map <input type="checkbox"/> DEP's eMAP					
5. U.S.G.S. 7.5 min. Quad Map Name _____					
6. Will the project be conducted as a phased permit project? <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, Include Master Site Plan					
Estimated Timetable for Phased Projects <input type="checkbox"/> Additional sheet(s) attached					
Phase No. or Name	Description	Total Area	Disturbed Area	Start Date	End Date

7. Existing and previous land use	
8. Other Pollutants: Will the stormwater discharge contain pollutional substances other than sediment? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, explain and provide any available quantitative data.	
9. Will fuels, chemicals, solvents, other hazardous waste or materials be used or stored on site during earth disturbance activities? Yes <input type="checkbox"/> No <input type="checkbox"/> (If yes, a PPC Plan is required)	
10. Receiving Water/Watershed Name <hr/> Chapter 93 Designated Use or Existing Use Stream Classification <input type="checkbox"/> High Quality <input type="checkbox"/> Exceptional Value <input type="checkbox"/> Other Secondary Water	Name of Municipal or Private Separate Storm Sewer Operator

SECTION B. APPLICANT INFORMATION

Applicant's Last Name	First Name	MI	Phone	FAX
Organization Name or Registered Fictitious Name			Phone	FAX
Mailing Address	City	State	ZIP + 4	
Co-Applicant's Last Name	First Name	MI	Phone	FAX
Organization Name or Registered Fictitious Name			Phone	FAX
Mailing Address	City	State	ZIP + 4	

SECTION C. SITE INFORMATION

Site Name				
Site Location				
Site Location -- City	State	ZIP+4		
Detailed Written Directions to Site				
County	Municipality	City	Boro	Twp
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION D. SITE RESTORATION PLAN AND POST CONSTRUCTION STORMWATER BMPS
See the Attached Instructions on how to Complete This Section

1. Site restoration should be designed to use natural measures to eliminate pollution, infiltrate runoff, not require extensive construction and maintenance efforts, promote pollutant reduction, preserve the integrity of stream channels, and protect the physical, chemical and biological qualities of the receiving water.

Check those that apply:

- The Site Restoration Plan and PCSM BMPs are developed to be consistent with an Act 167 Stormwater Management Plan approved by the Department after January 2005.
- The Site Restoration Plan and PCSM BMPs are developed to be consistent with existing local ordinances.
- The Site Restoration Plan and PCSM BMPs were developed to employ water quality design features and the PCSM BMPs will manage any net increase in stormwater runoff volume resulting from the 2-year/24-hour frequency storm.

2. Site Restoration Plan Contents

- a. Written narrative Yes No
- b. Plan drawings Yes No
- c. Identification and location of PCSM BMPs. Such PCSM BMPs should address: (1) infiltration; (2) volume and rate control; and (3) water quality treatment Yes No
- d. Operation and maintenance procedures Yes No
- e. Supporting calculations and measurements (when necessary): Yes No

Supporting calculations and measurements are required only if the answers to both questions 1 and 2 below are NO.

- 1) The approximate original contours of the project site will be maintained or replicated insuring the preservation of the pre-construction drainage pattern and features; and the disturbed areas will be re-vegetated or otherwise stabilized with pervious material. Yes No
- 2) PCSM BMPs will be employed which: use natural measures to eliminate pollution, do not require extensive construction and maintenance efforts, promote pollutant reduction, and are capable of controlling the net increase in the volume and rate of stormwater runoff from a 2-year/24-hour storm event, and the net increase in the volume of post construction runoff is infiltrated and/or dissipated away from surface waters of the Commonwealth. Yes No

If the responses to both questions 1 and 2, above are NO, please provide the requested post construction stormwater information in the Data Table for Supporting Calculations and Measurements below:

3. Explain how post construction stormwater runoff volume will be managed if BMPs will not infiltrate the total net increase in stormwater runoff volume. (Net increase volume = Post construction runoff volume minus Pre-construction runoff volume):

- N/A (check N/A only if BMPs **will** infiltrate all of the Net Change in Runoff)

- 4. Are there existing post construction stormwater management BMPs at this Location/Site? Yes No
Do you plan to use and/or expand these existing post construction stormwater management BMPs? Yes No N/A

5. **SUMMARY TABLE FOR SUPPORTING CALCULATION AND MEASUREMENT DATA**
See the Instructions on how to Complete This Section

- Check this box if supporting calculations and measurements are NOT required in accordance with Section D.2.e on the preceding page.

Design storm frequency _____ Rainfall amount _____ inches	Pre-construction	Post Construction	Net Change
Impervious area (acres)			
Volume of stormwater runoff (acre-feet) without planned stormwater BMPs			
Volume of stormwater runoff (acre-feet) with planned stormwater BMPs			
Stormwater discharge rate for the design frequency storm			

SUMMARY DESCRIPTION OF POST CONSTRUCTION STORMWATER BMPs

6. In the lists below, check the BMPs identified in the Site Restoration Plan. The primary function(s) of the BMP listed in the functions column (infiltration/recharge; detention/retention; water quality). Additional functions may be added if applicable to that BMP. List the stormwater volume and area of runoff to be treated by each BMP type when calculations are required. If any BMP in the Site Restoration Plan is not listed below, describe it in the space provided after "Other".

BMP	Function(s)	Volume of stormwater treated	Acres treated
Bio-infiltration areas <input type="checkbox"/> Infiltration Trench <input type="checkbox"/> Infiltration Bed <input type="checkbox"/> Infiltrated Basin	Infiltration/Recharge	_____	_____
Natural Area Conservation <input type="checkbox"/> Streamside Buffer Zone <input type="checkbox"/> Wetland Buffer Zone <input type="checkbox"/> Sensitive Area Buffer Zone <input type="checkbox"/> Pre-Construction Drainage Pattern Intact	Infiltration/Recharge	_____	_____
Stormwater Retention <input type="checkbox"/> Constructed Wetlands <input type="checkbox"/> Wet Ponds <input type="checkbox"/> Retention Basin	Detention/Retention	_____	_____
Sediment and Pollutant Removal <input type="checkbox"/> Vegetated Filter Strips <input type="checkbox"/> Brush Barriers <input type="checkbox"/> Detention Basins	Water Quality Treatment	_____	_____
Access Road Design <input type="checkbox"/> Road Crowning <input type="checkbox"/> Ditches <input type="checkbox"/> Turnouts <input type="checkbox"/> Culverts <input type="checkbox"/> Roadside Vegetated Filter Strips	Infiltration/Recharge	_____	_____
Stormwater Energy Dissipaters <input type="checkbox"/> Level Spreaders <input type="checkbox"/> Riprap Aprons <input type="checkbox"/> Upslope Diversions <input type="checkbox"/> _____	Infiltration/Recharge	_____	_____

SECTION E: SPECIAL PROTECTION WATERS

List the reasonable and cost effective best management practices (BMPs) that will be used to meet the requirements of 25 Pa. Code Chapter 93. Recommended Special Protection Watershed BMPs are found in the Oil and Gas Operators Manual.

<input type="checkbox"/> Minimize disturbed area	<input type="checkbox"/> Alternative Site Analysis	<input type="checkbox"/> Permanently stabilized ditches and Channels
<input type="checkbox"/> Earth Moving activities limited during rainstorms and spring thaw	<input type="checkbox"/> Roads stabilized with crushed rock and/or vegetation	<input type="checkbox"/> Rock lined culvert inlets and outlets
<input type="checkbox"/> No direct discharge to surface water	<input type="checkbox"/> Immediate Stabilization	<input type="checkbox"/> Proper vegetative cover techniques
<input type="checkbox"/> Designed temporary and permanent BMPs for surface water diversion	<input type="checkbox"/> Prompt site restoration	<input type="checkbox"/> 100 ft. vegetated riparian buffer
<input type="checkbox"/> Other	<input type="checkbox"/> Stabilized Upslope Diversion	

SECTION F: COMPLIANCE REVIEW

Yes No

Is the applicant in violation of any existing permit, regulation, order, or schedule of compliance issued by the Department within the last 5 years? If yes, provide the permit number or facility name, a brief description of the violation, the compliance schedule (including dates and steps to achieve compliance) and the current compliance status. (Attach additional information on a separate sheets, when necessary)

SECTION G. CERTIFICATION BY PERSON PREPARING APPLICATION

I do hereby certify to the best of my knowledge, information, and belief, that the Erosion and Sediment Control and PCSM/Site Restoration Plan are true and correct, represent actual field conditions, and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Print Name	Signature	Professional Seal
Company		
Address		
Phone		
Most Recent DEP Training Attended	Location _____ Date _____	

EXPEDITED REVIEW PROCESS

In addition to the certification required above applicants using the expedited permit review process must attach an E&S and PCSM/Site Restoration Plan developed and sealed by a licensed professional engineer, surveyor or professional geologist. The plans shall contain the following certification:

I do hereby certify to the best of my knowledge, information, and belief, that the Erosion and Sediment Control and PCSM/Site Restoration Plan and Post Construction BMPs are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

SECTION H. APPLICANT CERTIFICATION

Applicant Certification. I certify under penalty of law that this document and all attachments were prepared by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. The responsible official's signature also verifies that the activity is eligible to participate in the permit, and that the applicant agrees to abide by the terms and conditions of the permit. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Print Name and Title of Applicant	Print Name and Title of Co-Applicant (if applicable)
Signature of Applicant	Signature of Co-Applicant
Date Application Signed	Date Application Signed

Notarization

Sworn to and subscribed to before me this	Commonwealth of Pennsylvania
_____ day of _____, 20_____	County of _____
Notary Public	My Commission expires _____

AFFIX SEAL

**NAME, ADDRESS AND PHONE NUMBER OF INDIVIDUAL TO BE CONTACTED
IF ADDITIONAL INFORMATION IS REQUIRED**

Name	
Address	Phone

Reference 8

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

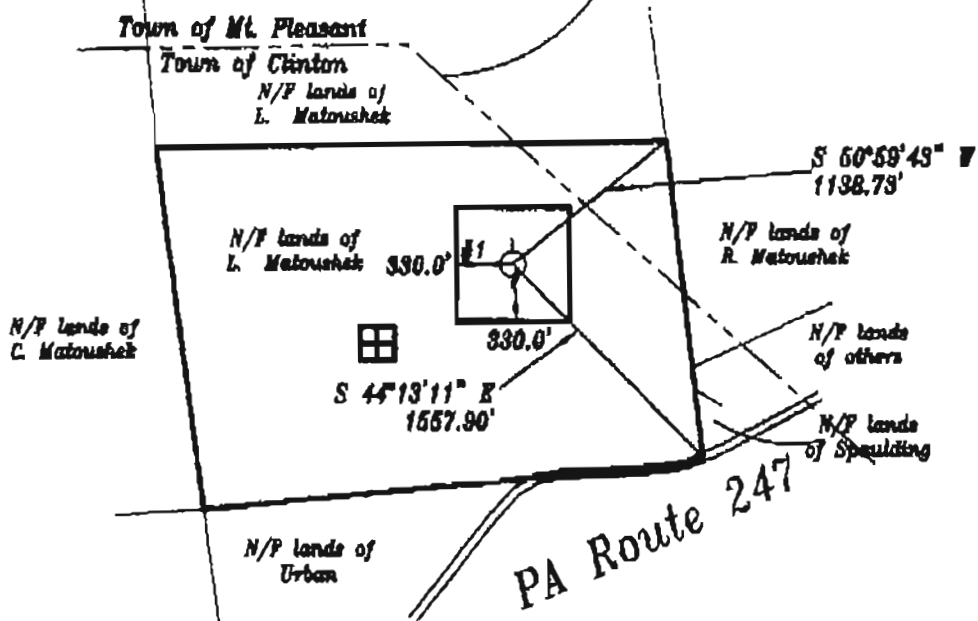
DEP USE ONLY	DEP Application Tracking # 636450	3/11/08
	Permit # 12720006	

<input type="checkbox"/> Denotes location of well on topo map.
True Latitude: NORTH 41° 41' 06.39"
True Longitude: WEST 75° 21' 58.21"

Well is located on topo map 8496 feet south of latitude 41° 42' 30"

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approximate location plotted from records ENVIRONMENTAL PROTECTION NORTHWEST REGIONAL OFFICE



Well is located on topo map
8398 feet west of longitude
75° 20' 00"

x=2851070
y=562201



D. Michael Conover

Surveyor or Engineer: D. Michael Conover, License # 028272 E, Phone # (716) 379-7815, Exp. # 6669, Date: Rev. 3/3/08, December 12, 2007, Scale: 1" = 1000', Tract Acreage: 139.45 AC

Lat. & Long. Method: Static GPS, Accuracy: ± 10 ft., Datum: NAD 83		Elevation Method: Staked, Accuracy: ± 10 ft., Datum: 1988 Quad: Dec. 11, 2007	
Applicant/Well Operator Name: Stones Energy Corporation		Well (Farm) Name: Matoushek	Well # / Serial #: 1 / 1
Address: PO Box 5280 Lafayette, LA. 70506		County - Code: Wayne	Municipality: Clinton / Mt. Pleasant
Surface Landowner: Louis Matoushek		1866 712 Quadrangle Map Name: Aldenville , Map Section: 4	
Surface Lessee:		Angle & Course of Deviation (Drilling):	Surface Elevation: 1545 ± , Anticipated Total Depth: 8150 ±
Surface Owner of Water Purveyor with a Water Supply within 1,000 ft.	Approximate Course and Distance to Water Supply:	Owner, Lessee, or Operator of Workable Coal Seam:	Name of Coal Seam Owned, Leased, or Operated:

Reference 9



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

WELL PERMIT

DEP USE ONLY	
Permittee's eFACTS ID 277879	Auth ID 826657
Watershed Name Shehawken Rattlesnake Creek	Quality HQ

Permittee NEWFIELD APPALACHIA PA LLC	OGO.# OGO-67425	Permit Number 37-127-20013-	Date Issued 04/23/2010
Address 363 N SAM HOUSTON PKWY E STE 2020		Farm Name & Well Number DL TEEPLE 1 1	Well Serial #
		Municipality Manchester	County Wayne
HOUSTON, TX 770602424		7½' Quadrangle Name Long Eddy	Map Section # 1
Phone (281) 847-6031	Project #	Latitude 41-49-39.9000	Longitude -75-11-53.3300
Surf Elev at Site 1516 feet	Anticipated Total Depth 8350 feet	Well Type GS	Offset distances referenced to NE corner of map section. South 2304 feet West 8580 feet

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

This permit expires 04/23/2011 unless drilling is commenced on or before that date and prosecuted with due diligence.

Steve Mustafsa for S. Craig Lobins
Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone

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APR 29 2010

OIL & GAS



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

DEP USE ONLY	
AUTH #	CNC #1250
Check #	1063245 Amount \$1500.00 + 250 = \$1500

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

Notes <i>Vertical Test Well</i>	OGO #	67425	Objection Date - Do not issue before:	Well Permit #	127-20013
	Bond #	12382	4/5/10	Special Cond.	A B C D E F
	C: 3/11/10 Re: G: 4/5/10 Ac:		Date Approved:	Watershed Name:	Shehawken Rattlesnake
	INV: 4-22-10		4/20/10 JS	Designation:	(HQ) EV Creek

Please read instructions before you begin filling in this form.

Applicant (Operator) Name Newfield Appalachia PA LLC		DEP Client ID# 277879	Phone 281-847-6031	FAX 281-847-6160	Check if new address. <input type="checkbox"/>
Mailing Address (Street or PO Box) 363 N. Sam Houston Pkwy E. Suite 2020		City Houston	State TX	Zip +4 77060-2424	Country (if not USA)
(Well) Farm Name D.L. Teeple	Well # 1-1	Serial #	PERMIT TYPE Check applicable. Application is to: <input checked="" type="checkbox"/> Drill a new well <input type="checkbox"/> Deepen a well <input type="checkbox"/> Redrill a well <input type="checkbox"/> Alter a well <input type="checkbox"/> E&S Control Module <input type="checkbox"/> Other (specify)	TYPE OF WELL Check one. <input type="checkbox"/> Gas <input type="checkbox"/> Oil <input type="checkbox"/> Comb. (gas & oil) <input type="checkbox"/> Injection, recovery <input type="checkbox"/> Injection, disposal <input type="checkbox"/> Coalbed Methane <input type="checkbox"/> Gas Storage <input checked="" type="checkbox"/> Other (specify) vertical test well	APPLICATION FEE Check applicable. <input type="checkbox"/> Marcellus Well: Non-Vertical <input type="checkbox"/> Marcellus Well: Vertical <input type="checkbox"/> Non-Marcellus Well: Non-Vertical <input checked="" type="checkbox"/> Non-Marcellus Well: Vertical <input type="checkbox"/> \$200 (Home Use Well) <input type="checkbox"/> \$500 E&S Fee <input type="checkbox"/> \$ 0 (Rehab orphan) <input checked="" type="checkbox"/> Vertical: Length 8350 ft. <input type="checkbox"/> Marcellus: Length _____ ft. <input type="checkbox"/> Non-Vertical: Length _____ ft. Total Application Fee \$ 1500
County WAYNE	Municipality MANCHESTER	Project # (from DEP)			
If you are applying for a permit to redrill, drill deeper, or alter a well that was previously permitted or registered, or for a well site that was previously permitted but not drilled, check this box <input type="checkbox"/> and enter the permit or registration number here:					
If applying for a permit to rework an existing well not registered or permitted, check this box <input type="checkbox"/> and enter date drilled, if known: _____ (see instructions)					
PNDI Attached: <input checked="" type="checkbox"/> Any "hit" must include accepted mitigation plan from applicable agency.					

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No	DEP USE ONLY
1. Will the well be subject to the Oil and Gas Conservation Law? If "No," go to 2).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Date Stamps/Notes
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Auth 826659
b. Does the location fall within an area covered by a spacing order?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Site 731937
2. Will the well penetrate a workable coal seam? If "No," include justification and supporting documentation.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Cint 277879
3. If the well will penetrate a workable coal seam, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells).	<input type="checkbox"/>	<input type="checkbox"/>	APS 715262
a. If "No," is the required exception request attached? (Check here if re-working an existing well: <input type="checkbox"/> N/A)	<input type="checkbox"/>	<input type="checkbox"/>	Acct 674710
4. Will the well be drilled at a location where the coal has been removed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	PF 728625 SF 10/0226
5. Will the well be drilled through an active (operating or projected) coalmine, or within 1,000 feet of the boundary?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
a. If "Yes," print the names of: Mine: _____ Operator: _____			
6. Will the well penetrate or be within 2,000 feet of an active gas storage reservoir boundary?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
a. If Yes, print the names of: Storage Field: _____ Operator: _____			
7. Is the proposed well location within the permitted area of a landfill?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
8. Will the well site be within 100 feet (measured horizontally) of a stream, spring or body of water identified on the most current 7 1/2' topographic map?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
a. If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached?	<input type="checkbox"/>	<input type="checkbox"/>	
9. Will the well site be within 100 feet of a wetland or in a wetland?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
a. Is the well site within 100 feet of a wetland greater than one acre in size?	<input type="checkbox"/>	<input type="checkbox"/>	
If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached?	<input type="checkbox"/>	<input type="checkbox"/>	
10. Will the well be drilled within 200 feet (horizontally) from any existing building or an existing water supply?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
a. If "Yes," is written consent from the owner attached?	<input type="checkbox"/>	<input type="checkbox"/>	
b. If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached?	<input type="checkbox"/>	<input type="checkbox"/>	
11. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a completed copy of the form.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
12. Is the well site in a Special Protection High Quality (HQ) or Exceptional Value (EV) watershed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13. Is this well part of a development where you need an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, attach a completed Erosion Sediment and Stormwater Control Module or list the number and date of the ESCGP-1 Approval.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Signature of Applicant	The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.		
Signature of Person Authorized to Submit Application <i>Donald F. Sleeth</i>	(Print or Type) Name of Signer: DONALD F. SLEETH	Title: Drilling Manager	Date 3-5-10
Application Preparer/Contact: BETSY COLLINS		Phone: 412-921-8250	

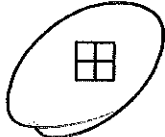


COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

DEP USE ONLY	DEP Application Tracking #	C: ACO
	Permit # 127-20013	4/19/10
	Project #	C:

	Denotes location of well on topo map.
True Latitude: NORTH	
41 ° 49 ' 39.90 "	
True Longitude: WEST	
75 ° 11 ' 53.33 "	
WELL NORTHING - Y	
615,470.64	
WELL EASTING - X	
2,663,898.16	

Well is located on topo map 2,034 feet south of latitude 41 ° 50 ' 00 "

