

**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
Damascus Citizens for Sustainability**

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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 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

Figure 1. Brush Seed Mixture that is primarily grasses

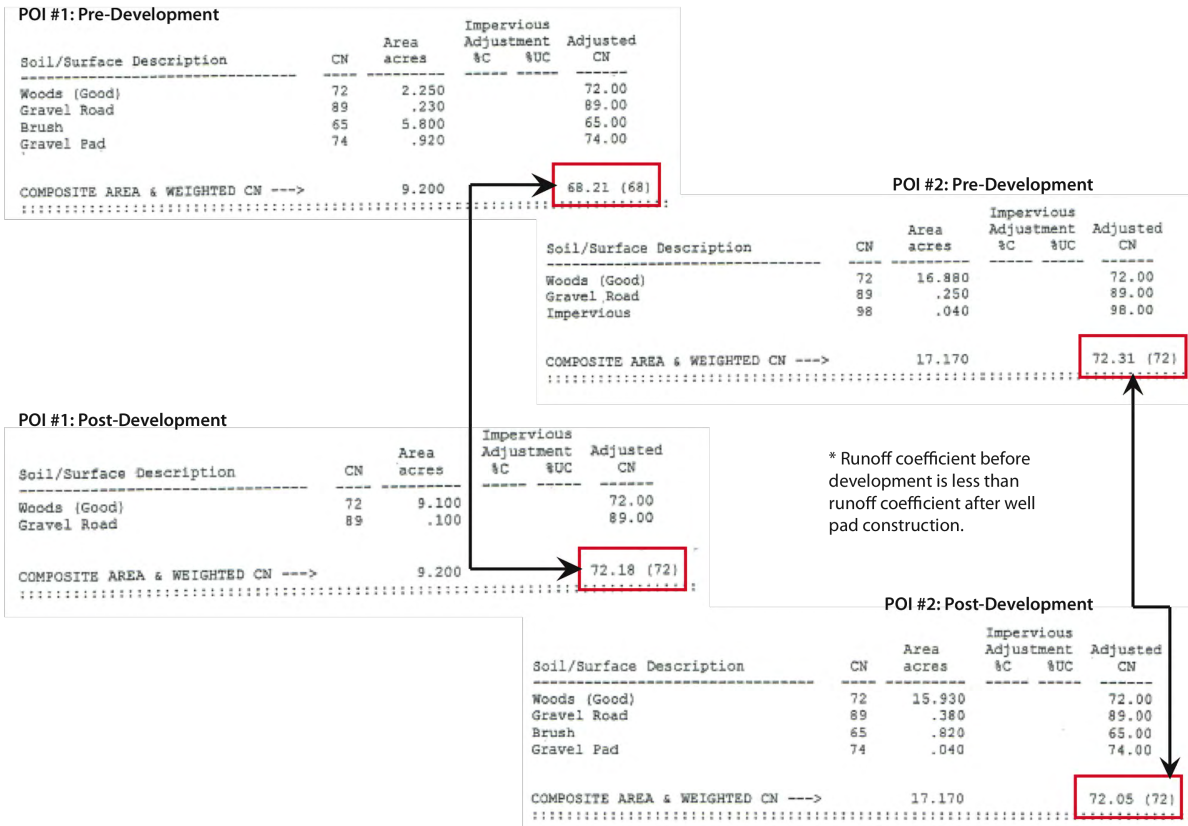


Figure 2: Runoff Curve Number for pre and post-development conditions exhibiting increased runoff after construction

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.

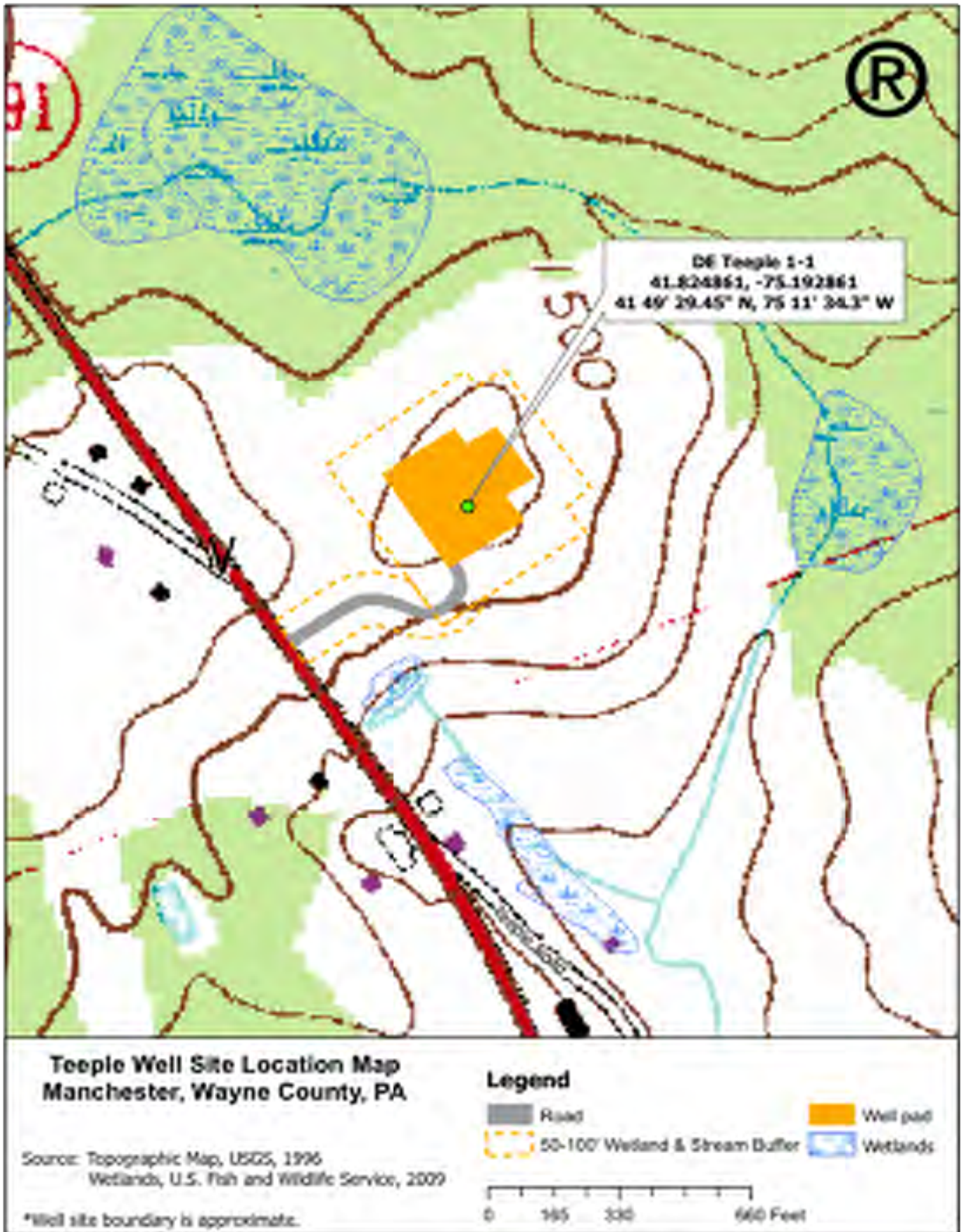


Figure 3. D.L. Teeple 1 1 well, located in Manchester Township, Wayne

County



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