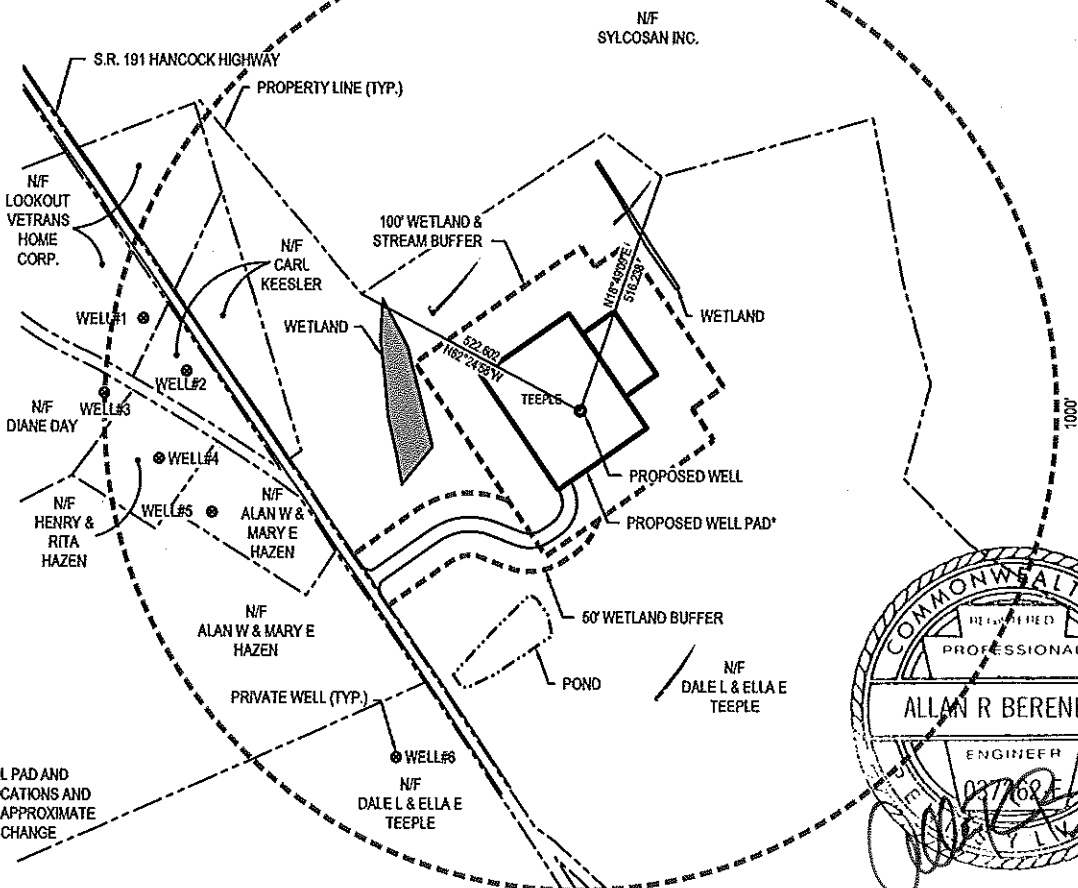


H Q She hawken
WATERSHED Rattlesnake Creek

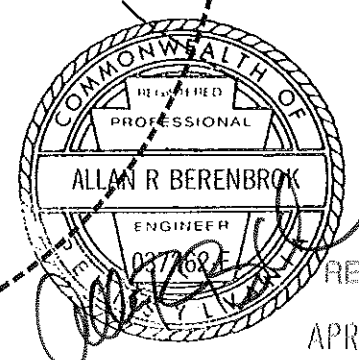
Well is located on topo map

8,580 feet west of longitude

75 ° 10 ' 00 "



* PROPOSED WELL PAD AND ACCESS ROAD LOCATIONS AND DIMENSIONS ARE APPROXIMATE AND SUBJECT TO CHANGE



Surveyor or Engineer **TETRA TECH** Phone # (412) 921-8873 Dwg. # 1 Date 4/16/2010 Scale 1" = 400'

Lat. & Long Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83		Elevation Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83		Survey Date Jan. 2010	
Applicant / Well Operator Name Newfield Appalachia PA LLC		Well(Farm) Name D.L. Teeple		Well # 1-1	
Address 363 N. Sam Houston Parkway E., Suite 2020, Houston, TX 77060		County - Code Wayne		Municipality Manchester	
Surface Landowner / Lessor Dale and Ella Teeple		USGS 71/2 Quadrangle Map Name Long Eddy, NY		Map Section 5	
Target Formation(s) Onondaga		Angle & Course of Deviation (Drilling) N/A		Anticipated Total Depth TVD 8,350 TMD 8,350	
Surface Owner or Water Purveyor with a Water Supply within 1,000 ft.		Approximate Course and Distance to Water Supply		Owner, Lessee, or Operator of Workable Coal Seam	
Lookout Veterans Home Corp.		N78d 20' 44"W 938'		N/A	
Carl Keesler		N84d 27' 43"W 832'		N/A	
Dale L & Ella E Teeple		S27d 51' 49"W 818'		N/A	
Alan W Mary E Hazen		S74d 33' 6"W 802'		N/A	
				Name of Coal Seam Owned, Leased, or Operated	
				N/A	
				N/A	
				N/A	

R:_Marcellus Shale Projects\Newfield2679 - Newfield Wells\Well Plat Permits\Permit Drawings\Teeple Well Pad Plat Exhibit A.dwg PTT BENL HOPPE 4/16/2010 12:43:02 PM

Reference 10



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

WELL PERMIT

DEP USE ONLY	
Permittee's eFACTS ID 277879	Auth ID 830993
Watershed Name Salt River Brook	Quality HQ

Permittee NEWFIELD APPALACHIA PA LLC	OGO.# OGO-67425	Permit Number 37-127-20018-00	Date Issued 05/25/2010
Address 363 N SAM HOUSTON PKWY E		Farm Name & Well Number DL TEEPLE 1 2H	Well Serial #
SUITE 2020		Municipality Manchester	County Wayne
HOUSTON, TX 77060-2424		7 1/2' Quadrangle Name Long Eddy	Map Section # 5
Phone (281) 674-2501	Project #	Latitude 41-49-23.1900	Longitude -75-11-39.3900
Surf Elev at Site 1438 feet	Anticipated Total Depth 8140 feet	Well Type GS	Offset distances referenced to NE corner of map section. South 3725 feet West 7525 feet

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

The permittee shall not withdraw or use water from water sources within the Commonwealth of Pennsylvania, for well fracing activities, unless the permittee does so in accordance with a Water Management Plan approved by the Department.

Permittee shall obtain a permit or Environmental Assessment approval from the Department prior to the construction of any dam, reservoir, water obstruction, and/or encroachment for which a permit or Environmental Assessment approval is required by 25 Pa. Code Chapter 105. Any dam embankment including centralized dam embankments utilized to impound freshwater or frac water associated with well fracing not requiring a permit pursuant to 25 Pa. Code Chapter 105 will be constructed in accordance with requirements of 25 Pa. Code §§ 78.56-78.63 and Department guidelines 5500-PM-OG0085 entitled, Design, construction and maintenance standards for dam embankments associated with impoundments for oil and gas wells.

Prior to fracturing the well, as part of its Preparedness, Prevention and Contingency Plan the permittee shall implement a Control and Disposal Plan for the control and disposal of fluids and residual wastes in accordance with 25 Pa. Code § 78.55. The Control and Disposal Plan shall identify the control and disposal methods and practices utilized to prevent pollutants from directly or indirectly reaching waters of the Commonwealth during the impoundment, production, processing and transportation of pollutants, including identification of the permitted processing or disposal facilities where residual wastes will be processed or disposed, in accordance with 25 Pa. Code §§ 78.55 and 91.34.

Prior to transport of the residual wastewater off site, chemical analysis and characterization of the waste shall be conducted and provided to the processing or disposal facility intended for acceptance of the waste in accordance with 25 Pa. Code § 287.54.

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OIL & GAS

The Operator shall run a complete angular deviation survey of the intentionally deviated well. The deviation survey is to be obtained by a responsible well surveying company and shall be filed with the Department within thirty (30) days after well drilling together with other regularly required reports.

This permit expires 05/25/2011 unless drilling is commenced on or before that date and prosecuted with due diligence.



Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

ESM10-127-0001
DEP USE ONLY
AUTH # NC
Check # 1067827 Amount \$ 3650.00
1067826 \$500.00

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

Notes <i>M</i>	OGO # <i>67425</i>	Objection Date - Do not issue before: <i>4/26/10</i>	Well Permit # <i>127-20018 NC</i>
	Bond # <i>12382</i>	Date Approved: <i>5/21/10</i> <i>B.M.</i>	Special Cond. A B C D <u>E</u> F
	C: <i>4/13/10 mgs. 4/26/10 JL</i>		Watershed Name: <i>SALT RIVER BROOK</i>
	INV: <i>5-24-10</i>		Designation: <u>HQ</u> EV

Please read instructions before you begin filling in this form.

Applicant (Operator) Name <i>Newfield Appalachia PA LLC</i>		DEP Client ID# <i>277879</i>	Phone <i>281-674-2501</i>	FAX <i>281-674-2902</i>	Check if new address. <input type="checkbox"/>
Mailing Address (Street or PO Box) <i>363 N. Sam Houston Pkwy E. Suite 2020</i>		City <i>Houston</i>	State <i>TX</i>	Zip +4 <i>77060-2424</i>	Country (if not USA)

(Well) Farm Name <i>D.L. Teepie</i>	Well # <i>1-2H</i>	Serial #	PERMIT TYPE Check applicable. Application is to: <input checked="" type="checkbox"/> Drill a new well <input type="checkbox"/> Deepen a well <input type="checkbox"/> Redrill a well <input type="checkbox"/> Alter a well <input checked="" type="checkbox"/> E&S Control Module <input type="checkbox"/> Other (specify)	TYPE OF WELL Check one. <input checked="" type="checkbox"/> Gas <input type="checkbox"/> Oil <input type="checkbox"/> Comb. (gas & oil) <input type="checkbox"/> Injection, recovery <input type="checkbox"/> Injection, disposal <input type="checkbox"/> Coalbed Methane <input type="checkbox"/> Gas Storage <input type="checkbox"/> Other (specify)	APPLICATION FEE Check applicable. <input checked="" type="checkbox"/> Marcellus Well: Non-Vertical <input type="checkbox"/> Marcellus Well: Vertical <input type="checkbox"/> Non-Marcellus Well: Non-Vertical <input type="checkbox"/> Non-Marcellus Well: Vertical <input type="checkbox"/> \$200 (Home Use Well) <input checked="" type="checkbox"/> \$500 E&S Fee <input type="checkbox"/> \$ 0 (Rehab orphan) <input type="checkbox"/> Vertical: Length _____ ft. <input checked="" type="checkbox"/> Marcellus: Length <i>13,548.8</i> ft. <input type="checkbox"/> Non-Vertical: Length _____ ft. Total Application Fee \$ <i>4,150</i>
County <i>WAYNE</i>	Municipality <i>MANCHESTER</i>	Project # (from DEP)			

If you are applying for a permit to redrill, drill deeper, or alter a well that was previously permitted or registered, or for a well site that was previously permitted but not drilled, check this box and enter the permit or registration number here:

If applying for a permit to rework an existing well not registered or permitted, check this box and enter date drilled, if known: _____ (see instructions)

PNDI Attached: Any "hit" must include accepted mitigation plan from applicable agency.

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No	DEP USE ONLY
1. Will the well be subject to the Oil and Gas Conservation Law? If "No," go to 2). a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary? b. Does the location fall within an area covered by a spacing order?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Date Stamps/Notes Auth <i>3309913</i> Site <i>733332</i> Cnt <i>277879</i> APS <i>717984</i> Acct <i>676740</i> PF <i>729789</i> SF <i>1012170</i>
2. Will the well penetrate a workable coal seam? If "No," include justification and supporting documentation.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
3. If the well will penetrate a workable coal seam, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells). a. If "No," is the required exception request attached? (Check here if re-working an existing well: <input type="checkbox"/> N/A)	<input type="checkbox"/>	<input type="checkbox"/>	
4. Will the well be drilled at a location where the coal has been removed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5. Will the well be drilled through an active (operating or projected) coalmine, or within 1,000 feet of the boundary? a. If "Yes," print the names of: Mine: _____ Operator: _____	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
6. Will the well penetrate or be within 2,000 feet of an active gas storage reservoir boundary? a. If Yes, print the names of: Storage Field: _____ Operator: _____	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
7. Is the proposed well location within the permitted area of a landfill?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
8. Will the well site be within 100 feet (measured horizontally) of a stream, spring or body of water identified on the most current 7 1/2' topographic map? a. If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
9. Will the well site be within 100 feet of a wetland or in a wetland? a. Is the well site within 100 feet of a wetland greater than one acre in size? If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
10. Will the well be drilled within 200 feet (horizontally) from any existing building or an existing water supply? a. If "Yes," is written consent from the owner attached? b. If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
11. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a completed copy of the form.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
12. Is the well site in a Special Protection High Quality (HQ) or Exceptional Value (EV) watershed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13. Is this well part of a development where you need an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, attach a completed Erosion Sediment and Stormwater Control Module or list the number and date of the ESCGP-1 Approval. See Attached Module	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Signature of Applicant	The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.		
Signature of Person Authorized to Submit Application <i>Donald F. Sleeth</i>	(Print or Type)	Name of Signer: <i>DONALD F. SLEETH</i>	Date <i>4-12-10</i>
Application Preparer/Contact: <i>ANDREW STRASSNER</i>		Phone: <i>412-862-7963</i>	

Farm Name - Well # D.L. Teeple 1-2H	DEP ID# 277879
Applicant Name Newfield Appalachia PA LLC	APS #
DEP USE ONLY	

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
 Page 2 --- Record of Notification / Written Consent

Name:	Address:	Surface Landowner	Coal Owner	Coal Lessee	Coal Mine Operator	Gas Storage Operator	Operator	Within 1,000 feet				Notification				
								Surf Water	Water Purveyor	Coal Mine Operator	Note the means and attach proof.		Return Receipt	Address Affidavit	Written Consent	
											Certified Mail Dates	Sent				
Dale L & Ella E Teeple	13 Teeple Road Equinunk, Pa 18417-3514	X						X							X	
Roger D & Patricia A Hazen	3697 Hancock Hwy Equinunk, Pa 18417-3164							X							X	
Granville W & Charlene Teeple	24 Sault River Road Equinunk, Pa 18417-3501							X						3-25-10	3-29-10	
Cynthia F Rowe	3743 Hancock Hwy Equinunk, Pa 18417-3166							X						3-25-10	3-29-10	
Name:	Address:															
Name:	Address:															
Name:	Address:															

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Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.		Signature below indicates written consent. Check applicable box.	
<input checked="" type="checkbox"/> Water Purveyor or <input checked="" type="checkbox"/> Landowner with water supply within 1,000 ft. Date 3-31	<input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee	Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet	Date
<input checked="" type="checkbox"/> Water Purveyor or <input checked="" type="checkbox"/> Landowner with water supply within 1,000 ft. Date 3-31-10	<input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee	Address (of above)	Date
<input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. Date	<input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee	Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet	Date
<input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. Date	<input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee	Address (of above)	Date
<input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. Date	<input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee	Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet	Date
Surface Landowner at proposed location <i>Dale L Teeple</i> 3-31-10	Coal Operator within 1,000 feet of proposed location	Address (of above)	Date
Surface Landowner at proposed location <i>Ella E Teeple</i> 3-31-10	Gas Storage Operator within 2,000 feet		Date

8100E-L61



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DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

Farm Name - Well # D.L. Teeple 1-2H	DEP ID# 277879
Applicant Name Newfield Appalachia PA LLC	APS#
DEP USE ONLY	

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 --- Record of Notification / Written Consent

Name:	Address:	Surface Landowner	Coal Owner	Coal Lessee	Coal Mine Operator	Gas Storage Operator	Within 1,000 feet			Notification				
							Surf Owner	Water Purveyor	Coal Mine Operator	Certified Mail Dates		Return Receipt	Address Affidavit	Written Consent
Dale L & Ella E Teeple	13 Teeple Road Equinunk, Pa 18417-3514	X					X							X
Roger D & Patricia A Hazen	3697 Hancock Hwy Equinunk, Pa 18417-3164						X							X
Granville W & Charlene Teeple	24 Sault River Road Equinunk, Pa 18417-3501						X			3-25-10	3-29-10			
Cynthia F Rowe	3743 Hancock Hwy Equinunk, Pa 18417-3166						X			3-25-10	3-27-10			
Name:	Address:													
Name:	Address:													
Name:	Address:													
Name:	Address:													
<p>Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.</p> <p><input type="checkbox"/> Water Purveyor or <input checked="" type="checkbox"/> Landowner with water supply within 1,000 ft. Date 03/30/2010</p> <p><input type="checkbox"/> Water Purveyor or <input checked="" type="checkbox"/> Landowner with water supply within 1,000 ft. Date 3/30/2010</p> <p><input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. Date</p> <p><input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. Date</p> <p>Surface Landowner at proposed location Date</p> <p>Surface Landowner at proposed location Date</p>														
<p>Signature below indicates written consent. Check applicable box.</p> <p>Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet Date</p> <p>Address (of above)</p> <p>Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet Date</p> <p>Address (of above)</p>														

127-20018

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DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 --- Record of Notification / Written Consent

Farm Name - Well #	D.L. Teeple 1-2H
Applicant Name	Newfield Appalachia PA LLC
DEP USE ONLY	APPS#
DEP ID#:	277879

Name	Address	Surface Landowner	Coal Owner	Coal Lessee	Coal Mine Operator	Gas Storage Operator	Within 1,000 feet				Notification			
							Surf Owner	Water Purveyor	Coal Mine Operator	Water Purveyor	Return Receipt	Address Affidavit	Written Consent	
Dale L & Ella E Teeple	Address: 13 Teeple Road Equinunk, Pa 18417-3514	X						X						X
Roger D & Patricia A Hazen	Address: 3697 Hancock Hwy Equinunk, Pa 18417-3164							X						X
Granville W & Charlene Teeple	Address: 24 Sault River Road Equinunk, Pa 18417-3501							X				3-25-10	3-29-10	
Cynthia F Rowe	Address: 3743 Hancock Hwy Equinunk, Pa 18417-3166							X				3-25-10	3-27-10	
Name:	Address:													
Name:	Address:													
Name:	Address:													
<p>Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.</p> <p><input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. Date _____</p> <p><input type="checkbox"/> Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee Date _____</p> <p><input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. Date _____</p> <p><input type="checkbox"/> Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee Date _____</p> <p><input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. Date _____</p> <p><input type="checkbox"/> Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee Date _____</p> <p><input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. Date _____</p> <p><input type="checkbox"/> Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee Date _____</p> <p>Surface Landowner at proposed location Date _____</p> <p>Coal Operator within 1,000 feet of proposed location Date _____</p> <p>Surface Landowner at proposed location Date _____</p> <p>Gas Storage Operator within 2,000 feet Date _____</p>														
<p>Signature below indicates written consent. Check applicable box.</p> <p>Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet Date _____</p> <p>Address (of above) _____</p> <p>Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet Date _____</p> <p>Address (of above) _____</p>														

127-20018



DEP USE ONLY	
APS # 717984	Site # 733332
Permit # 107-20018	Auth ID # 830995

Acct-676742

**Erosion, Sediment and Stormwater Control
MODULE**

ESM10-127-0001

Please complete this section if your earth disturbance activities will disturb 5 acres or greater.

1.	<p>Project Site Information.</p> <p>a. Attach topographic map of proposed location.</p> <p>b. Location of surface waters which may receive runoff and the waters classification, pursuant to Chapter 93 and the "statewide existing use listing":</p> <p>Receiving Waters/Watershed Name <u>Salt River Brook / Little Equinunk Creek</u></p> <p>Chapter 93 Designated Use or Existing Use Stream Classification <input checked="" type="radio"/> High Quality <input type="radio"/> Exceptional Value <input type="radio"/> Other _____</p>
	<p>RECEIVED APR 13 2010 ENVIRONMENTAL PROTECTION NORTHWEST REGIONAL OFFICE</p>
2.	Erosion and Sediment Control authorization for Earth Disturbance Associated with Oil and Gas Activities filing fee of \$500 payable to: Commonwealth of Pennsylvania, Clean Water Fund.
3.	<p>Compliance History</p> <p>Is the applicant in violation of any existing permit, regulation, order or schedule of compliance issued by the Department? If yes, provide the permit number or facility name, a brief description of the violation, the compliance schedule (including dates and steps to achieve compliance) and the current compliance status.</p> <p>Yes <input type="radio"/> No <input checked="" type="radio"/></p> <p>(Attach on a separate sheet, if needed)</p>
4.	<p>Erosion & Sediment Control and Site Restoration Plan</p> <p>At least fourteen days before the commencement of earth disturbance activities, or earlier in accordance with applicable Chapter 105 permitting requirements, the applicant shall provide the appropriate DEP Regional Oil and Gas Program Office with the following:</p> <p>A. An Erosion and Sediment Control and Site Restoration Plan that meets the requirements of 25 Pa. Code Chapters 78 and 102, and in the Department's <i>Erosion and Sediment Pollution Control Manual</i>, No. 363-2134-008, as amended and updated and the Department's <i>Oil and Gas Operator's Manual</i>, No. 550-0300-001.</p> <p>B. The Site Restoration Plan shall include PCSM BMPs designed and implemented to meet the requirements of 25 Pa. Code Chapter 93, and consistent with the <i>Pennsylvania Stormwater Best Management Practices Manual</i>, No. 363-0300-002, as amended and updated.</p> <p>Both the E&S and Site Restoration Plan shall minimize the accelerated erosion and sedimentation and shall eliminate the net change in post construction stormwater runoff as compared to the amount of preconstruction stormwater runoff. This shall be accomplished first through the use of site design and nonstructural BMP approaches, and if necessary structural filtration, infiltration, and runoff control BMPs in accordance with <i>Erosion and Sediment Pollution Control Manual</i>, No. 363-2134-008, <i>Oil and Gas Operator's Manual</i>, No. 550-0300-001 and <i>Stormwater Best Management Practices Manual</i>, No. 363-0300-002, as amended and updated. Supporting calculations and measurements for PCSM BMPs are not required unless there will be permanent impervious paved surfaces or above-ground structures or facilities (excluding well-heads and brine storage tanks and other such ancillary equipment. See model plan for further guidance). Crushed rock or gravel roads are not considered impervious.</p> <p>Both the E&S and Site Restoration Plan shall be developed and sealed by a licensed professional engineer, surveyor or professional geologist, and shall contain the following certification:</p> <p><i>I do hereby certify to the best of my knowledge, information and belief, that the Erosion and Sediment Control and Site Restoration Plan are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.</i></p> <p>Print Name: _____ Signature: _____</p> <p>Company: _____</p> <p>Address: _____</p> <p>Phone: _____</p>
5.	<p>Area Wide or Phased E&S and Stormwater Management</p> <p>List the well permit numbers for any other well permit that is or will be included in the E&S and/or Site Reclamation Plan for this project:</p>



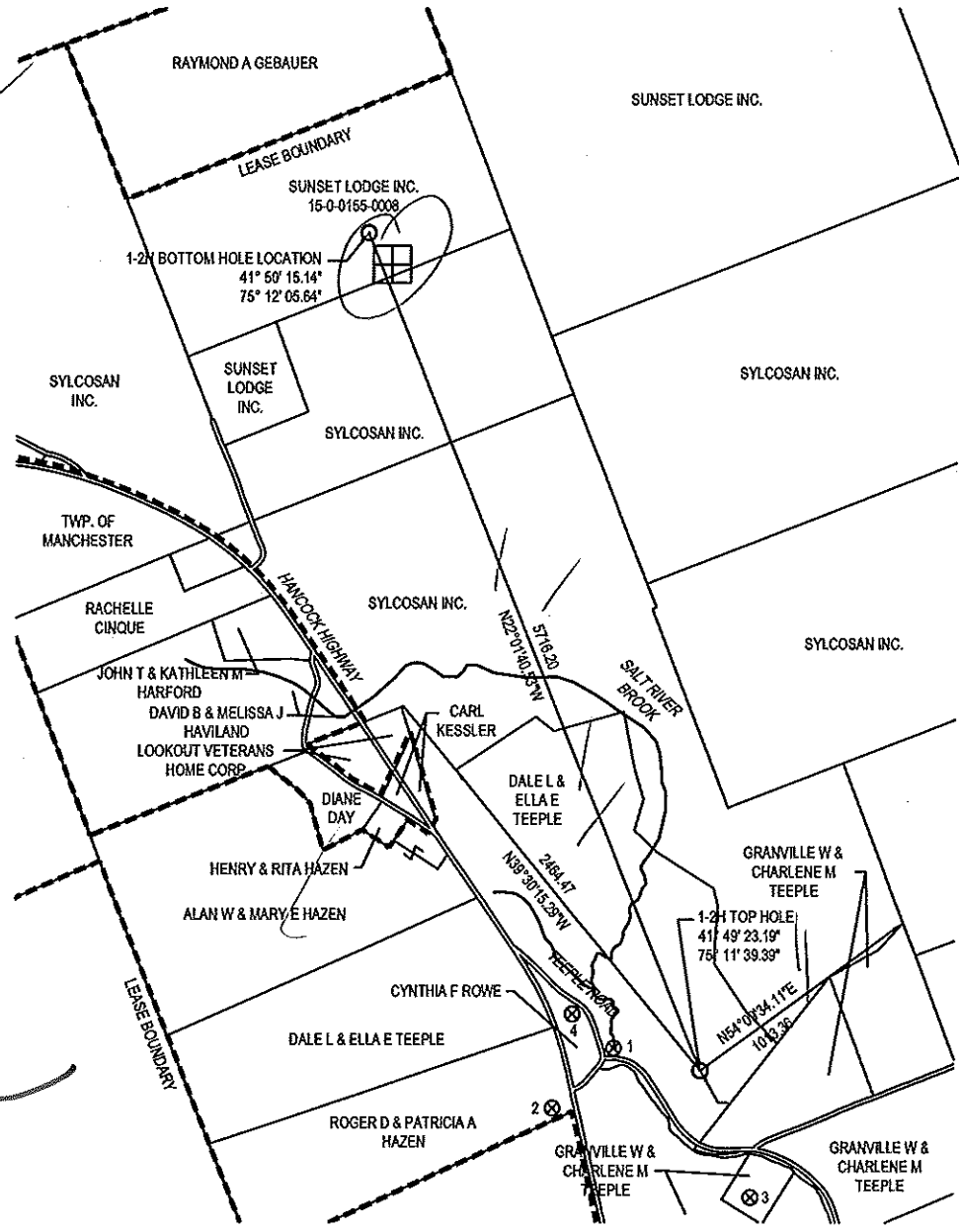
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

DEP USE ONLY	DEP Application Tracking #	G: <i>JR</i>
	Permit # <i>127-2008</i>	4/26/10
	Project #	C:

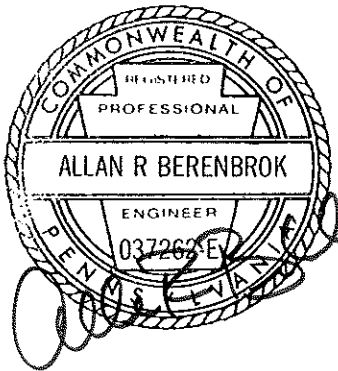
<input type="checkbox"/>	Denotes location of well on topo map.
True Latitude: NORTH	
41° 49' 23.19"	
True Longitude: WEST	
75° 11' 39.39"	
WELL NORTHING - Y	
613,811.1	
WELL EASTING - X	
2,665,002.7	

Well is located on topo map 3,725 feet south of latitude 41 ° 50 ' 00 "

Well is located on topo map 7,525 feet west of longitude 75 ° 10 ' 00 "



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Surveyor or Engineer **TETRA TECH** Phone # (412) 921-8873 Dwg. # 1-2H Date 4/7/2010 Scale 1" = 1200' Tract Acreage

Lat. & Long Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83		Elevation Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83		Survey Date Jan. 2010	
Applicant / Well Operator Name Newfield Appalachia PA LLC		Well(Farm) Name D.L. Teeple		Well # 1-2H	
Address 363 N. Sam Houston Parkway E., Suite 2020, Houston, TX 77060		County - Code Wayne		Municipality Manchester	
Surface Landowner / Lessor Dale and Ella Teeple		USGS 7 1/2 Quadrangle Map Name Long Eddy, NY		Map Section 5	
Target Formation(s) Marcellus Shale		Angle & Course of Deviation (Drilling) N22D 01' 40.53"W 5,716.20'		Anticipated Total Depth TVD 8,140 ft. TMD 13,548.80 ft.	
Surface Owner or Water Purveyor with a Water Supply within 1,000 ft.		Approximate Course and Distance to Water Supply		Owner, Lessee, or Operator of Workable Coal Seam	
Dale L. and Ella E. Teeple		N75D 34' 24.47"W 568'		N/A	
Roger D. and Patricia A. Hazen		S75d 45' 16.93"W 967'		N/A	
Granville W. and Charlene M. Teeple		S21d 53' 56.41"E 864'		N/A	
Cynthia F. Rowe		N66d 11' 03.82"W 887'		N/A	
				Name of Coal Seam Owned, Leased, or Operated	
				N/A	
				N/A	
				N/A	

WATERSHED SALT RIVER BASIN

Reference 11



11/2007

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DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

WELL PERMIT

DEP USE ONLY	
Permittee's eFACTS ID 261535	Auth ID 715410
Watershed Name	Quality

Permittee STONE ENERGY CORPORATION		OGO.# OGO-66630	Permit Number 37-127-20007-00		Date Issued 04/28/2008
Address PO BOX 5280		Farm Name & Well Number GEUTHER 1		Well Serial #	
LAFAYETTE, LA 70506		Municipality Clinton	County Wayne		
Phone (337) 237-0410	Project #	7 1/2' Quadrangle Name Forest City		Map Section # 5	
Surf Elev at Site 2210 feet	Anticipated Total Depth 8150 feet	Well Type GS	Latitude 41-41-3.7400	Longitude -75-26-10.8600	
			Offset distances referenced to NE corner of map section. South 8,703 feet West 5377 feet		

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations. Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

This permit expires 04/28/2009 unless drilling is commenced on or before that date and prosecuted with due diligence.

S. Craig Loh
Regional Oil and Gas Program Manager

P O Box 673, Coudersport, PA 16915-0673
Address

814-274-3611
Telephone

RB KARLINSEY
and Gas Inspector



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

DEP USE ONLY	
AUTH#	CNE
Check # 1198	Amount \$ 350.00

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

Notes		DEP USE ONLY	
OGO # 66630	Objection Date - Do not issue before: 4-17-08	Well Permit # 127-20007	Special Cond. A B C D E F
Bond # 11503	Date Approved: 2	Watershed Name:	Designation: HQ EV
C: 3/10/08 del 4/18/08	IN: 4-28-08		

Please read instructions before you begin filling in this form.

Applicant (Operator) Name STONE ENERGY CORPORATION		DEP Client ID#	Phone 337-237-0410	FAX 337-237-0426	Check if new address. <input type="checkbox"/>
Mailing Address (Street or PO Box) P.O. Box 5280		City Lafayette	State LA	Zip +4 70506	Country (if not USA)
(Well) Farm Name Geuther	Well # 1	Serial #	PERMIT TYPE Check one. Application is to: <input checked="" type="checkbox"/> Drill a new well <input type="checkbox"/> Deepen a well <input type="checkbox"/> Redrill a well <input type="checkbox"/> Alter a well <input type="checkbox"/> Other (specify)	TYPE OF WELL Check one. <input checked="" type="checkbox"/> Gas <input type="checkbox"/> Oil <input type="checkbox"/> Comb. (gas & oil) <input type="checkbox"/> Injection, recovery <input type="checkbox"/> Disposal <input type="checkbox"/> Coalbed Methane <input type="checkbox"/> Gas Storage <input type="checkbox"/> Other (specify)	APPLICATION FEE Check one. <input checked="" type="checkbox"/> \$ 350 (Gas; Comb.; Coal Meth; Storage) <input type="checkbox"/> \$ 250 (Oil; Inj- Rec) <input type="checkbox"/> \$ 150 (Injection - Waste Disposal) <input type="checkbox"/> \$ 100 (Redrill, Drill Deeper, Alter a Well, or Change Use) <input type="checkbox"/> \$ 0 (Rehab orphan)
County WAYNE	Municipality CLINTON	Project # (from DEP)			
If you are applying for a permit to redrill, drill deeper, or alter a well that was previously permitted or registered, or for a well site that was previously permitted but not drilled, check this box <input type="checkbox"/> and enter the permit or registration number here:					
If applying for a permit to rework an existing well not registered or permitted, check this box <input type="checkbox"/> and enter date drilled, if known: (see instructions)					
PNDI Attached: <input checked="" type="checkbox"/> Any "hit" must include accepted mitigation plan from applicable agency.					

COORDINATION WITH REGULATIONS AND OTHER PERMITS		Yes	No	DEP USE ONLY
1.	Will the well be subject to the Oil and Gas Conservation Law? If "No," go to 2).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Date Stamps/Notes
a.	If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Auth 715410
b.	Does the location fall within an area covered by a spacing order?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Site 702466
2.	Will the well penetrate a workable coal seam? If "No," include justification and supporting documentation.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Clnt 261535
3.	If the well will penetrate a workable coal seam, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells).	<input type="checkbox"/>	<input type="checkbox"/>	APS 639350
a.	If "No," is the required exception request attached? (Check here if re-working an existing well: <input type="checkbox"/> N/A)	<input type="checkbox"/>	<input type="checkbox"/>	Acct 614142
4.	Will the well be drilled at a location where the coal has been removed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
5.	Will the well be drilled through an active (operating or projected) coalmine, or within 1,000 feet of the boundary?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
a.	If "Yes," print the names of: Mine: Operator:			
6.	Will the well penetrate or be within 2,000 feet of an active gas storage reservoir boundary?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
a.	If Yes, print the names of: Storage Field: Operator:			
7.	Is the proposed well location within the permitted area of a landfill?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
8.	Will the well site be within 100 feet (measured horizontally) of a stream, spring or body of water identified on the most current 7 1/2 topographic map?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
a.	If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached?	<input type="checkbox"/>	<input type="checkbox"/>	
9.	Will the well site be within 100 feet of a wetland or in a wetland?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
a.	Is the well site within 100 feet of a wetland greater than one acre in size? If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached?	<input type="checkbox"/>	<input type="checkbox"/>	
10.	Will the well be drilled within 200 feet (horizontally) from any existing building or an existing water supply?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
a.	If "Yes," is written consent from the owner attached?	<input type="checkbox"/>	<input type="checkbox"/>	
b.	If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached?	<input type="checkbox"/>	<input type="checkbox"/>	
11.	Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a completed copy of the form.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
12.	Is the well site in a Special Protection High Quality (HQ) or Exceptional Value (EV) watershed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
13.	Is this well part of a development where you need an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

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Signature of Applicant	The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.		
Signature of Person Authorized to Submit Application Eric W. Rankinen	(Print or Type)	Name of Signer: Eric W. Rankinen Title: Regional Landman	Date 2/13/2008
Application Preparer/Contact: FOX AND FOX, INC.		Phone: 814-745-2861	

Forest City



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

DEP Application Tracking # 205#1639350 4-18-08
Permit # 127-20007 c:
Project #

Denotes location of well on topo map.
True Latitude: NORTH
41° 41' 03.74"
True Longitude: WEST
75° 26' 10.86"

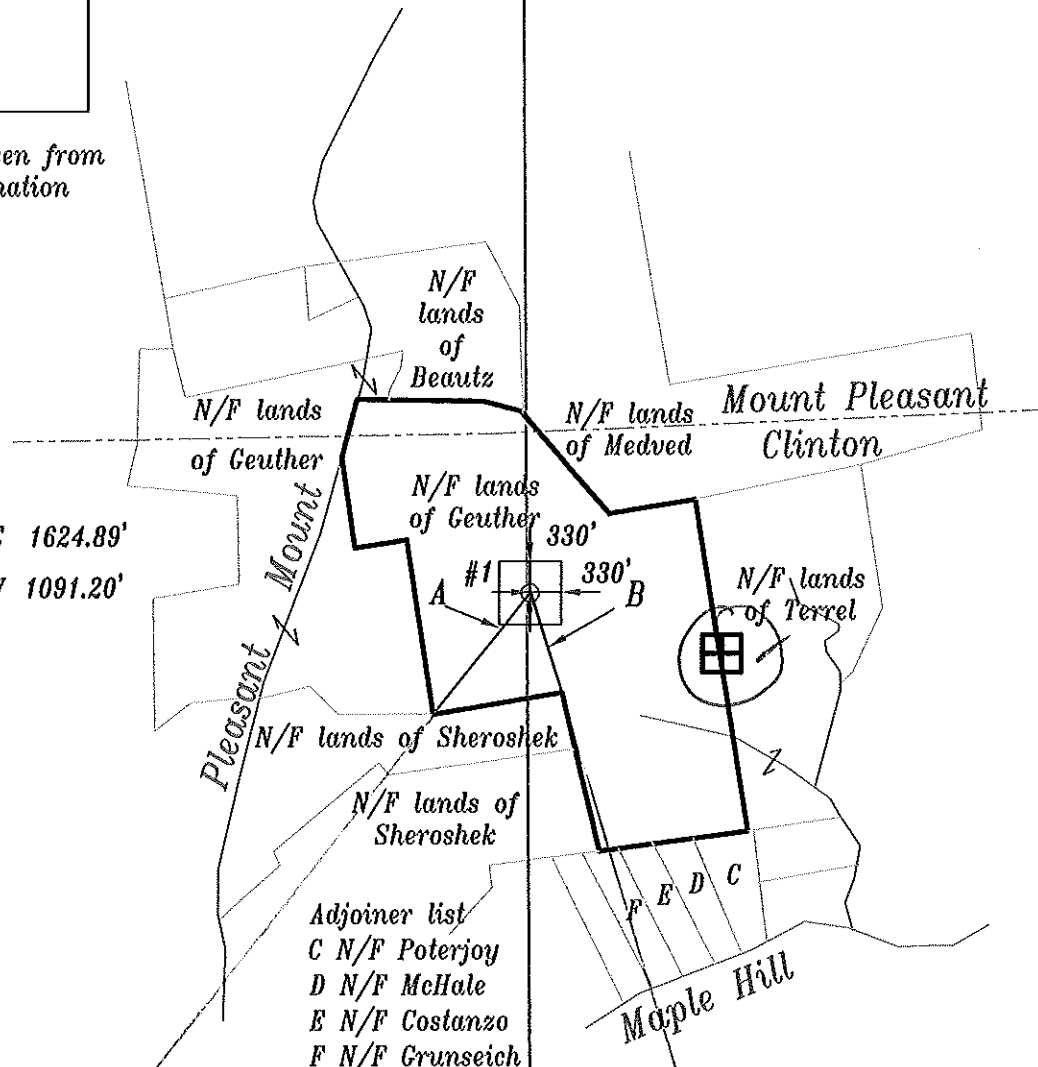
Well is located on topo map 8703 feet south of latitude 41 ° 42 ' 30 / "

Well is located on topo map
5377 feet west of longitude

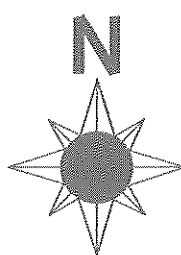
parcel lines taken from tax map information

x 561411.86
y 2631916

A N 38°52'59" E 1624.89'
B N 17°59'20" W 1091.20'



- Adjoiner list
C N/F Poterjoy
D N/F McHale
E N/F Costanzo
F N/F Grunseich



75 ° 25 ' 00 "

D. Michael Canada

Surveyor or Engineer D. Michael Canada Pa. Lic. # 029272 E Phone # (716) 379-7918 Dwg. # 6669 Date Rev. Mar. 3, 2008 January 30, 2008 Scale 1" = 2000' Tract Acreage 261

Lat. & Long Metadata Method Static GPS Accuracy ± 10 ft. Datum NAD 27		Elevation Metadata Method Scaled Accuracy ± 10 ft. Datum USGS Quad		Survey Date 1/30/2008
Applicant / Well Operator Name Stone Energy Corporation		Well (Farm) Name Geuther		Well # #1
Address PO Box 5280 Lafayette, LA 70506		County - Code Wayne	Municipality Clinton	
Surface Landowner Robert Geuther		USGS 7 1/2 Quadrangle Map Name Forest City		Map Section 5
Surface Lessor		Angle & Course of Deviation (Drilling) Vertical 0	Surface Elevation 2210 ft.	Anticipated Total Depth 8150 ft.
Surface Owner or Water Purveyor with a Water Supply within 1,000 ft.	Approximate Course and Distance to Water Supply	Owner, Lessee, or Operator of Workable Coal Seam	Name of Coal Seam Owned, Leased, or Operated	
RECEIVED				
APR 17 2008				

ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

Reference 12



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DEP USE ONLY	
Permittee's eFACTS ID 277879	Auth ID 825419
Watershed Name N. Branch Culkins Creek	Quality HQ

WELL PERMIT

Permittee NEWFIELD APPALACHIA PA LLC	OGO # OGO-67425	Permit Number 37-127-20012-	Date Issued 04/29/2010
Address 363 N SAM HOUSTON PKWY E STE 2020		Farm Name & Well Number HL RUTLEDGE 1 1	Well Serial #
HOUSTON, TX 77060-2424		Municipality Damascus	County Wayne
Phone (281) 847-6031	Project #	7½' Quadrangle Name Galilee	Map Section # 2
Surf Elev at Site 1440 feet	Anticipated Total Depth 8350 feet	Well Type GS	Latitude 41-43-43.2000
			Longitude -75-11-32.1000
Offset distances referenced to NE corner of map section. South 7820 feet West 6983 feet			

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

This permit expires **04/29/2011** unless drilling is commenced on or before that date and prosecuted with due diligence.

Staci Gustafson, Co. Scraig Lobias
Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone

LOG OF FORMATIONS

Well API#: 37-127-20012--

(If you will need more space than this page, please photocopy the blank form before filling it in.)

Formation Name or Type	Top (feet)	Bottom (feet)	Gas at (feet)	Oil at (feet)	Water at (fresh / brine: ft.)	Source of Data

I do hereby certify to the best of my knowledge, information and belief that the well identified on this Well Record and Completion Report has been properly cased and cemented in accordance with the requirements of 25 Pa. Code Chapter 78 and any conditions contained in the permit for this well. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Well Operator's Signature

Title:

Date:

DEP USE ONLY

Reviewed by:

Date:

Comments:



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DEP USE ONLY	
Site ID	Primary Fac ID 728266
Client Id 277879	Subfacility Id

Well Site Restoration Report

A. Operator and Well Information			<i>Please read instructions on back before completing this form.</i>		
Well Operator NEWFIELD APPALACHIA PA LLC		DEP ID# 277879	Well API # (Permit / Reg) 37-127-20012-		
Address 363 N SAM HOUSTON PKWY E STE 2020,			Well Farm Name & Well # HL RUTLEDGE 1 1		Serial #
City HOUSTON	State TX	Zip Code 77060-2424	County Wayne	Municipality Damascus	
Phone (281) 847-6031		Fax			
B. Land Application of Tophole Water			E. Pit Disposal		
Date applied	pH		Describe pit closure procedures.		
Volume (bbls)	Spec. cond. (µmhos/cm)				
C. Off-site Waste Disposal					
Type: <input type="checkbox"/> Drilling Fluid (803)	Amount: bbls				
<input type="checkbox"/> Fracing Fluid (804)	bbls				
<input type="checkbox"/> Other, specify:	Qty: bbls or tons				
Method of disposal or reuse		<input type="checkbox"/> Sewage Treatment Plant (10)	Subbase, material:		Thickness: inches
<input type="checkbox"/> Disposal Well (04)	<input type="checkbox"/> Brine Treatment Plant (12)		Pit liner, material:		Thickness: mils
<input type="checkbox"/> Landfill (05)	<input type="checkbox"/> Other (08)		Pit dimensions (feet) Length:		Width: Depth:
Facility Information			F. Land Application		
Name	Permit #		Area: Length: feet		Width: feet
Hauler Information			Waste-to-soil ratio (by volume):		
Name			Chemical analysis of waste		
Address			Cadmium (Cd) ppm Nickel (Ni) ppm		
City	State	Zip Code	Copper (Cu) ppm Zinc (Zn) ppm		
D. On-site Disposal – Drill Cuttings or Waste			Chromium (Cr) ppm Oil and Grease %		
Location of center of disposal area in relation to the well:			Lead (Pb) ppm Spec. Cond. µmhos/cm		
Course	Distance	feet	Mercury (Hg) ppm		
Describe the material disposed, including additives.			Well Operator's Signature		
			Title: Date:		
			DEP USE ONLY		
			Reviewed by: Date:		
Specify disposal method			Comments:		
<input type="checkbox"/> Unlined pit, complete Section E.	<input type="checkbox"/> Dusting				
<input type="checkbox"/> Lined pit, complete Section E.	<input type="checkbox"/> Solidification				
<input type="checkbox"/> Land application, complete Section F.	<input type="checkbox"/> Other				

Reference 13

COPY

5500-FM-OG0001A Rev. 11/2007



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DEP USE ONLY	
Permittee's eFACTS ID 277879	Auth ID 830957
Watershed Name Hollister Creek	Quality HQ

WELL PERMIT

Permittee NEWFIELD APPALACHIA PA LLC	OGO.# OGO-67425	Permit Number 37-127-20017-00	Date Issued 05/27/2010
Address 363 N SAN HOUSTON PKWY E		Farm Name & Well Number WOODLAND MGMT PARTNERS 1 1	Well Serial #
SUITE 2020		Municipality Damascus	County Wayne
HOUSTON, TX 77060-2424		7 1/2' Quadrangle Name Callicoon	Map Section # 7
Phone (281) 847-6031	Project #	Latitude 41-45-57.2000	Longitude -75-6-33.8000
Surf Elev at Site 1193 feet	Anticipated Total Depth 8350 feet	Well Type GS	Offset distances referenced to NE corner of map section. South 9393 feet West 7108 feet

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

This permit expires 05/27/2011 unless drilling is commenced on or before that date and prosecuted with due diligence.

Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone

DEP USE ONLY
 AUTH # CNC
 Check # 1064287 Amount \$ 1500 \$1500

1950
 200
 50

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

Notes		DEP USE ONLY	
OGO # <u>67425</u>	Objection Date - Do not issue before: <u>5/3/10</u>	Well Permit # <u>127-20017</u>	Special Cond. A B C D E F
Bond # <u>12382</u>	Date Approved: <u>5/11/10</u>	Watershed Name: <u>HOLLISTER CREEK</u>	Designation: <u>(AO) EV</u>
C: <u>4/13/10</u> n: <u>5/3/10</u> s: <u>5/11/10</u>	INV: <u>5-27-10</u>	Please read instructions before you begin filling in this form.	

Applicant (Operator) Name Newfield Appalachia PA LLC	DEP Client ID# 277879	Phone 281-847-6031	FAX 281-847-6160	Check if new address. <input type="checkbox"/>
Mailing Address (Street or PO Box) 363 N. Sam Houston Pkwy E. Suite 2020	City Houston	State TX	Zip +4 77060-2424	Country (if not USA)

(Well) Farm Name Woodland Management Partners	Well # 1-1	Serial #	PERMIT TYPE Check applicable.	TYPE OF WELL Check one.	APPLICATION FEE Check applicable.
County WAYNE	Municipality DAMASCUS	Project # (from DEP)	Application is to: <input checked="" type="checkbox"/> Drill a new well <input type="checkbox"/> Deepen a well <input type="checkbox"/> Redrill a well <input type="checkbox"/> Alter a well <input type="checkbox"/> E&S Control Module <input type="checkbox"/> Other (specify)	<input type="checkbox"/> Gas <input type="checkbox"/> Oil <input type="checkbox"/> Comb. (gas & oil) <input type="checkbox"/> Injection, recovery <input type="checkbox"/> Injection, disposal <input type="checkbox"/> Coalbed Methane <input type="checkbox"/> Gas Storage <input checked="" type="checkbox"/> Other (specify) vertical test well	<input type="checkbox"/> Marcellus Well: Non-Vertical <input type="checkbox"/> Marcellus Well: Vertical <input type="checkbox"/> Non-Marcellus Well: Non-Vertical <input checked="" type="checkbox"/> Non-Marcellus Well: Vertical <input type="checkbox"/> \$200 (Home Use Well) <input type="checkbox"/> \$500 E&S Fee <input type="checkbox"/> \$0 (Rehab orphan) <input checked="" type="checkbox"/> Vertical: Length <u>8350</u> ft. <input type="checkbox"/> Marcellus: Length _____ ft. <input type="checkbox"/> Non-Vertical: Length _____ ft. Total Application Fee \$ <u>1500</u>

COORDINATION WITH REGULATIONS AND OTHER PERMITS

	Yes	No	DEP USE ONLY
1. Will the well be subject to the Oil and Gas Conservation Law? If "No," go to 2).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Date Stamps/Notes
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Auth <u>830957</u>
b. Does the location fall within an area covered by a spacing order?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Site <u>733315</u>
2. Will the well penetrate a workable coal seam? If "No," include justification and supporting documentation.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Cint <u>277879</u>
3. If the well will penetrate a workable coal seam, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells).	<input type="checkbox"/>	<input type="checkbox"/>	APS <u>717958</u>
a. If "No," is the required exception request attached? (Check here if re-working an existing well: <input type="checkbox"/> N/A)	<input type="checkbox"/>	<input type="checkbox"/>	Acct <u>676721</u>
4. Will the well be drilled at a location where the coal has been removed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	PF <u>729777</u>
5. Will the well be drilled through an active (operating or projected) coalmine, or within 1,000 feet of the boundary?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	SF <u>101251</u>
a. If "Yes," print the names of: Mine: _____ Operator: _____			
6. Will the well penetrate or be within 2,000 feet of an active gas storage reservoir boundary?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
a. If Yes, print the names of: Storage Field: _____ Operator: _____			
7. Is the proposed well location within the permitted area of a landfill?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
8. Will the well site be within 100 feet (measured horizontally) of a stream, spring or body of water identified on the most current 7 1/2' topographic map?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
a. If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached?	<input type="checkbox"/>	<input type="checkbox"/>	
9. Will the well site be within 100 feet of a wetland or in a wetland?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
a. Is the well site within 100 feet of a wetland greater than one acre in size?	<input type="checkbox"/>	<input type="checkbox"/>	
If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached?	<input type="checkbox"/>	<input type="checkbox"/>	
10. Will the well be drilled within 200 feet (horizontally) from any existing building or an existing water supply?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
a. If "Yes," is written consent from the owner attached?	<input type="checkbox"/>	<input type="checkbox"/>	
b. If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached?	<input type="checkbox"/>	<input type="checkbox"/>	
11. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a completed copy of the form.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
12. Is the well site in a Special Protection High Quality (HQ) or Exceptional Value (EV) watershed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
13. Is this well part of a development where you need an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, attach a completed Erosion Sediment and Stormwater Control Module or list the number and date of the ESCGP-1 Approval.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

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 NORTHWEST REGIONAL OFFICE

The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.			
Signature of Person Authorized to Submit Application <u>Donald F. Sleeth</u>	(Print or Type)	Name of Signer: DONALD F. SLEETH	Date 4-6-10
Application Preparer/Contact: BETSY COLLINS		Title: Drilling Manager	
Phone: 412-921-8250			



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

Farm Name - Well #
Woodland Management Partners-Well #1-1
Applicant Name
Newfield Appalachia PA LLC
DEP ID#
277879
APPS #

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 --- Record of Notification / Written Consent

List the following: surface landowner, all landowners or water purveyors whose water supplies are within 1,000 feet of this proposed well location; gas storage operator if within 2000 feet; all coal owners and lessees of all underlying workable coal seams; operators of underground coal mines at the proposed location; and coal operators with a deep mine within 1,000 feet. Mark the boxes, "X," which show the parties' interests. Use additional forms if you need more space. You are required to notify each of these parties.

Name:	Address:	Surface Landowner	Coal Owner	Coal Lessee	Coal Mine Operator	Gas Storage Operator	Within 1,000 feet			Notification			
							Surf Owner With Water	Water Purveyor	Coal Mine Operator	Certified Mail Dates	Return Receipt	Address Affidavit	Written Consent
Donald and Marie Hartnett	841A Calicoon Rd. Damascus, PA 18415-3514						X			3/25/10	3/29/10		
Woodland Management Partners	308 Egypt Rd. Taffon, PA 18464	X								3/25/10	4/1/10		X
Alfred Cimino	124 Monroe St, Apt. 1 Archibald, PA 18403-1818						X						X
Leon N Clause, Sr.	PO Box 241 Stanhope, NJ 07874-0241						X						X
Name:	Address:												
Name:	Address:												
Name:	Address:												

Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.

Water Purveyor or Landowner with water supply within 1,000 ft. Date _____ Coal Operator, Owner, or Lessee Date _____

Water Purveyor or Landowner with water supply within 1,000 ft. Date _____ Coal Operator, Owner, or Lessee Date _____

Water Purveyor or Landowner with water supply within 1,000 ft. Date _____ Coal Operator, Owner, or Lessee Date _____

Water Purveyor or Landowner with water supply within 1,000 ft. Date _____ Coal Operator, Owner, or Lessee Date _____

Surface Landowner at proposed location Date _____ Coal Operator within 1,000 feet of proposed location Date _____

Surface Landowner at proposed location Date _____ Gas Storage Operator within 2,000 feet Date _____

Signature below indicates written consent. Check applicable box.

Owner of: water supply, or building within 200 feet Date 3/16/10

Address (of above)
Leon N Clause

Owner of: water supply, or building within 200 feet Date _____

Address (of above)

127-20017



Farm Name - Well #
Woodland Management Partners-Well #1-1

Applicant Name
Newfield Appalachia PA LLC

DEP ID#
277879

APPS #

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 -- Record of Notification / Written Consent

Name	Address	Surface Landowner	Coal Owner	Coal Lessee	Coal Mine Operator	Gas Storage Operator	Surt Owner	Within 1,000 feet			Notification		
								Water Purveyor	Coal Mine Operator	Operator	Certified Mail Dates	Return Receipt	Address Affidavit
Donald and Marie Harneit	841A Calicoon Rd. Damascus, PA 18415-3514						X				3/25/10	3/29/10	
Woodland Management Partners	308 Egypt Rd. Taffton, PA 18464	X											X
Alfred Cimino	124 Monroe St, Apt. 1 Archibald, PA 18403-1818						X				3/25/10	4/1/10	
Leon N Clouse, Sr.	PO Box 241 Starhope, NJ 07874-0241						X						X
Name:	Address:												
Name:	Address:												
Name:	Address:												

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APR 12 2010
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

Optional: Signatures below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.

Water Purveyor or Landowner with water supply within 1,000 ft. Date

Coal Operator, Owner, or Lessee Date

Water Purveyor or Landowner with water supply within 1,000 ft. Date

Coal Operator, Owner, or Lessee Date

Water Purveyor or Landowner with water supply within 1,000 ft. Date

Coal Operator, Owner, or Lessee Date

Water Purveyor or Landowner with water supply within 1,000 ft. Date

Coal Operator, Owner, or Lessee Date

Surface Landowner at proposed location
Date

WOODLAND MANAGEMENT PARTNERS LP 3/14/2010

Surface Landowner at proposed location
Date

WOODLAND MGT SERVICES INC General
TODD M. H. [Signature] PRESIDENT

Signature below indicates written consent. Check applicable box.

Owner of: water supply, or building within 200 feet Date

Address (of above)

Owner of: water supply, or building within 200 feet Date

Address (of above)

127-20017



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

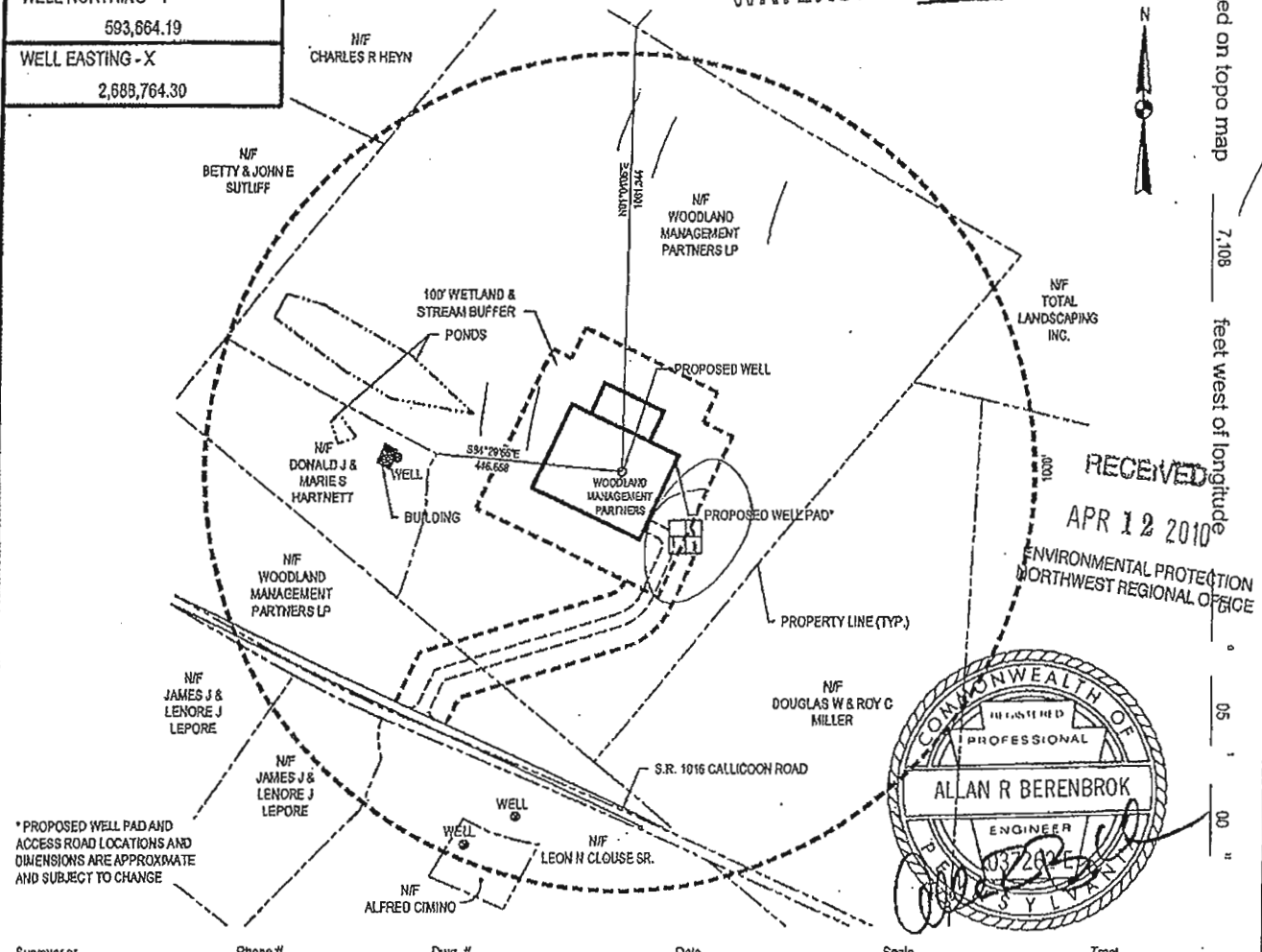
DEP Application Tracking #	G: <i>ju</i>
Permit #	C: <i>5/3/10</i>
Project #	<i>127-20017</i>

<input type="checkbox"/> Denotes location of well on topo map.
True Latitude: NORTH 41° 45' 57.2"
True Longitude: WEST 75° 06' 33.8"
WELL NORTHING - Y 593,664.19
WELL EASTING - X 2,688,764.30

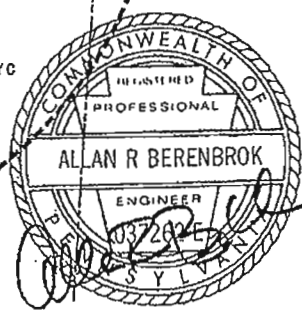
Well is located on topo map 9,393 feet south of latitude 41° 37' 30"

HQ

WATERSHED Hollister Creek



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APR 12 2010
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE



Surveyor or Engineer: **TETRA TECH** Phone #: (412) 921-8873 Dwg. #: 1 Date: 4/6/2010 Scale: 1" = 400' Tract Acreage: 7.108

Lat. & Long Metadata Method: GPS Accuracy +/- 1 ft. Datum: NAD83		Elevation Metadata Method: GPS Accuracy +/- 1 ft. Datum: NAD83		Survey Date: Jan. 2010
Applicant / Well Operator Name: Newfield Appalachia PA LLC		Well (Farm) Name: Woodland Management Partners		Well #: 1-1
Address: 363 N. Sam Houston Parkway E., Suite 2020, Houston, TX 77080		County - Code: Wayne	Municipality: Damascus	Well Type: Vertical Test
Surface Landowner / Lessor: Woodland Management Partners		USGS 7 1/2 Quadrangle Map Name: Callicoon, PA		Map Section: 7 Surface Elevation: 1193 ft.
Target Formation(s): Onondaga		Angle & Course of Deviation (Drilling): N/A		Anticipated Total Depth: TVD 8,350 ft. TMD 8,350 ft.
Donald and Marie Hartnett		N86d 22° 34' W 537'		N/A
Leon N. Clouse Sr.		S16d 46° 23' W 862'		N/A
Alfred Cimino		S22d 36° 51' W 965'		N/A

RA: Marcelus Shale Project\Newfield\0279 - Newfield Well\Well Plat\Permit\Drawings\Well Plat\Well Plat Estd\A.dwg PTT BEN.HOPPE 4/22/10 10:54:04 AM

Reference 14

**Erosion and Sediment Control
General Permit
For
Earth Disturbance
Associated With Oil & Gas Exploration,
Processing or Treatment Operations
or
Transmission Facilities**

(take a deep breath)

Otherwise known as...

ESCGP-1

HISTORY

- E&S Controls Required since 1972.
- E&S Control Manual published in 1981
 - E&S Control Manual incorporated into the Oil and Gas Operator's Manual.
- NPDES Phase I Stormwater Rule in 1990
- Oil and Gas Stormwater Policy was issued in 2001. Reissued in 2003

ENERGY POLICY ACT OF 2005

- Defined Oil and Gas Activities in the Clean Water Act
- Identified Oil and Gas Activities that do not require an NPDES Permit.
- Made certain Oil and Gas activities eligible for exemption from Stormwater NPDES permits associated with Construction Activities.

July 2006

EPA amended the NPDES regulations for stormwater discharges associated with oil and gas exploration, production, processing or treatment operations or transmission facilities **exempting them from the NPDES Stormwater Permit requirements.**

The EPA rulemaking does not affect the authority of the Department to regulate earthmoving activities under Chapter 102

The Department's Plan

- Continue Enforcement of Chapter 102
- Issue a General Permit for Erosion and Sediment Control.
- Revise Existing Oil & Gas Stormwater Policy.
- Revise Regulations.

Why Do We Need This Permit?

- **Restore disturbed areas promptly**
- **Minimize earth disturbance**
- **Ensure proper oversight by DEP**

ESCGP – 1

(the permit)

- Specific to Oil and Gas Activities
- disturb 5 acres or greater **at one time over the life of the project**
- Encourages prompt stabilization
- Ensure proper design and use of Erosion & Sediment BMPs and Post Construction Stormwater BMPs

- Encourages Operators to complete site restoration promptly



- Incentive for Operators to minimize disturbed areas

What Activities Might Need This Permit?



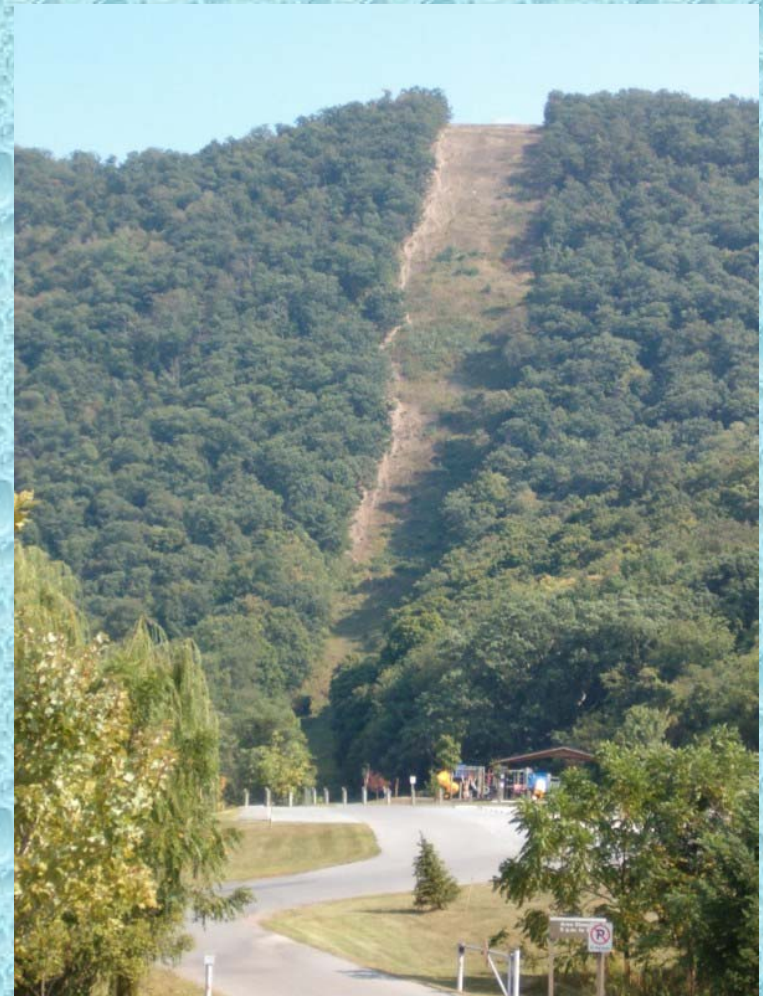
- **Deep well drilling**



- **Projects with multiple, closely spaced and interconnected wells**



**Multiple wells that are interconnected
by a common access road and pipeline**



• **Transmission Pipelines**

Who Issues What?

County Conservation Districts

- **Chapter 102 Delegated**
- **can issue the ESCGP-1**

Non-Delegated Counties

Bureau of Oil & Gas Management

Regional Office (SWRO or NWRO)

- **Projects that include well sites, access roads, flow lines and gathering lines**

Bureau of Watershed Management Regional Office

- **Transmission Line Projects**

Where Are We in the Process?

November 18, 2006 – The Dept. announced it's intent to develop an Erosion & Sediment Control Permit for Oil and Gas Activities in the PA Bulletin.

The intent to issue ESCGP-1 was published in the PA Bulletin on **May 5, 2007** and the public comment period ended on **June 4, 2007**.

Draft Permit, Application, Checklist and Instructions have been prepared.

Oil and Gas Earth Disturbance Examples

Example No. 1 – To construct the well sites and access roads for five oil wells on 660 ft. spacing. Pipelines and power lines will be buried along the access road.

Disturbed Area

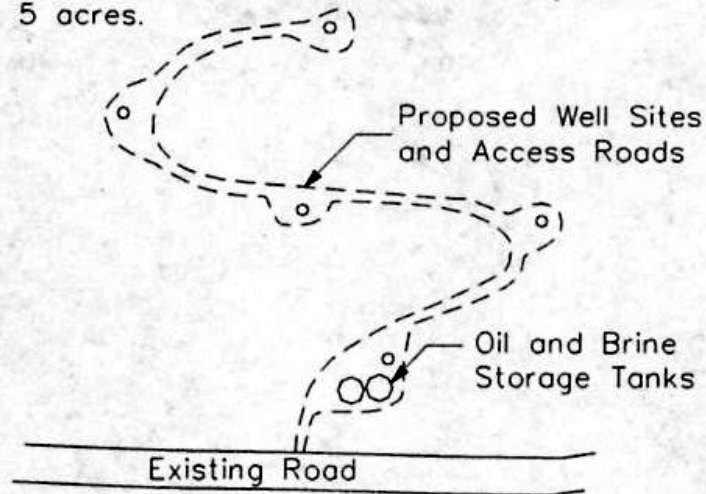
Access Road 3,400 ft. x 16 ft. = 54,400 Sq. Ft.

5 Well Sites 75 ft. x 60 ft. x 5 = 22,500 Sq. Ft.

Total = 76,900 Sq. Ft.

= 1.8 Acres

Comment – The disturbed area for the project will be less than 5 acres.

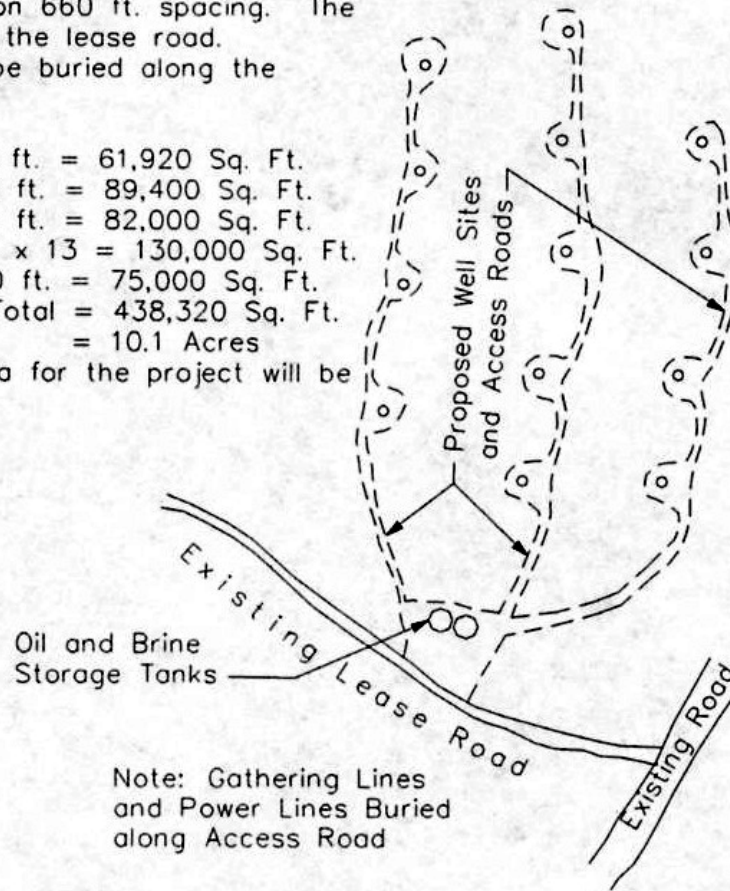


Example No. 2 – To construct the well sites and access roads for 13 oil wells on 660 ft. spacing. The tank battery will be set along the lease road. Pipelines and power lines will be buried along the access road.

Disturbed Area

Access Road	3,440 ft. x 18 ft. = 61,920 Sq. Ft.
	2,980 ft. x 30 ft. = 89,400 Sq. Ft.
	3,280 ft. x 25 ft. = 82,000 Sq. Ft.
13 Well Sites	100 ft. x 100 ft. x 13 = 130,000 Sq. Ft.
Tank Battery	300 ft. x 250 ft. = 75,000 Sq. Ft.
	Total = 438,320 Sq. Ft.
	= 10.1 Acres

Comment – The disturbed area for the project will be greater than 5 acres.



Example No. 3 – To construct the well sites and access roads for four new oil wells at an existing operation. Wells are placed on 660 ft. spacing. Pipelines and power lines will be buried in the access road.

Disturbed Area

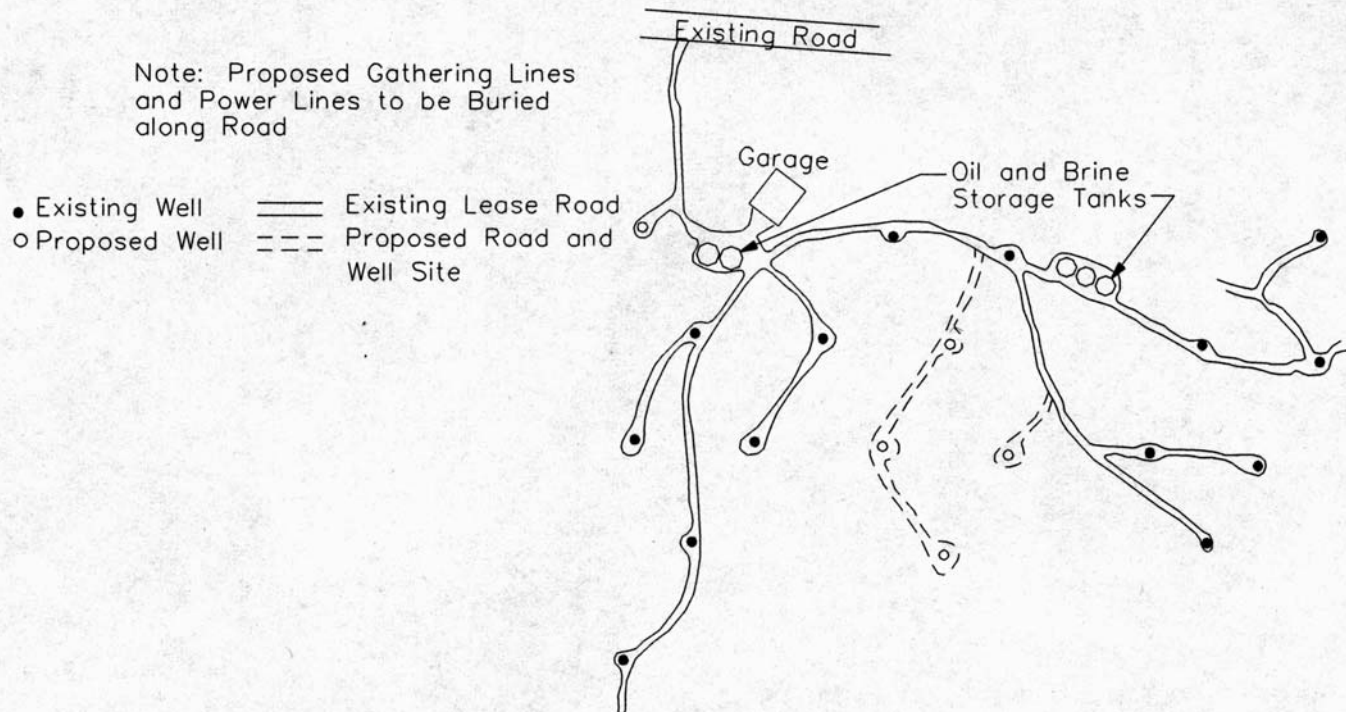
Access Road 2,700 ft. x 16 ft. = 43,200 Sq. Ft.

4 Well Sites 50 ft. x 60 ft. x 4 = 12,000 Sq. Ft.

Total = 55,200 Sq. Ft.

= 1.3 Acres

Comment – The disturbed area for the project will be less than 5 acres.



Example No. 4 – To construct the well site and access road and install the gathering line for a gas well on 1,000 ft. or 1,320 ft. spacing.

Disturbed Area

Access Road 900 ft. x 20 ft. = 18,000 Sq. Ft.

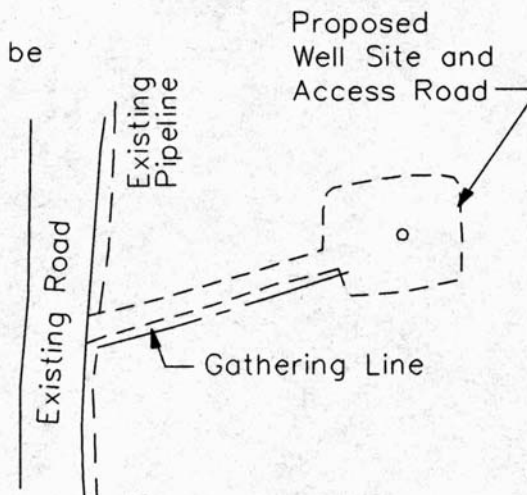
1 Well Site 220 ft. x 220 ft. = 48,400 Sq. Ft.

Gathering Line 900 ft. x 10 ft. = 9,000 Sq. Ft.

Total = 75,400 Sq. Ft.

= 1.7 Acres

Comment – The disturbed area for the project will be less than 5 acres



Example No. 5 – To construct well sites and access roads and install the gathering line for five gas wells on 1,200 ft. spacing.

Disturbed Area

Access Road 4,900 ft. x 20 ft. = 98,000 Sq. Ft.

5 Well Sites 175 ft. x 175 ft. x 5 = 153,125 Sq. Ft.

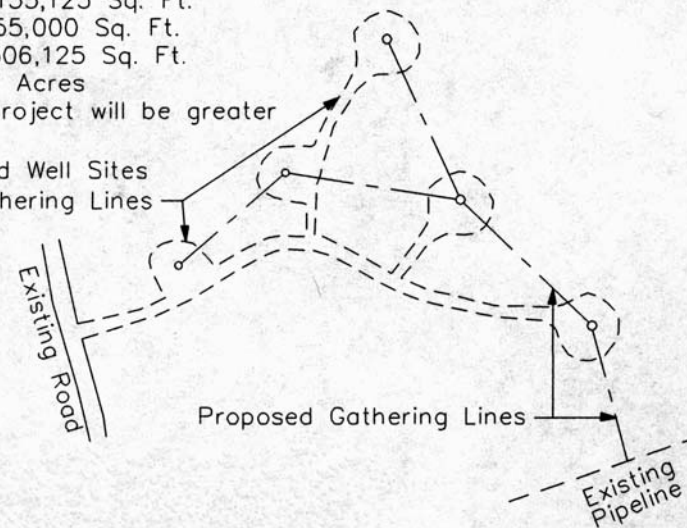
Gathering Line 5,500 ft. x 10 ft. = 55,000 Sq. Ft.

Total = 306,125 Sq. Ft.

= 7 Acres

Comment – The disturbed area for the project will be greater than 5 acres.

Proposed Well Sites
and Gathering Lines



Example No. 6 – To construct well sites and access roads and install the gathering line for six gas wells (1000 ft. well spacing). Access for three wells is from the existing road on the west and access for the other 3 wells is from the existing road on the east. The installation of the gathering line connects the two areas.

Disturbed Area

Access Road 3,850 ft. x 22 ft. = 84,700 Sq. Ft.

Well Site 190 ft. x 190 ft. x 6 = 216,600 Sq. Ft.

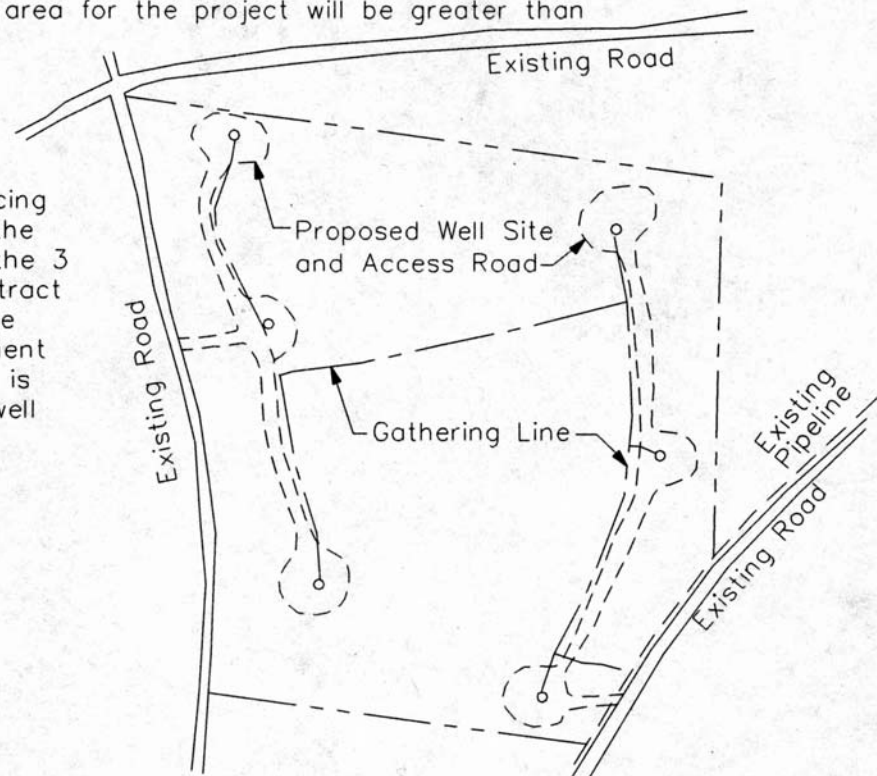
Gathering Line 2100 ft. x 10 ft. = 21,000 Sq. Ft.

Total = 322,300 Sq. Ft.

= 7.4 Acres

Comment – The disturbed area for the project will be greater than 5 acres.

Note – Since the well spacing is greater than 900 feet, the construction activities for the 3 wells on each side of the tract may be treated as separate common plans of development provided the gathering line is not constructed until the well site and access roads are permanently stabilized.



In Summary

- **Conservation District with 102 delegation can process the ESCGP-1 permit for O & G well sites, access roads, flow lines and gathering lines as well as transmission lines**
- **Non Delegated counties, in the case of O & G covered activities, the ESCGP-1 permit would go to the appropriate O & G REGIONAL OFFICE. (NWRO or the SWRO)**
- **For Transmission lines in non-delegated counties the permit would be reviewed by the appropriate Regional Watershed Management program for that county.**

- **Transmission lines are exempt from the NPDES Stormwater Permit process.**
- **They are not exempt from the state permit ESCGP-1**
- **O & G doesn't do transmission lines. They will be covered, as always, by Watershed Management**
- **O & G covers well sites, access roads, flow lines and gathering lines**
- **Distribution lines are not exempt from the federal NPDES permit process. These are also the responsibility of Watershed Management.**

The Permit Application and Checklist





COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED MANAGEMENT
BUREAU OF OIL AND GAS MANAGEMENT

OFFICIAL USE ONLY

ID # _____

Date Received _____

**NOTICE OF INTENT FOR COVERAGE
UNDER THE EROSION AND SEDIMENT CONTROL GENERAL PERMIT (ESCGP-1)
FOR EARTH DISTURBANCE ASSOCIATED WITH OIL AND GAS EXPLORATION,
PRODUCTION, PROCESSING OR TREATMENT OPERATIONS OR TRANSMISSION FACILITIES
(ESCGP-1)**

READ THE STEP-BY-STEP INSTRUCTIONS PROVIDED IN THIS PERMIT APPLICATION PACKAGE BEFORE COMPLETING THIS FORM.

PLEASE PRINT OR TYPE INFORMATION IN BLACK OR BLUE INK.

APPLICATION TYPE	NEW <input type="checkbox"/>	RENEWAL <input type="checkbox"/>	REVISED <input type="checkbox"/>
SECTION A. E&S PLANNING REQUIREMENTS			
1. Total Project Area (Acres): _____	Total Disturbed Area (Acres): _____		
2. Project Name _____			
3. Project Description			
<input type="checkbox"/> Oil/Gas Well <input type="checkbox"/> Pipeline/Transmission Facility <input type="checkbox"/> Processing Facility <input type="checkbox"/> Treatment Facility			
<input type="checkbox"/> Number of wells to be drilled <input type="checkbox"/> Installation of injection lines			
<input type="checkbox"/> Construction of access road <input type="checkbox"/> Construction and restoration of well site <input type="checkbox"/> Installation of pipeline			
<input type="checkbox"/> Installation of tank battery <input type="checkbox"/> Installation of gathering/production line <input type="checkbox"/> Other (list) _____			
4. Please provide the latitude and longitude coordinates for the center of the project. The coordinates should be in degrees, minutes and seconds (dd mm ss.ss)			
Latitude _____ degrees _____ minutes _____ seconds Longitude _____ degrees _____ minutes _____ seconds			
Reference Datum: <input type="checkbox"/> North American Datum 1983 <input type="checkbox"/> North American Datum 1927 <input type="checkbox"/> World Geodetic System 1984			
Horizontal Collection Method: <input type="checkbox"/> GPS <input type="checkbox"/> Interpolated from U.S.G.S. topo map <input type="checkbox"/> DEP's eMAP			
5. U.S.G.S. 7.5 min. Quad Map Name _____			
6. Estimated Timetable for Phased Projects			
Phase No. or Name	Description	Total Area	Disturbed Area
7. Existing and previous land use _____			
8. Other Pollutants: Will the stormwater discharge contain pollutional substances other than sediment? Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, explain and provide any available quantitative data.			
9. Receiving Water/Watershed Name _____		Name of Municipal or Private Separate Storm Sewer Operator _____	
Chapter 93 Designated Use or Existing Use Stream Classification			
<input type="checkbox"/> High Quality <input type="checkbox"/> Exceptional Value <input type="checkbox"/> Other			
Secondary Water			

SECTION B. PERMIT COORDINATION					
In addition to well permits, are other DEP environmental permits required for this project (check the type of permit needed)?					
<input type="checkbox"/> Encroachment permit			<input type="checkbox"/> √ if the application has been submitted		
<input type="checkbox"/> Air Quality permit for compressor station			<input type="checkbox"/> √ if the application has been submitted		
<input type="checkbox"/> Other (list)			<input type="checkbox"/> √ if the application has been submitted		
SECTION C. APPLICANT INFORMATION					
Applicant's Last Name	First Name	MI	Phone	FAX	
Organization Name or Registered Fictitious Name			Phone	FAX	
Mailing Address	City	State	ZIP + 4		
Co-Applicant's Last Name	First Name	MI	Phone	FAX	
Organization Name or Registered Fictitious Name			Phone	FAX	
Mailing Address	City	State	ZIP + 4		
SECTION D. SITE INFORMATION					
Site Name					
Site Location					
Site Location -- City		State	ZIP+4		
Detailed Written Directions to Site					
County	Municipality	City	Boro	Twp	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
SECTION E. POST CONSTRUCTION STORMWATER MANAGEMENT (PCSM) PLAN See the Attached Instructions on how to Complete This Section					
All PCSM plans should be designed to maximize infiltration technology, eliminate or minimize point source discharges to surface waters, preserve the integrity of stream channels, and protect the physical, chemical and biological qualities of the receiving water. In addition to these water quality design features, all PCSM plans must comply with local water quantity or flood control requirements.					
Check those that apply:					
<input type="checkbox"/> The attached PCSM plan was developed to be consistent with an Act 167 Stormwater Management Plan approved by the Department after July 2001.					
<input type="checkbox"/> The attached PCSM plan was developed to be consistent with existing local ordinances					
<input type="checkbox"/> The attached PCSM plan was developed to employ water quality design features and BMPs that will manage any net increase in stormwater runoff volume resulting from the DEP recommended 2-year/24-hour frequency storm.					

- a. Written narrative Yes No
- b. Plan drawings Yes No
- c. Identification and location of post construction stormwater management BMPs. Such BMPs should address: (1) infiltration; (2) volume and rate control; and (3) water quality treatment Yes No
- d. Operation and maintenance procedures Yes No
- e. Supporting calculations and measurements: Yes No

Supporting calculations and measurements are required only if the answers to both questions 1 and 2 below are NO.

- 1) The approximate original contours of the project site will be maintained or replicated and the disturbed areas will be revegetated or otherwise stabilized with pervious material. Yes No
- 2) PCSM BMPs which: use natural measures to eliminate pollution, do not require extensive construction efforts, promote pollutant reduction, and are capable of controlling the net increase in the volume and rate of stormwater runoff from a 2-year/24-hour storm event will be employed, and the net increase in the volume of post construction runoff is infiltrated and/or dissipated away from surface waters of the Commonwealth. Yes No

If the responses to both questions 1 and 2, above are NO, please provide the requested post construction stormwater information in the Data Table for Supporting Calculations and Measurements below:

- 2. Explain how post construction stormwater runoff volume will be managed if BMPs will not infiltrate the total net increase in stormwater runoff volume. (Net increase volume = Post construction runoff volume minus Pre-construction runoff volume):

Supporting calculations and measurements are required only if the answers to both questions 1 and 2 below are NO.

- 1) The approximate original contours of the project site will be maintained or replicated and the disturbed areas will be revegetated or otherwise stabilized with pervious material. Yes No
- 2) PCSM BMPs which: use natural measures to eliminate pollution, do not require extensive construction efforts, promote pollutant reduction, and are capable of controlling the net increase in the volume and rate of stormwater runoff from a 2-year/24-hour storm event will be employed, and the net increase in the volume of post construction runoff is infiltrated and/or dissipated away from surface waters of the Commonwealth. Yes No

Check this box if supporting calculations and measurements are NOT required in accordance with Section E.1.e on the preceding page.

Design storm frequency _____	Pre-construction	Post Construction	Net Change
------------------------------	------------------	-------------------	------------

If the responses to both questions 1 and 2, above are NO, please provide the requested post construction stormwater information in the Data Table for Supporting Calculations and Measurements below:

- 2. Explain how post construction stormwater runoff volume will be managed if BMPs will not infiltrate the total net increase in stormwater runoff volume. (Net increase volume = Post construction runoff volume minus Pre-construction runoff volume):

N/A (check N/A only if BMPs will infiltrate all of the Net Change in Runoff)

SECTION H. CERTIFICATION BY PERSON PREPARING APPLICATION	
<p>I do hereby certify to the best of my knowledge, information and belief, that the Erosion and Sediment Control Plan and Post Construction Stormwater Management Plan are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.</p>	
Print Name	Signature
Company	
Address	
Phone	
SECTION I. APPLICANT CERTIFICATION	
<p>Applicant Certification. I certify under penalty of law that this document and all attachments were prepared by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. The responsible official's signature also verifies that the activity is eligible to participate in the permit, and that the applicant agrees to abide by the terms and conditions of the permit. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.</p>	
_____ Print Name and Title of Applicant	_____ Print Name and Title of Co-Applicant (if applicable)
_____ Signature of Applicant	_____ Signature of Co-Applicant
_____ Date Application Signed	_____ Date Application Signed
Notarization	
Sworn to and subscribed to before me this _____ day of _____, 20____	Commonwealth of Pennsylvania County of _____
_____ Notary Public	My Commission expires _____
NAME, ADDRESS AND PHONE NUMBER OF INDIVIDUAL TO BE CONTACTED IF ADDITIONAL INFORMATION IS REQUIRED	
Name	
Address	Phone



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED MANAGEMENT
BUREAU OF OIL AND GAS MANAGEMENT

**NOTICE OF INTENT (NOI) CHECKLIST
EROSION AND SEDIMENT CONTROL GENERAL PERMIT FOR EARTH
DISTURBANCE ASSOCIATED WITH OIL AND GAS EXPLORATION,
PRODUCTION, PROCESSING, OR TREATMENT OPERATIONS
OR TRANSMISSION FACILITIES
(ESCGP-1)**

Please check the following list to make sure that you have included all the required information. Place a check mark in the column provided for all items completed and/or provided. Failure to provide all of the requested information will delay the processing of the application and may result in the application being placed ON HOLD with NO ACTION, or being considered withdrawn and the application file closed.

THIS CHECKLIST MUST BE COMPLETED AND ENCLOSED WITH YOUR GENERAL PERMIT NOI

✓CHECKLIST FOR EROSION AND SEDIMENT CONTROL GENERAL PERMIT NOI		Applicant Check ✓ If Included	Official Use Only
1.	Fully completed, properly signed and notarized Notice of Intent form (1 original and 2 copies).	<input type="checkbox"/>	<input type="checkbox"/>
2.	Complete Erosion and Sediment Control Plans. (3 copies)	<input type="checkbox"/>	<input type="checkbox"/>
a.	Topographic features	Location: _____ Page: _____	<input type="checkbox"/>
b.	Soils information	Location: _____ Page: _____	<input type="checkbox"/>
c.	Proposed alteration	Location: _____ Page: _____	<input type="checkbox"/>
d.	Amount of runoff	Location: _____ Page: _____	<input type="checkbox"/>
e.	Location of water which may receive runoff and receiving water classification, pursuant to Chapter 93 and the "statewide existing use listing".	Location: _____ Page: _____	<input type="checkbox"/>
f.	Supporting calculations	Location: _____ Page: _____	<input type="checkbox"/>
g.	BMPs used before, during, and after earth disturbance, including special protection BMPs.	Location: _____ Page: _____	<input type="checkbox"/>
h.	Maintenance program	Location: _____ Page: _____	<input type="checkbox"/>
i.	Plan drawings and narratives	Location: _____ Page: _____	<input type="checkbox"/>
j.	Sequence of BMP installation and removal	Location: _____ Page: _____	<input type="checkbox"/>
k.	Recycling and disposal methods	Location: _____ Page: _____	<input type="checkbox"/>
3.	Permit filing fee of \$500 payable to the appropriate Clean Water Fund.	<input type="checkbox"/>	<input type="checkbox"/>
4.	Location map: USGS of scale 1:24,000 indicating project location and boundaries. (3 copies)	<input type="checkbox"/>	<input type="checkbox"/>

✓CHECKLIST FOR ESCGP-1			Applicant Check ✓ If Included	Official Use Only
5.	Notifications to the local municipality and county governments that specify Acts 67 and 68 Coordination, and that the application is for a Erosion and Sediment Control General permit for Earth Disturbance Associated with Oil and Gas Activities. (3 copies) A "sample" notification letter is provided as Appendix A of the instructions.		<input type="checkbox"/>	<input type="checkbox"/>
6.	Proof of receipt of municipal notifications; copies of certified mail receipts or acknowledgment letters from the local municipality and county government. (3 copies)		<input type="checkbox"/>	<input type="checkbox"/>
7.	The PNDI Review receipt for the project area. Include impact clearance letters if proof of agency coordination is required. (3 copies)		<input type="checkbox"/>	<input type="checkbox"/>
8.	PPC Plan: Include a current Preparedness, Prevention and Contingency Plan (3 copies)		<input type="checkbox"/>	<input type="checkbox"/>
9.	Complete Post Construction Stormwater Management Plan. (3 copies) Location: Drawings (D), Narrative (N).		<input type="checkbox"/>	<input type="checkbox"/>
	a. Written Narrative	Location _____ Page _____	<input type="checkbox"/>	<input type="checkbox"/>
	b. Location of BMPs showing final contours	Location _____ Page _____	<input type="checkbox"/>	<input type="checkbox"/>
	c. Plan drawings of permanent stabilization	Location _____ Page _____	<input type="checkbox"/>	<input type="checkbox"/>
	d. Plan drawings of BMPs	Location _____ Page _____	<input type="checkbox"/>	<input type="checkbox"/>
	e. Operation and maintenance procedure	Location _____ Page _____	<input type="checkbox"/>	<input type="checkbox"/>
	f. Supporting calculations or measurements	Location _____ Page _____	<input type="checkbox"/>	<input type="checkbox"/>
	g. Design frequency storm rainfall amount	Location _____ Page _____	<input type="checkbox"/>	<input type="checkbox"/>
	h. Area of impervious surface	Location _____ Page _____	<input type="checkbox"/>	<input type="checkbox"/>
	i. Curve Number or Runoff Coefficient	Location _____ Page _____	<input type="checkbox"/>	<input type="checkbox"/>
	j. Runoff from the design frequency storm	Location _____ Page _____	<input type="checkbox"/>	<input type="checkbox"/>
	k. Volume of water infiltrated through BMPs	Location _____ Page _____	<input type="checkbox"/>	<input type="checkbox"/>
	l. Peak discharge rate from the design frequency storm	Location _____ Page _____	<input type="checkbox"/>	<input type="checkbox"/>

Umholtz's Corollaries to Murphy's Law of BMP Entrophy

- 1. All BMPs work if it's not raining.**
- 2. BMPs and PMS sound alike for a reason.**
- 3. All BMPs will eventually fail.**
The question is, will they last until you retire?
- 4. You can get grass to grow on the side of a tree.**
The question is, for how long? (See 3 above.)
- 5. Water flows downhill, unless you're looking at the
Erosion and Sedimentation Plan upside down..**
- 6.. All filter fence and hay bales are installed correctly, and yes, Virginia, there is a
Santa Claus.**
- 7. Snow is not an effective sediment filter BMP.**
- 8. Erosion is a natural process, but then again, so is death.**
It is not in your best interest to accelerate either.



Questions?

Reference 15

Last update 8/26/2010 12:58:04 PM

Site Details

[North Central Regional Office](#)

[Site Search](#)

[Sites by County/Muni Search](#)

Site ID:	721137
Site Name:	PRESTON 38 LLC OG WELL
Address:	ORSON,
Status:	Active

Clients

Client List
PENNSWOOD OIL & GAS LLC (272597)

Programs

DEP Programs
Oil & Gas

PA Municipalities

Municipalities/Counties
Preston Twp, Wayne County

Site Permits

No records matched the criteria.

Facility Permits

Authorization Id	Authorization Type	Date Received	Status/Date
792478	Drill & Operate Well Permit	05/15/2009	Issued 07/29/2009
841478	Drill & Operate Well Permit	07/06/2010	Issued 07/20/2010

Site-Level and Primary Facility-Level Inspections

No records matched the criteria.

[Licensing, Permits, and Certification](#)

http://www.ahs2.dep.state.pa.us/eFACTSWeb/searchResults_singleClient.aspx?ClientID=272597

Reference 16

[EPA Envirofacts](#)

[The PA Code](#)

Last update 8/26/2010 12:58:04 PM

Site [North Central Regional](#) [Site](#) [Sites by County/Muni](#) [no
Details [Office](#) [Search](#) [Search](#) paging]

Site ID:	722440
Site Name:	STOCKPORT ASSN 1
Address:	HANCOCK,
Status:	Active

Clients

Client List
PENNSWOOD OIL & GAS LLC (272597)

Programs

DEP Programs
Oil & Gas

PA Municipalities

Municipalities/Counties
Buckingham Twp, Wayne County

Site Permits

No records matched the criteria.

Facility Permits

Authorization Id	Authorization Type	Date Received	Status/Date
796670	Drill & Operate Well Permit	06/15/2009	Issued 07/22/2009
841481	Drill & Operate Well Permit	07/06/2010	Issued 07/20/2010

Site-Level and Primary Facility-Level Inspections

No records matched the criteria.

[Licensing, Permits, and Certification](#)

Reference 17
(Excerpt)

Environmentally Sensitive Maintenance Practices for Unpaved Roads: Sediment Reduction Study

Prepared for

Chesapeake Bay Commission

c/o Senate of Pennsylvania
G-05 North Office Building
Harrisburg, PA 17120

By

Dr. Barry E. Scheetz
Steven M. Bloser

Center for Dirt and Gravel Road Studies

The Pennsylvania State University
University Park, PA 16802

FINAL REPORT

June 30, 2008

Revised August 29, 2008

Research Overview:

Pennsylvania's Dirt and Gravel Road Maintenance Program has long advocated Environmentally Sensitive Maintenance (ESM) Practices to reduce stream pollution from unpaved roads. Penn State's Center for Dirt and Gravel Road Studies (Center) has recently completed a research project with funding from the Chesapeake Bay Commission that begins to quantify sediment reductions from several commonly used ESM practices.

This document is a summary only, full report is available at www.dirtandgravelroads.org under "research".

research funded by...



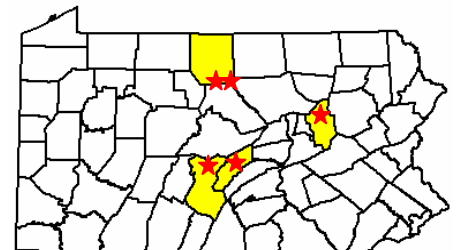
ESM Practices Tested:

Five Environmentally Sensitive Maintenance Practices were tested in this study:

- **Driving Surface Aggregate:** a specific aggregate mixture designed as a wearing course for unpaved roads;
- **Raising the Road Profile:** raising road elevation to eliminate lower ditch & restore sheet flow;
- **Grade Breaks:** elongated humps in the road surface designed to shed water to each side of the road;
- **Additional Drainage Outlets:** creating new outlets in ditchline to reduce channelized flow; and
- **Berm Removal:** removing unnecessary berm and ditch on down slope side of road to encourage sheet flow.

Methods:

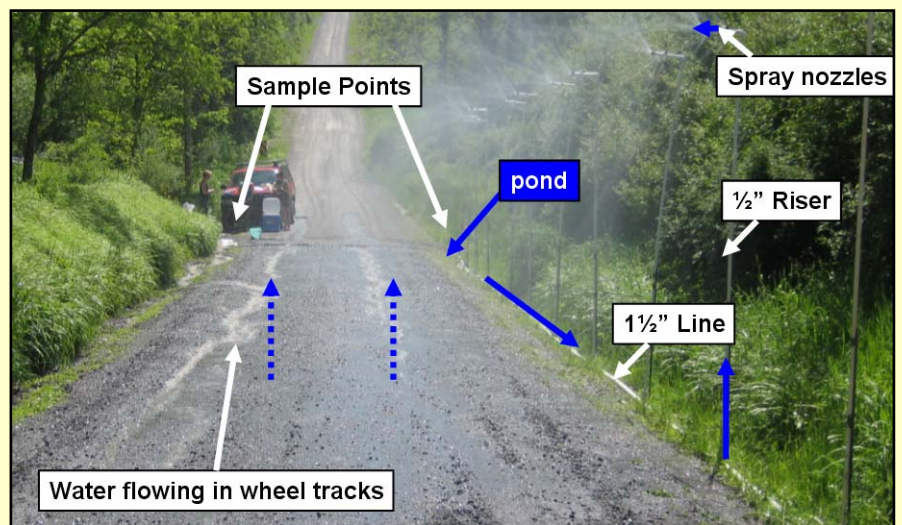
In order to determine sediment reductions of the five practices, it was necessary to collect sediment data both before and after each practice was implemented. The Rainmaker (see description below) was used to create a controlled and repeatable rainfall event on a 100' section of road. Each test consisted of three 30-minute runs of the rainmaker, both before and after ESM practice implementation. Flow and sediment samples were taken at regular intervals to determine the total sediment loss for each section of road. The three test runs were combined for each section of road to determine the average sediment loss for one 30 minute event. By comparing the flow and sediment differences from before and after ESM practice implementation, the sediment reduction from each practice can be determined.



These projects were completed on roads in Potter, Columbia, Huntingdon, and Mifflin Counties as illustrated by the stars above.

Meet the Rainmaker, a Rainfall Simulator for Roadways...

The "rainmaker" is a rainfall simulator developed by the Center that creates a 0.55" rainfall event in 30 minutes over a 100' length of road. This is equivalent to a 1-month return interval for a 30 minute storm for most of Pennsylvania. The rainmaker creates a controlled, repeatable rainfall event that is run both before and after ESM practices are installed on the road. By comparing runoff and sediment concentrations, sediment reductions can be calculated for the various ESM practices. Rainmaker layout and components are illustrated to the right.



The publishers of this publication gratefully acknowledge the financial support of the Pennsylvania State Conservation Commission and the Chesapeake Bay Commission. For additional information, contact: Center for Dirt & Gravel Roads Studies, Penn State University, 207 Research Unit D, University Park, PA 16802 (Toll-Free Phone: 1-866-668-6683, Fax: 814-863-6787, Email: dirtandgravel@psu.edu). Additional copies available on our website at: www.dirtandgravelroads.org



Results

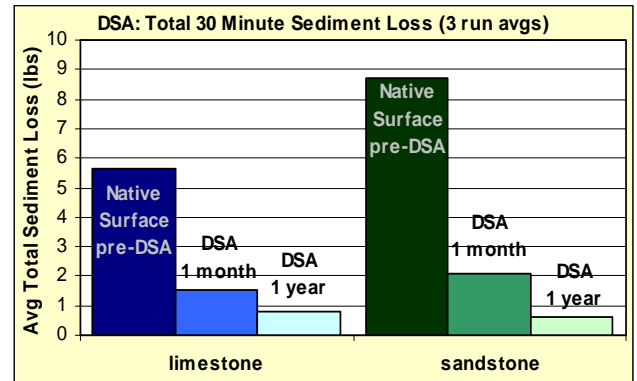
Special Note: This study provides a valuable initial look at sediment reductions from ESM practices. However, due to the limited number of sample points, and the infinite variability of road conditions in the field, sediment reductions for specific practices found in this study should NOT be considered blanket or universal reductions for each practice.

Runoff Rates from Existing Roads:

The five “existing condition” tests done for this study found sediment production rates ranging from 0.7-12.2 pounds of sediment runoff in a single 30 minute, 0.55 inches simulated rainfall. The 0.7 pound event was generated from a flat narrow farm lane with grass growing between the wheel tracks. The 12.2 pound event was generated from a wider, mixed limestone/clay road at a 4-5% slope. This highlights the great variability in erosion rates based on specific site conditions. Using the average sediment runoff rate of 5.6 pounds per event, a single 30 minute 0.55 inch rain event moving across Pennsylvania can be conservatively expected to generate over 3,000 tons* of sediment from the State’s 20,000+ miles of public unpaved roads. *For illustrative purposes only, more testing on varied roads is needed to substantiate this extrapolation.

Driving Surface Aggregate:

Two separate DSA placements were tested on Lebo Road in Potter County. The aggregates, one limestone and one sandstone, were placed according to Dirt and Gravel Road Program standards (one 8” lift, placed using a paver, compacted to 6”). Rainfall simulations were run before placement, and at intervals of 1 month and one year after placement. The graph to the right summarizes the results in total sediment loss per 30 minute rainfall simulation. Compared to their respective native surfaces, Limestone DSA reduce sediment by 73% after one month and 86% after one year, while Sandstone DSA reduced sediment by 76% after one month and 93% after one year. Parent material did not significantly affect sediment generation rates.



Drainage Control Practices:

Unlike DSA which reduces sediment generation from the road surface, the four remaining practices reduce sediment by reducing and controlling the volume of road runoff.

Raising the Road Profile:

Diehl Road in Columbia County was filled approximately 5 feet in order to completely eliminate the ditch on the down slope side of the road. Sheet flow into a vegetative filter was achieved off the down slope side of the road after it was filled. This practice reduced the amount of sediment entering the stream by 82% after one month, and 87% after one year. Some infiltration of runoff into the new road fill may have accounted for the higher than expected sediment reductions on Diehl Road.

Grade Break:

Two grade breaks were tested in this study, one in Huntingdon County, and one in Mifflin County. The grade breaks showed sediment reductions of 57% and 43% respectively. Note that the grade breaks were placed in the middle of the 100’ test section, therefore sediment reductions of 50% indicate the gradebreak was 100% effective in eliminating upslope sediment.

Additional Drainage Outlets:

The effect of adding a turnout was tested on Pine Swamp Road in Huntingdon County. The new turnout discharged into a vegetative filter and did not affect the stream. A turnout was used instead of a culvert for cost effectiveness and simplicity. The turnout showed sediment reductions of 48% for the down slope ditch alone, or 31% when factoring in the up slope ditch that was unaffected by the turnout. Note that, as with the “grade-break”, the turnout was placed in the middle of the 100’ test section, so a 50% sediment reduction indicates a 100% efficiency.

Berm Removal:

The effect of berm removal was tested on Pine Swamp Road in Huntingdon County. Removing the berm effectively eliminated the down slope ditch and allowed water to sheet flow into a vegetative filter area. Berm removal showed sediment reductions of 94% for the down slope ditch alone, or 59% when factoring in the up slope ditch that was unaffected by the practice.

This is a summary only, full report available at www.dirtandgravelroads.org under “research”.

Reference 18
(Excerpt)

**PREPAREDNESS, PREVENTION,
AND CONTINGENCY PLAN
WAYNE COUNTY FIELD
WAYNE COUNTY, PENNSYLVANIA**

Prepared for:

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May 2010

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1.0 DESCRIPTION OF FACILITY

1.1 DESCRIPTION OF THE INDUSTRIAL OR COMMERCIAL ACTIVITY

Newfield Appalachia PA LLC (Newfield) is a natural gas exploration company with operations planned for Wayne County, Pennsylvania. Operations will involve natural gas exploration of the Marcellus Shale formation, which will include site preparation, drilling, and well development and production activities. Wastes generated during these activities will be typical for gas drilling operations and will include drill cuttings, produced water, drilling and frac fluids, waste oil, municipal waste and trash. No hazardous waste is expected to be generated at the Newfield sites.

Newfield is currently in the exploratory phase of operations, which will require construction activities for new natural gas well pads and access roads.

This Prevention, Preparedness and Control (PPC) Plan applies to all well sites in Wayne County, Pa.

The attached map (Figure 1) in Appendix B shows the area covered under this PPC Plan. Figure 2 is the required 7.5 topographic map of the specific well site. The proposed Site Plan (Figure 3) shows the site layout, the well site boundaries, material storage areas, waste storage areas, dike drains and drainage that leads away from the well site, and the entrances and exits to the well site.

During the different stages of site preparation, construction, drilling, well development and production, the site will store various fuels, oils and chemicals on-site. A chemical and container inventory for the specific well site is located in Table 1 of Appendix C.

1.2 DESCRIPTION OF EXISTING EMERGENCY RESPONSE PLANS

This is a new facility and this plan has been prepared prior to construction of the well pad. There are no previous emergency response plans.

A separate Spill Prevention Control and Countermeasure (SPCC) Plan will be prepared for each facility meeting the requirements defined in 40 CFR§112.

1.3 MATERIAL AND WASTE INVENTORY

Information in this section is used to evaluate the prevention, containment, mitigation, cleanup, and disposal measures which would be used in the event of a spill, discharge, explosion, or fire. Oils, chemicals and other hazardous materials anticipated to be used and stored at the facility during site preparation and construction, drilling, well development and production are listed in Table 1.

MSDS's will be maintained onsite for chemicals and compounds used at the facility in accordance with the Occupational Safety and Health Administration (OSHA) worker right-to-know requirements, as appropriate.

1.4 POLLUTION INCIDENT HISTORY

Newfield has not had any reportable incidents for this facility.

1.5 IMPLEMENTATION SCHEDULE FOR PLAN ELEMENTS NOT CURRENTLY IN PLACE

All plan elements are in place.

1.6 PURPOSE AND IMPLEMENTATION OF PPC PLAN

Newfield has developed and will implement this PPC Plan for effective action to minimize and abate hazards to human health and the environment from fire, explosion, and emission or discharge of pollutants to air, soil, surface water or groundwater. This plan was prepared to satisfy the requirements set forth in 25 PA Code Section 78.

The Drilling Manager serves as the Primary Emergency Coordinator and is responsible for the preparation and implementation of the PPC Plan. The PPC Plan has been prepared and implemented in general accordance with Pennsylvania Department of Environmental Protection (PADEP) guidelines, and will be submitted to PADEP for approval at such time as the PADEP may prescribe.

This PPC Plan identifies and describes any arrangements with police departments, fire departments, hospitals, contractors, and state, county, and local emergency response teams to coordinate emergency services.

The PPC Plan lists names, addresses and phone numbers of all persons identified to act as Emergency Coordinator. One person is named as the Primary Emergency Coordinator and others are listed in the order in which they will assume responsibility as alternates. The PPC Plan also includes a list of emergency equipment at the facility, the location and a physical description of emergency equipment, and a brief outline of emergency equipment capabilities.

1.7 PLAN REVISIONS

This PPC Plan will be reviewed and amended, annually, or whenever:

- Applicable PADEP regulations are revised;
- The plan fails in an emergency;
- The list of Emergency Coordinators changes;
- The list of emergency equipment changes; and
- Construction, operation, maintenance, or other circumstances change in a manner that materially increases the potential for fires, explosions, or releases of toxic or hazardous constituents; or which changes the response necessary in an emergency.

Reference 19



Polluted Runoff

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Erosion, Sediment and Runoff Control for Roads and Highways

United States
Environmental Protection
Agency

Office of Water
(4503F)

EPA-841-F-95-008d
December 1995



The Coastal Zone Management Act of 1972 established a program for states to voluntarily develop comprehensive programs to protect and manage coastal water resources. There are now 29 coastal states and territories with federally approved coastal management programs.

The Coastal Zone Act Reauthorization Amendments (CZARA) of 1990 specifically charged coastal states and territories with upgrading their runoff pollution control programs to protect coastal waters. The Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) jointly oversee the development and implementation of these *Coastal Nonpoint Pollution Control Programs*, or CNPCPs.

EPA published *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* to be used by states to implement management measures - economically achievable measures that reflect the greatest degree of runoff pollution control - to control the addition of runoff pollutants to coastal waters.

The *Guidance* also includes best management practices, technologies, processes, siting criteria, and operating methods for roads, highways, and bridges that states can use to implement the management measures. States can use alternative management measures if they provide the same or a greater degree of pollutant control as the management measures in the *Guidance*. States will begin implementing their CNPCPs in 1996 and achieve full implementation by 2004.

CZARA applies to site development and land disturbing activities in the coastal management area of each State with an approved coastal management program. Certain road, highway and bridge related activities are excluded from this program due to coverage under the National Pollutant Discharge Elimination System (NPDES) permitting program. These activities include construction activities where 5 or more acres (2.02 ha) are disturbed, and activities within municipalities with municipal separate storm sewer systems that have populations of 100,000 or more.

Why Runoff Control is Needed

Runoff controls are essential to preventing polluted runoff from roads, highways, and bridges from reaching surface waters. Erosion during and after construction of roads, highways, and bridges can contribute large amounts of sediment and silt to runoff waters, which can deteriorate water quality and lead to fish kills and other ecological problems.

Heavy metals, oils, other toxic substances, and debris from construction traffic and spillage can be absorbed by soil at construction sites and carried with runoff water to lakes, rivers, and bays. Runoff control measures can be installed at the time of road, highway, and bridge construction to reduce runoff pollution both during and after construction. Such measures can effectively limit the entry of pollutants into surface waters and ground waters and protect their quality, fish habitats, and public health.

Pesticides and fertilizers used along roadway rights-of-way and adjoining land can pollute surface waters and ground water when they filter into the soil or are blown by wind from the area where they are applied. Table 1 shows typical pollutants in runoff waters that can be traced to the operation of roads and highways.

Principles of Runoff Control for Roads, Highways, and Bridges

Preventing runoff pollution from road, highway, and bridge construction in coastal areas requires planning, education, inspection,

and maintenance. An erosion and sediment control (ESC) plan that incorporates the most appropriate and cost-effective best management practices (BMPs) is essential to effective pollution control. Affected highway personnel must be educated about the requirements of the ESC plan. Inspection and enforcement authority are necessary to ensure awareness of and compliance with the adopted practices. Finally, BMPs require regular maintenance to ensure that they perform optimally. The following principles apply to an effective erosion and runoff control program.

- **Develop a comprehensive erosion and sediment control (ESC) plan prior to earth-moving activities.** Write ESC requirements into plans, specifications, and cost estimates for highway and bridge projects. Four key factors affect the potential for soil erosion from a site: soil characteristics, vegetative cover, topography, and climate. Take all of these factors into consideration to develop an ESC plan that will minimize soil loss, limit the area exposed to construction, maximize the vegetative cover, use natural topographic features to the best advantage, and include BMPs suitable to the regional climate.

The Federal Highway Administration Local Transportation Assistance Program, the Association of American State Highway and Transportation Officials, and many state highway departments can provide ESC guidelines.

- **Apply ESC practices to prevent excessive onsite damage.** Use ESC BMPs to control the flow of runoff water and thereby prevent or lessen soil erosion. Limiting land disturbance and preserving natural vegetation are excellent ESC practices.
- **Apply perimeter control practices to protect the disturbed area from offsite runoff and to prevent sedimentation damage to areas below the construction site.** A sediment and runoff barrier surrounding the disturbed area prevents construction site runoff from moving offsite and fouling surface waters downstream.
- **Keep runoff velocities low and retain runoff on the site.** The erosive power of runoff increases dramatically as distance and slope increase. BMPs can be used to effectively control runoff velocity and detain it to remove 80 to 90 percent of the sediment from runoff.
- **Stabilize disturbed areas immediately after final grade has been attained.** Any exposed soil is subject to erosion from rainfall, wind, and vehicles. BMPs to stabilize soil should be applied as quickly as possible after the land is disturbed. Temporary stabilization practices include seeding, mulching, and erosion control blankets or mats.
- **Develop a schedule and implement a comprehensive inspection and maintenance program.** This principle is vital to the success of erosion control. BMPs must receive regular inspection and maintenance to ensure that they are operating effectively and optimally, both during and after construction.

Best Management Practices

CZARA defines management measures as economically achievable measures to control the addition of pollutants to our coastal waters. Management measures are achieved by the application of one or more BMPs. The BMPs described below are especially useful for erosion and runoff control for roads, highways, and bridges.

Best management practices can be organized by the function they perform. General maintenance BMPs (listed below) are usually vegetative practices used to contain polluted runoff from the operation of highways or from erosion and sedimentation generated at small construction sites. A variety of practices are used at construction sites to control both erosion and polluted runoff. These are identified as Construction Site BMPs. Practices developed as permanent erosion and sediment control devices are both structural and nonstructural. Several of these BMPs are listed below as long-term or Permanent Control BMPs.

Construction Site BMPs

- **Straw bale barriers** should be bound, entrenched, and securely anchored to prevent deterioration. A row of straw bales slows runoff flow and creates a pond behind the barrier where sediment can settle out. Straw bale barriers are most effective for filtering low to moderate storm flows, where structural strength is not required.
- **Filter fabrics** are engineering fabrics designed to retain sediment particles larger than a certain size and allow water to pass through. Filter fabrics can be used in silt fences (see below) or erosion control mats. Erosion control mats protect soil and seed from erosion and can be designed to allow vegetation to grow through the material.
- **Silt fences** are vertical fences of filter fabric that are stretched across and attached to support poles. The fabric retains sediment on the construction site and allows relatively sediment-free water to pass through. Silt fences are placed to protect streams and surrounding property from sediment-laden runoff.
- **Sediment basins** are ponds created by excavation or the construction of a dam or barrier. Sediment basins primarily serve to retain or detain runoff to allow excessive sediment to settle out during construction. Sediment basins can be converted into permanent detention ponds or wetlands after construction.
- **Stabilized entrances** reduce the amount of sediment carried off a construction site by vehicles when pressure-washed on-site. These entrances are designed to include stabilized pads of aggregate underlain with a filter fabric. Stabilized construction site entrances should be located at any point in the construction zone where vehicles enter and leave. Wheels and undercarriages of vehicles should be washed before leaving the site.

Operation and Maintenance

Inspection and maintenance of erosion and sediment control BMPs after construction has been completed is important to ensure that the BMPs are operating properly and effectively. Some key operation and maintenance procedures include:

- **Prepare and adhere to a schedule of regular maintenance for temporary erosion and runoff control BMPs.** Two critical maintenance operations that must be performed regularly are cleaning out accumulated sediment and replacing worn-out or deteriorated materials, such as silt fence fabrics, so that the effectiveness of the controls is maintained. Maintenance can include dredging and reshaping sediment basins and revegetating the slopes of grassed swales.
- **Remove temporary BMPs from construction areas when they are no longer needed and replace them, where appropriate, with permanent BMPs.**
- **Schedule and periodically inspect and maintain permanent erosion and runoff controls.** This should include a periodic visual inspection of permanent BMPs during runoff conditions to ensure that the controls are operating properly. Clean, repair, and replace permanent erosion and runoff control BMPs when necessary.

General Maintenance BMPs

- **Seeding with grass and fertilizing** to promote strong growth provide long-term stabilization of exposed surfaces. Disturbed areas can be seeded and fertilized during construction and after it is completed. Sufficient watering and refertilizing 30 to 40 days after the seeds germinate help establish dense growth.
- **Seeding with grass and overlaying with mulch or mats** is done to stabilize cleared or freshly seeded areas. Types of mulches include organic materials, straw, wood chips, bark or other wood fibers, or decomposed granite and gravel. Mats are made of natural or synthetic material and are used to temporarily or permanently stabilize soil.
- **Wildflower cover** has been successfully used by many state and county highway departments to provide attractive vegetation along roadways and erosion control. Careful consideration must be given to visibility, access, soil condition, climate, and maintenance when choosing sites for wildflower cover.
- **Sodding** with established grass blankets on prepared soil provides a quick vegetative cover to lessen erosion. Proper watering and fertilizing are important to ensure the vitality of newly placed sod.

Permanent Control BMPs

- **Grassed swales** are shallow, channeled grassed depressions through which runoff is conveyed. The grass in swales slows the flow of runoff water, which allows sediment to settle out and water to infiltrate into the soil. Grassed swales can remove small amounts of pollutants such as nutrients and heavy metals. Check dams (see below) can be added to grassed swales to further reduce flow velocity and promote infiltration and pollutant removal.
- **Filter strips** are wide strips of vegetation located to intercept overland sheet flows of runoff. They can remove organic material, sediment, and heavy metals from runoff. Filter strips can consist of any type of dense vegetation from woods to grass but they cannot effectively treat high-velocity flows. They are therefore best suited to low-density developments.
- **Terracing** breaks a long slope into many flat surfaces where vegetation can become established. Small furrows are often placed at the edge of each terraced step to prevent runoff from eroding the edge. Terracing reduces runoff velocity and increases infiltration.
- **Check dams** are small temporary dams made of rock, logs, brush, limbs, or another durable material, placed across a swale or drainage ditch. By reducing the velocity of storm flows, sediment in runoff can settle out and erosion in the swale or ditch is reduced.
- **Detention ponds or basins** temporarily store runoff from a site and release it at a controlled rate to minimize downstream flooding. Pollutant removal effectiveness is quite good for well-designed basins. Effectiveness is greatest for suspended sediments (80 percent or more removal) and related pollutants such as heavy metals.
- **Infiltration trenches** are shallow, three to eight feet deep (.91 to 2.44 m), excavated trenches that are backfilled with stone to create underground reservoirs. Runoff is diverted into the trenches, from which it percolates into the subsoil. Properly designed infiltration trenches effectively remove sediment from runoff and can remove some other runoff pollutants.
- **Infiltration basins** are relatively large, open depressions produced by either natural site topography or excavation. When runoff enters an infiltration basin, the water percolates through the bottom or the sides and the sediment is trapped in the basin. The soil where an infiltration basin is built must be permeable enough to provide adequate infiltration. Some pollutants other than sediment are also removed in infiltration basins.
- **Constructed wetlands** are areas inundated by water for a sufficient time to support vegetation adapted for life in saturated soil conditions. Wetlands effectively filter sediment, nutrients, and some heavy metals from runoff waters.

Table 1. Typical pollutants found in runoff from roads and highways.

Sources of Pollution in Highway Runoff

	Pollutant	Source
Sedimentation	Particulates	Pavement wear, vehicles, the atmosphere and maintenance activities
Nutrients	Nitrogen & phosphorus	Atmosphere and fertilizer application
Heavy Metals	Lead	Leaded gasoline from auto exhausts and tire wear
	Zinc	Tire wear, motor oil and grease
	Iron	Auto body rust, steel highway structures such as bridges and guardrails, and moving engine parts
	Copper	Metal plating, bearing and brushing wear, moving engine parts, brake lining wear, fungicides & insecticides
	Cadmium	Tire wear and insecticide application
	Chromium	Metal plating, moving engine parts and brake lining wear
	Nickel	Diesel fuel and gasoline, lubricating oil, metal plating, bushing wear, brake lining wear and asphalt paving
	Manganese	Moving engine parts
	Cyanide	Anti-caking compounds used to keep deicing salt granular
	Sodium, calcium & chloride	Deicing salts
Hydrocarbons	Sulphates	Roadway beds, fuel and deicing salts
	Petroleum	Spills, leaks, antifreeze and hydraulic fluids and asphalt surface leachate

Adapted from Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters

Last updated on Wednesday, April 21, 2010.

Reference 20
(Excerpt)

**United States Environmental Protection Agency
Final Report for Catalog of Federal Domestic Assistance Grant
Assistance Number 66.463 Water Quality Cooperative
Agreement for Project Entitled “Demonstrating the Impacts of
Oil and Gas Exploration on Water Quality and How to Minimize
these Impacts Through Targeted Monitoring Activities and Local
Ordinances”**

ID No. CP-83207101-1

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12-17-07

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Summary of the Results of the Investigation Regarding Gas Well Site Surface Water Impacts

In 2005, the Environmental Protection Agency awarded a grant to the City of Denton, Texas, to monitor and assess the impact of gas well drilling on stormwater runoff, and to provide, if necessary, regulatory and management strategies for these activities. This unique study focused on three nearby gas well sites where pad construction and drilling were occurring. Runoff, primarily from the sites' well pad areas, was monitored and analyzed, as were the contents of on-site drilling mud pits.

There is presently no regulatory oversight of oil and gas-related construction or operations under the National Pollutant Discharge Elimination System (NPDES) permit program, except in very limited circumstances. While NPDES stormwater regulations cover a large amount of the construction and industrial activity in the US, Congress mandated that oil and gas construction is specifically exempt from stormwater regulations in the Energy Policy Act of 2005 (the act encourages oil and gas operators to voluntarily implement best management practices to minimize erosion and control sediment). To help local governments decide whether drilling activities do, in fact, have impacts on their water resources, and how to minimize those impacts, the Agency awarded this research grant.

Findings

Gas well sites have the potential to produce sediment loads comparable to traditional construction sites.

- Total suspended solids (TSS) and turbidity event mean concentrations (EMC = pollutant mass / runoff volume) at gas sites were significantly greater than at reference sites (the median TSS EMC at gas sites was 136 times greater than reference sites).
- Compared to the median EMCs of storms sampled by Denton near one of their outfalls, the gas well site median EMC was 36 times greater.
- Gas site TSS EMCs ranged from 394 to 9898 mg/l and annual sediment loadings ranged from 21.4 to 40.0 tonnes/hectare/year (tonne = 1000 Kg; hectare = 10,000 square meters), and were comparable to previous studies of construction site sedimentation.

Other pollutants in gas well runoff were found in high concentrations.

- EMCs of total dissolved solids, conductivity, calcium, chlorides, hardness, alkalinity and pH were higher at gas well sites compared to reference sites, and differences were statistically significant for all parameters except conductivity.
- Generally, the presence of metals was higher at gas well sites compared to reference sites and EMCs were statistically significantly greater for Fe, Mn and Ni.
- Overall, the concentrations of metals tend to be higher at gas well sites compared to both nearby reference sites and as measured in runoff from local mixed-use watersheds (EMCs were statistically significantly greater for Fe, Mn and Ni).
- Total petroleum hydrocarbons (TPH) were not detected in any of the samples collected at gas well sites or reference sites.

Conclusions based on runoff sampling results.

- Gas well sites have the potential to negatively impact surface waters due to increased sedimentation rates and an increase in the presence of metals in stormwater runoff.
- Pad sites also have the potential to produce other contaminants associated with equipment and general site operations.
- Gas wells do not appear to result in high concentrations of petroleum hydrocarbons in runoff, but accidental spills and leaks are still a potential source of impact.

Runoff monitoring from gas well sites can be difficult.

- Requires complex equipment to do the volume-based sampling needed.
- Municipal inspections by trained individuals are important.
- In most cases, sediment impacts are visually apparent.

States or local governments should consider regulating sediment and associated pollutants in stormwater runoff.

- Recommended approach: develop regulations similar to current NDPES requirements for construction sites.
- Requirement options: stormwater pollution prevention plans, erosion and sediment control BMPs, provisions for containing spills and leaks, procedures for site inspections and enforcement of control measures, sanctions to ensure compliance.
- Require installation of berms around the down slope portion of gas well pad sites (regular compost can be used but newer, better technologies such as compost “socks” offer more stability, durability and ease of installation).

Models and other predictive tools can help with gas site management decisions.

- The Water Erosion Prediction Project (WEPP) and the Revised Universal Soil Loss Equation (RUSLE 2.0) can be used to model runoff and sediment yields from gas well sites, and to evaluate sediment impacts and control options
- Modeling indicated that using both erosion and sediment controls at sites tended to give the best combination of protection and cost, but the optimum combination is dependent on soil type and slope.
- Modeling showed that using BMPs reduced sediment from 52% to 93%.
- Generally, mulching and erosion control blankets produced the best results; however, in most cases, silt fences or filter strips were shown to be less expensive and still effective.
- The approach used can be applied to complex or simple slopes, can evaluate a wide variety of BMPs, and can be easily customized for specific site characteristics or geographical regions.

Regulating gas well drilling and production operations is needed, but can be complex.

- In addition to erosion and sediment control requirements, institute regulations for site locations and tree preservation.
- Requirements are needed for proper site management, equipment maintenance, and hazardous materials management and containment.
- Subchapter 22 of the Denton Development Code (www.cityofdenton.com) has information municipalities can use to establish gas well regulations.
- Regular monitoring of receiving waters using specific conductance (conductivity) can, under the right circumstances, offer a relatively inexpensive and rapid method for detecting contaminant discharges and tracing these discharges back to the well site source.

Regulating site activities (i.e., site management).

- Place drip pans or oil absorbing materials underneath all tanks, containers and other equipment with a potential to leak.
- Store chemical materials on pallets or other devices to raise containers off the ground, and shelter the materials from stormwater and wind.
- Depending on the type and quantity of materials, use secondary containment and other similar strategies.
- Institute a hazardous materials management plan, including adequate labeling and containment, and having material safety data sheets on hand.
- Remediate as quickly and safely as possible any accidental spills, leaks or discharges of materials.

Regulating well drilling locations.

- Typically, consists of site “setback” requirements from residential structures and places of assemblage (e.g., schools, churches).
- The proximity to surface water conveyances is an important consideration for minimizing water impacts, i.e., flat, heavily vegetated areas distant from surface waters are usually less of a concern than those areas close to waters that have highly erodible soils, steeper slopes and little vegetation.
- In floodplains or other environmentally sensitive areas, Denton requires a Watershed Protection Permit (WPP), which contains extra environmental regulations plus a fee to cover site assessments, additional regulatory oversight, and water quality testing.
- Denton’s WPP requirements highlights:
 - Must take a tree survey of the site and effect a 1:1 replacement for trees removed from the site.
 - Storage tanks and separation facilities allowed only if they are at least 18 in above the established base flood elevation, plus an extra depth for encroachment to the limits of the floodway

- Must show via an engineering study that the proposed activity will have no adverse impact on the carrying capacity of the adjacent waterway, and will not cause any increase in the elevations established for the floodplain.

Regulating tree preservation (Denton's program).

- All construction activities associated with gas wells, roads, pipelines, etc., must be considered.
- In non-WDD areas, must mitigate at a rate of 25% for all trees removed from the property in the form of payments to Denton's tree fund (not on-site planting).
- Removal of trees in WDD areas may cause a loss of critical habitat and harm waters, thus the 1:1 replanting requirement (or a very high payment into tree fund).

Well drilling mud pits merit attention and management.

- Mud pits exceeded the regulatory standard for total petroleum hydrocarbons (TPH) of 15 mg/L in approximately 46% of samples (there were also a few instances of very high concentrations, with a max of 25,590 mg/l).
- Based on the diesel and hydraulic equipment used at gas well sites, and the type of hydrocarbons found, contamination was likely due at least in part to such things as maintenance activities, fuel / hydraulic fluid leaks and spills, or similar sources.
- To a lesser extent, this also applies to fracture water pits.
- Municipalities may want to consider sampling and setting standards for pits, but mud pit contents are complex and appeared not amenable to analyses via rapid field-based methods or rapid laboratory methods.
- Although a regular monitoring program coupled with associated regulatory standards may be the best way to minimize the pollution potential for these pits, municipalities may not have the staff, resources or expertise to implement such a program.

Regulating mud pits.

- Enforceable standards for pit contents are not generally viable; instead, consider pit design standards that minimize the chances of releases.
- Restrict pits to areas with relatively flat slopes and design them to not capture much stormwater so the pits do not overflow.
- Use pit liners.
- Use freshwater-based muds only.
- Maintain a minimum freeboard distance between the elevation of the pit contents and the elevation of the top of the mud pit dam.
- Remove mud pits as soon as possible after drilling.
- Eliminate open mud pits altogether (e.g., use closed loop drilling).

Placement of drip pans or oil absorbing materials underneath all tanks, containers and other equipment with a potential to leak.

Safely store chemical materials on pallets or other devices to raise containers off the ground and, and sheltering them from stormwater and weather elements.

Depending on the type and quantity of materials, secondary containment and other similar strategies may be appropriate.

Institute a hazardous materials management plan including adequate labeling and containment, and have material safety data sheets available.

Remediate as quickly and safely as possible any accidental spills, leaks or discharges of materials.

Reference 21
(Excerpt)

EROSION AND SEDIMENT CONTROL PLAN

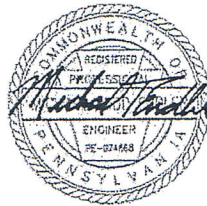
FOR THE PROPOSED DAVIDSON 1V WELL SITE SCOTT TOWNSHIP WAYNE COUNTY, PENNSYLVANIA

APRIL 2010

Submitted for:
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Houston, TX 77002

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I do hereby certify to the best of my knowledge, information and belief, that the Erosion and Sediment Control and Site Restoration Plan are true and correct, represent actual field conditions and are in accordance with 25 P.A. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of imprisonment.



Prepared By:

URS

335 COMMERCE DRIVE, SUITE 300
FORT WASHINGTON, PA 19034
Job # 19998479.00010

IMPORTANT
A COPY OF THIS EROSION AND SEDIMENT CONTROL PLAN NARRATIVE AND
COMPANION DRAWINGS MUST BE PRESENT ON SITE AT ALL TIMES DURING
CONSTRUCTION.

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ATTACHMENTS

Attachment A.	PNDI Search
Attachment B.	Design Calculations
Attachment C.	Soil Survey Report
Attachment D.	Form 5500-FM-OG0111
Attachment E.	Act 14 Notification Letters and Proof of Receipt
Attachment F.	Erosion and Sediment Control Plan Drawings



INTRODUCTION

The Erosion and Sediment Control (E&SC) Plan for well pad installation associated natural gas exploration (Project) includes this narrative, appended supporting information and drawings. The E&SC Plan described in this narrative was developed to comply with the requirements of Chapter 102, Title 25 of the Pennsylvania Administrative Code created under the Clean Streams Law. The Pennsylvania Department of Environmental Protection (PADEP) Erosion and Sediment Pollution Control Program Manual, dated April 2000, was used as a primary reference for the design and selection of erosion and sediment control Best Management Practices (BMPs).

1.0.0 Project Description

This project is located on an unused, forested area accessed from Harris Road in Scott Township, Wayne County, Pennsylvania. The proposed work includes grading and construction of approximately 2,600 feet (ft) of access road and a one (1) 300 ft x 300 ft gravel drilling pad. Once drilling has been completed, the gravel pad will be reduced in size to 200 ft x 200 ft. The resulting disturbed area will be stabilized with grass seed.

1.1.0 Stormwater Handling

1.1.1 Existing Site Drainage Characteristics

The site currently does not have a drainage system in place. The project is located on a gently sloping hillside. Stormwater from the existing project area generally drains in sheet-flow and/or concentrated overland flow conditions from north to south. Runoff from the site drains to an unnamed tributary to Sherman Creek which is classified as high quality – cold water fishes (HQ-CWF).

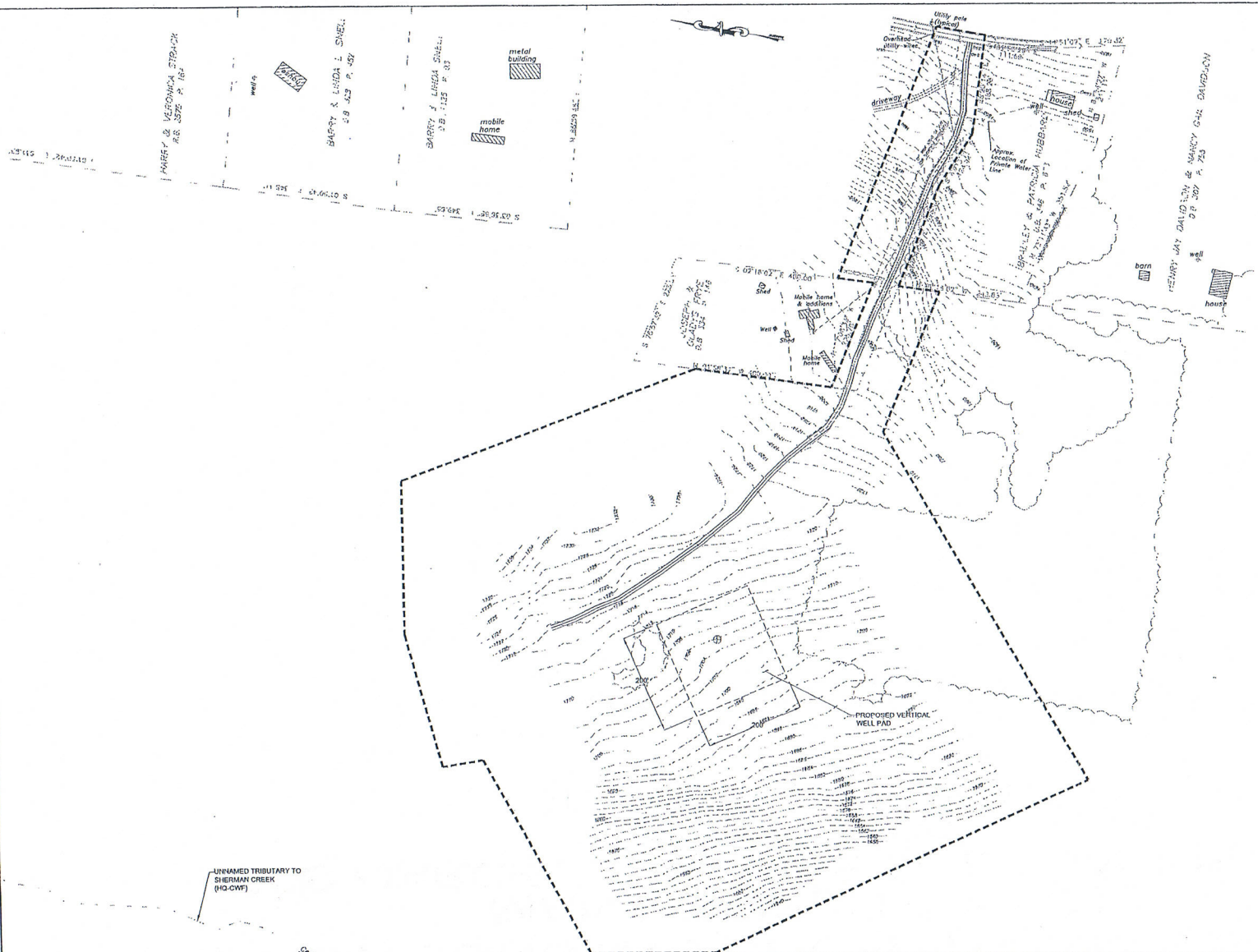
1.1.2 Proposed Site Drainage Characteristics

The proposed drainage will closely match that of the existing drainage characteristics. Due to the location of the well pad, stormwater runoff will generally flow from north to south following the same general pattern as under existing conditions. Diversion channels will be constructed at the base of the well pad cut slope which will divert up-gradient stormwater runoff around the pad to stabilized outlets (i.e., riprap aprons). Roadside ditches will be constructed on the upslope side of the access road. Cross drain culverts will be placed along the access road to convey stormwater under the roads to stabilized outlets (i.e., riprap aprons). Stormwater flowing across the well pad will drain to a sump located in a topographical low corner. The sump will be drained during rain events and discharged through a stabilized outlet (riprap apron) to areas with stable ground cover.

1.2.0 Project Schedule

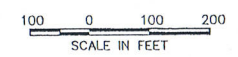
The project construction is anticipated to begin in May of 2010 and be concluded in February 2011.

Reference 22
(Excerpt)

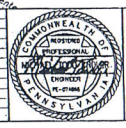


- LEGEND:**
- 1640— MAJOR CONTOUR (10' INTERVAL)
 - - - - MINOR CONTOUR (2' INTERVAL)
 - 243.2 EXISTING SPOT ELEVATION
 - LdC2 SOIL CLASSIFICATION
 - SOIL BOUNDARY
 - - - - PROPERTY LINE
 - ~ ~ ~ ~ EDGE OF TREES
 - - - - PROPERTY LINE
 - ⊕ VERTICAL GAS WELL
 - - - - PROJECT BOUNDARY
 - ⊖ EXISTING STONE WALL

- NOTES:**
1. EXISTING FEATURES, 2-FOOT CONTOURS, AND PROPERTY LINES SHOWN HEREON ARE FROM A FIELD SURVEY PERFORMED BY FACHER ASSOCIATES, INC., 148 HOLDGATE ROAD, HONESDALE, PA 18031, (570) 224-4300 DURING MARCH 2010.
 2. THIS TOPOGRAPHIC MAP DOES NOT REPRESENT A PROPERTY BOUNDARY SURVEY.
 3. HORIZONTAL DATUM IS TIED TO THE NORTH AMERICAN DATUM (NAD) OF 1983.
 4. VERTICAL DATUM IS TIED TO THE NATIONAL GEODEIC VERTICAL DATUM (NGVD) OF 1988.
 5. THE RECEIVING WATERCOURSE, LOCATED WEST OF THE PROJECT AREA, IS AN UNNAMED TRIBUTARY TO SHERMAN CREEK. THE CHAPTER 83 CLASSIFICATION IS HIGH QUALITY-COLDWATER FISHES (HIG-CWF).



NO.		BY	CHKD	DATE	REVISIONS	DESCRIPTION



NOTES:

1. SCALE NOTED APPLIES TO 22" x 34" SHEET SIZE. FOR SHEET SIZES OTHER THAN 22"x34", REFER TO GRAPHIC SCALE.
2. EXISTING CONTOURS SHOWN ARE BASED ON NGVD88 DATUM.
3. HORIZONTAL DATUM IS TIED TO THE NORTH AMERICAN DATUM (NAD) OF 1983.

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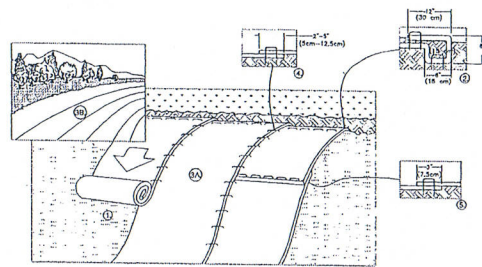
DESIGNED BY	DATE
BY	04/23/10
CHKD BY	04/23/10
APPROVED BY	04/23/10
CHECK APPROVED BY	04/23/10

HESS MARCELLUS SHALE WELL SITES
 DAVIDSON 1V
 SCOTT TOWNSHIP, WAYNE COUNTY, PENNSYLVANIA

POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN
 EXISTING CONDITIONS PLAN

PROJECT NO.	DATE	SCALE
19990479	04/23/10	1"=100'
04/23/10	04/23/10	0

PCSM-02



NOTES:

1. PLACE EROSION CONTROL MATING (NAG P-300 OR APPROVED EQUAL) ON SLOPES AT OR STEEPER THAN 3:1.
2. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
3. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30cm) PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE BLANKET.
4. ROLL THE BLANKETS (A) DOWN OR (B) HORIZONTALLY ACROSS THE SLOPE. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING OPTIONAL DOT SYSTEM, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
5. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2"-5" (5cm-12.5cm) OVERLAP DEPENDING ON BLANKET TYPE. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH ON THE PREVIOUSLY INSTALLED BLANKET.
6. CONSECUTIVE BLANKETS SPICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" (7.5cm) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" (30cm) APART ACROSS ENTIRE BLANKET WIDTH.

SUPPLEMENTAL NOTES:

- * IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15cm) MAY BE NECESSARY TO PROPERLY SECURE THE BLANKETS.
- ** STAPLE PATTERNS AND APPLICATIONS VARY BETWEEN MANUFACTURERS AND MATTING TYPES. THE CONTRACTOR IS ENCOURAGED TO CONSULT SPECIFIC MANUFACTURER INSTALLATION PROCEDURES FOR STAPLE SPACING AND CONSTRUCTION.

INSTALLATION OF EROSION CONTROL MATS FOR SLOPE STABILIZATION
N.T.S.

SEEDING PROCEDURES:

SEEDING PREPARATION WILL BE ACCOMPLISHED BY TRACKING THE AREAS TO BE SEEDDED WITH A SMALL BULLDOZER OR OTHER COMPARABLE DEVICE IN AN UP AND DOWN PATTERN TO CREATE TINY CONTOURS ALONG THE SLOPE. THESE TINY DEPRESSIONS HELP REDUCE EROSION AND PROVIDE A POCKET FOR PROPER GERMINATION OF THE SEEDS. THESE TINY DEPRESSIONS HELP "SITE STABILIZATION CHART" WILL BE REQUIRED TO PREPARE THE AREA TO BE SEEDDED.

MULCHING AS LISTED BELOW WILL BE PERFORMED IMMEDIATELY AFTER THE ADMINISTRATION OF THE LIME, FERTILIZER AND SEEDING MATERIALS.

THE MOST EFFECTIVE PERIODS FOR VEGETATION ESTABLISHMENT ARE EARLY SPRING TO EARLY SUMMER AND LATE SUMMER TO MID FALL. SEEDING AND MULCHING CAN BE PERFORMED DURING OTHER PERIODS AS WEATHER CONDITIONS PERMIT. MAJOR ACTIVITIES OF DEVELOPMENT SHALL BE PLANNED TO COINCIDE WITH THESE PRIME GROWING SEASONS.

IF OUT-OF-SEASON SEEDING IS NECESSARY, APPLY EITHER THE FULL-SPECIFIED QUANTITIES FOR SUPPLEMENTS, SEED AND MULCH OR APPLY FULL SUPPLEMENTS AND 50% OF THE SEED APPLICATION RATE TO BE FOLLOWED BY THE REMAINING 50% WITHIN THE NEXT SEEDING DATES. FULL MULCH RATE APPLICATIONS WILL BE REQUIRED FOR EACH SEEDING APPLICATION TO PREVENT SOIL EROSION UNTIL SEED GERMINATES.

TEMPORARY STABILIZATION:

ANNUAL RYE OR OATS SHALL BE USED AT A RATE OF 40 LBS. PER ACRE. STRAW AT A RATE OF 3 TONS PER ACRE SHALL BE USED AS MULCH. STRAW SHALL BE APPLIED IN LONG STRANDS, NOT CHOPPED OR FINELY BROKEN.

IN WETLAND AREAS, ANNUAL RYE SHALL BE USED AT A RATE OF 48 LBS. PER ACRE, CLEAN STRAW WITHOUT BINDERS AT A RATE OF 3 TONS PER ACRE SHALL BE USED.

SEEDING PROCEDURES:

BRUSH SEED MIXTURE			
BOTANICAL NAME	COMMON NAME	PERCENTAGE OF MIXTURE	APPLICATION RATE
LOLIUM MULTIFLORUM	ANNUAL RYEGRASS	35	20 LBS / ACRE
PHLEUM PRATENSE	TIMOTHY	25	
ANDROPOGON GERARDII	BIG BLUESTEM	10	
ELYMUS VIRGINICUS	VIRGINIA WILD RYE	10	
LESPEDEZA BICOLOR	BICOLOR LESPEDEZA	5	
HELIANTHUS ANNUUS	COMMON SUNFLOWER	5	
LATHYRUS SYLVESTRIS	LATHCO FLAT PEA	5	
VIBURNUM DENTATUM	ARROW WOOD	3	
SAMBUCUS CANADENSIS	ELDERBERRY	2	

* SEEDING DATES: APRIL 1-JUNE 15 & AUGUST 16-SEPTEMBER 15

SOIL SUPPLEMENT RATES:

SUPPLEMENTS	RATES
PULVERIZED AGRICULTURAL LIMESTONE	435 KG PER 1000 M ³ (800 LBS PER 1,000 SY)
10-20-20 ANALYSIS COMMERCIAL FERTILIZER	80 KG PER 1000 M ³ (140 LBS PER 1,000 SY)
38-0-0 UREAFORM FERTILIZER	30 KG PER 1000 M ³ (50 LBS PER 1,000 SY)
32-0-0 TO 38-0-0 SULFUR COATED UREA FERTILIZER	35 KG TO 30 KG PER 1000 M ³ (50 TO 50 LBS PER 1,000 SY)
31-0-0 IBDU FERTILIZER	35 KG PER 1000 M ³ (61 LBS PER 1,000 SY)

MULCHING:

SUPPLEMENTS	RATES
CLEAN STRAW	3 TONS PER ACRE

NOTES:

WITHIN SEVEN DAYS OF AN EARTH DISTURBANCE ACTIVITY OR ANY STAGE OR PHASE OF AN ACTIVITY, THE SITE SHALL BE SEEDDED, MULCHED, OR OTHERWISE PROTECTED FROM ACCELERATED EROSION AND SEDIMENTATION. (SECTION 102.22 (A)).

CLEAN STRAW MULCHING MAY BE USED AT A RATE OF 3 TONS PER ACRE AS TEMPORARY STABILIZATION DURING TIMES OF NON-GERMINATING.

EROSION CONTROL MATTING MUST BE USED ON ANY SLOPE STEEPER THAN 3:1. PLEASE SEE DETAIL ON SHEET ES-007.

THE SITE RESTORATION WILL BE IMPLEMENTED AND COMPLETED WITHIN 9 MONTHS AFTER THE LAST DRILLING AND FRACING ACTIVITIES.

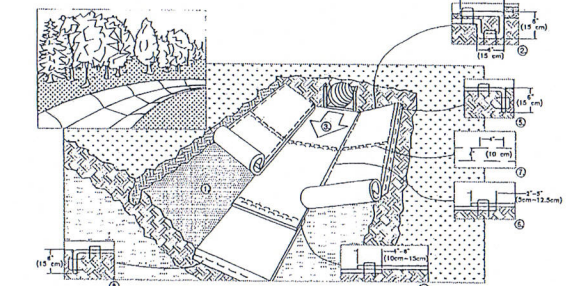
EROSION CONTROL MATTING FOR STEEP SLOPES:

STEEP SLOPES THAT ARE DISTURBED FOR CONSTRUCTION SUCH AS ROADWAY CUT OR EMBANKMENT SLOPES 3 HORIZONTAL TO 1 VERTICAL OR STEEPER SHALL BE PROTECTED AGAINST EROSION WITH EROSION CONTROL MATTING (NAG P-300 OR APPROVED EQUAL) OR MATS SUITABLE FOR THE ESTABLISHMENT OF VEGETATION. THE EROSION CONTROL MATTING SHOULD BE INSTALLED IMMEDIATELY AFTER THE SOIL AMENDMENTS AND THE SEED ARE APPLIED. EROSION CONTROL MATTING SHOULD ALSO BE INSTALLED ON OTHER STEEP SLOPES WHERE EROSION WILL BE A PROBLEM UNTIL VEGETATION IS ESTABLISHED. THE INSTALLATION PROCEDURE SHOULD COMPLY WITH THE RECOMMENDATIONS OF THE MANUFACTURER, INCLUDING SLOPE PREPARATION, ORIENTATION, TRENCHING, OVERLAP AND SPACING OF STAPLES.

STABILIZATION DURING NON-GROWING SEASONS:

ALL CONSTRUCTION SHOULD BE PLANNED FOR COMPLETION WITHIN THE RECOMMENDED DATES FOR THE APPLICATION OF PERMANENT SEEDING AND ESTABLISHMENT OF A PERMANENT VEGETATIVE COVER, HOWEVER, WHEN CONSTRUCTION MUST BE DONE AND IS COMPLETED DURING A NON-GROWING SEASON (WINTER, ETC.), INTERIM STABILIZATION BMP'S MUST BE IMPLEMENTED AND ACCURATELY MAINTAINED. THE APPLICATION OF STRAW MULCH AT THE RATE OF THREE TONS PER ACRE IS RECOMMENDED. THE BMP'S SHOULD BE CHECKED WEEKLY (UNLESS SNOW COVERED) TO IDENTIFY AREAS THAT BECOME BARE. THESE BARE AREAS SHOULD BE COVERED WITH A PROPERLY INSTALLED EROSION CONTROL MATTING.

ALL TEMPORARY EROSION AND SEDIMENT POLLUTION CONTROLS MUST BE MAINTAINED UNTIL PERENNIAL VEGETATION IS ESTABLISHED.



NOTES:

1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL-0-SEED DO NOT SEED PREPARED AREA. CELL-0-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE CHANNEL BY ANCHORING THE BLANKET IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30cm) PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE BLANKET.
3. ROLL CENTER BLANKET IN DIRECTION OF WATER FLOW IN BOTTOM OF CHANNEL. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE MANUFACTURER'S STAPLE PATTERN GUIDE. WHEN USING OPTIONAL DOT SYSTEM, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. PLACE CONSECUTIVE BLANKETS END OVER END (SHINGLE STYLE) WITH A 4"-6" (10cm-15cm) OVERLAP. USE A DOUBLE ROW OF STAPLES STAGGERED 4" (10cm) APART AND 4" (10cm) ON CENTER TO SECURE BLANKETS.
5. FULL LENGTH EDGE OF BLANKETS AT TOP OF SIDE SLOPES MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
6. ADJACENT BLANKETS MUST BE OVERLAPPED APPROXIMATELY 2"-5" (5cm-12.5cm) (DEPENDENT ON BLANKET TYPE) AND STAPLED, TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH ON THE BLANKET BEING OVERLAPPED.
7. IN HIGH FLOW CHANNEL APPLICATIONS, A STAPLE CHECK SLOT IS RECOMMENDED AT 30 TO 40 FOOT (9m-12m) INTERVALS. USE A DOUBLE ROW OF STAPLES STAGGERED 4" (10cm) APART AND 4" (10cm) ON CENTER OVER ENTIRE WIDTH OF THE CHANNEL.
8. THE TERMINAL END OF THE BLANKETS MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.

SUPPLEMENTAL NOTES:

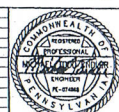
- * HORIZONTAL STAPLE SPACING SHOULD BE ALTERED IF NECESSARY TO ALLOW STAPLES TO SECURE THE CRITICAL POINTS ALONG THE CHANNEL SURFACE.
- ** IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15 cm) MAY BE NECESSARY TO PROPERLY ANCHOR THE BLANKETS.
- *** STAPLE PATTERNS AND APPLICATIONS VARY BETWEEN MANUFACTURERS AND MATTING TYPES. THE CONTRACTOR IS ENCOURAGED TO CONSULT SPECIFIC MANUFACTURER INSTALLATION PROCEDURES FOR STAPLE SPACING AND CONSTRUCTION.

CRITICAL POINTS

- A. OVERLAPS AND SEAMS
- B. PROJECTED WATER LINE
- C. CHANNEL BOTTOM/SIDE SLOPE VERTICES

INSTALLATION OF EROSION CONTROL MATS IN CHANNELS
N.T.S.

REVISIONS				
NO.	BY	DATE	DESCRIPTION	REVISIONS



NOTES:

1. SCALE NOTED APPLIES TO 22"x34" SHEET SIZE. FOR SHEET SIZES OTHER THAN 22"x34", REFER TO GRAPHIC SCALE.
2. EXISTING CONTOURS SHOWN ARE BASED ON NOV088 DATUM.
3. HORIZONTAL DATUM IS TIED TO THE NORTH AMERICAN DATUM (NAD) OF 1983.

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CHECKED BY:	1/98	1/98/001
APPROVED BY:	1/98	1/98/001
SCALE APPROVED BY:	1/98	1/98/001

HESS MARCELLUS SHALE WELL SITES
DAVIDSON 1V
SCOTT TOWNSHIP, WAYNE COUNTY, PENNSYLVANIA

POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN
DETAILS (SHEET 2 OF 2)

NO.	DATE	DESCRIPTION
19980479	04/22/10	NTS
042210	04/22/10	NTS

PCSM-05