DELAWARE RIVERKEEPER NETWORK

February 11, 2016

Ms. Kimberly Bose
Federal Energy Regulatory Commission
Office of the Secretary
888 1st Street, NE
Washington, DC 20428

Re: Docket No. *CP15-558*: Comments Regarding No Need for PennEast Pipeline Project

Dear Ms. Bose,

Attached please find an expert analysis regarding the PennEast Pipeline Project submitted by the Delaware Riverkeeper Network.

Sincerely,

Maya K. van Rossum

Maya K. van Rossum
the Delaware Riverkeeper

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The Short and Long-Term Consequences of the Construction of the PennEast Pipeline– A White Paper

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A White Paper
The Short and Long-Term Consequences of The Construction of the PennEast Pipeline

1. The PennEast Pipeline Project

The PennEast Pipeline is a joint venture effort of AGL Resources, NJR Pipeline Co, South Jersey Industries, PSEG Power LLC, Spectra Energy Partners and UGI Energy. The pipeline's purpose is to transfer natural gas extracted via "fracking" processes from the shale fields of Luzerne County PA to the Transcontinental Gas Pipe Line Co.'s Trenton-Woodbury Lateral located in Mercer County, N.J. (Figure 1). From its point of origin in Luzerne County it would run through the Lehigh Valley of Pennsylvania in an approximately southeasterly direction cutting through Northampton, Carbon and a portion of northern Bucks Counties. Some of the municipalities in Pennsylvania that the pipeline affects or runs close to include Moore, Bath, Upper and Lower Nazareth, Lower Saucon, Riegelsville, Williams and Durham Townships. The pipeline will cross under the Susquehanna River and Lehigh River and cross under the Delaware River near Durham Township, PA. The line then crosses into New Jersey near Holland Township, in northern Hunterdon County. From there it will continue in an approximately southeasterly direction, running through or close to the following municipalities Milford, Alexandria, Kingwood, West Amwell, East Amwell, Lambertville, Hopewell, Kingston, Pennington and Princeton. In Mercer County the pipeline terminates at the Transco Trenton-Woodbury interconnection.

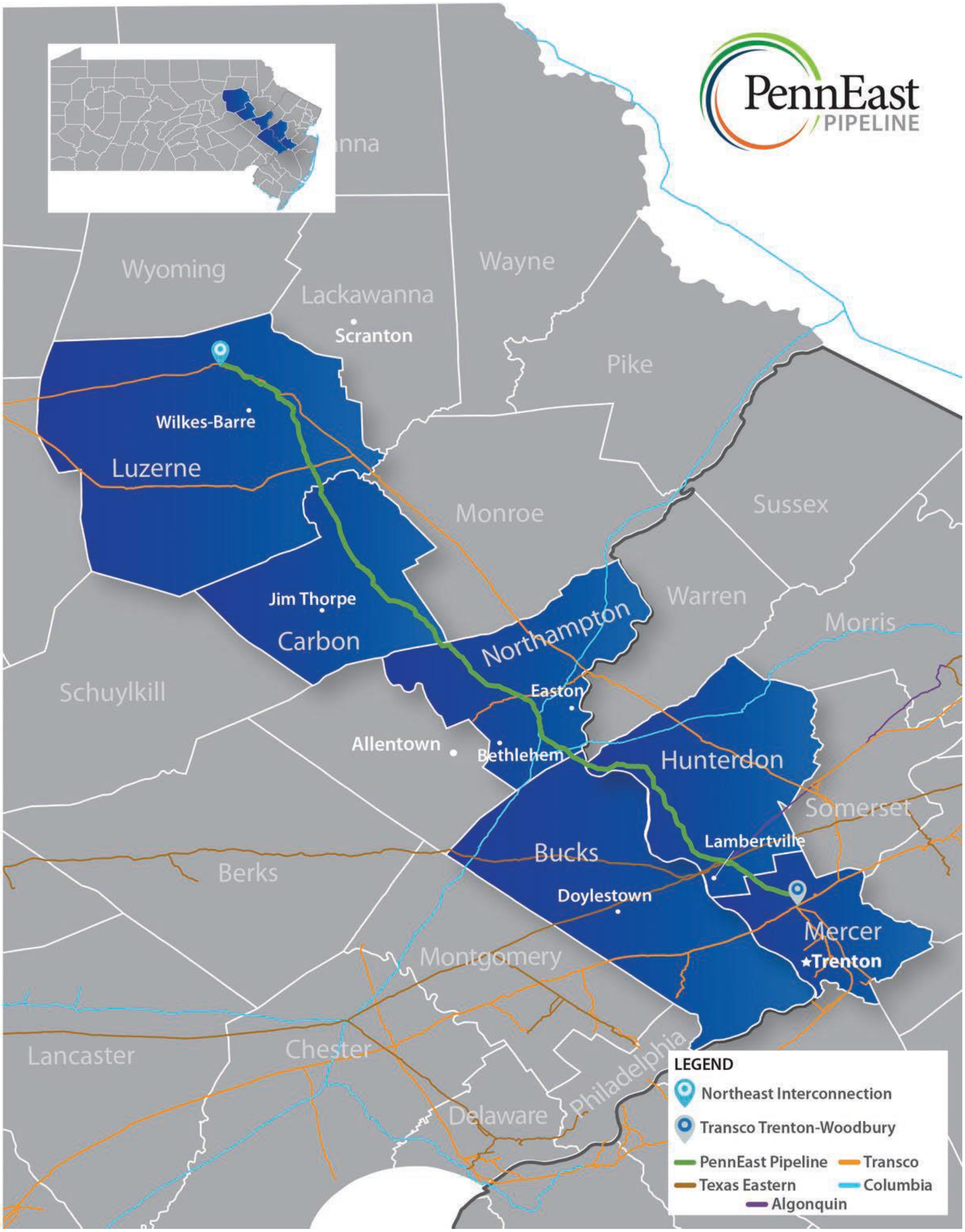
Overall, the pipeline cuts a path approximately 108 miles long and directly impacts over 1200 + acres of land. Approximately 85% of the affected lands are located within the watershed boundaries of the Delaware River ecosystem. As will be noted repeatedly herein, as well as crossing under the Delaware, Lehigh and Susquehanna Rivers, the pipeline crosses under approximately 80 streams, the vast majority of which are protected under PADEP's Exceptional Value and High Quality regulations, the NJDEP's Category-1, anti-degradation regulations, and the Delaware River Basin Commission's Special Protection Waters anti-degradation regulations. The affected streams are identified in Section 2 of this white paper.

It should be noted that the "pipeline" includes the various appurtenant facilities required for the transport of the gas. These include access/maintenance roads, compressor units, metering stations, regulator stations, delivery stations, holders, valves, and the other infrastructure elements critical to the pipeline's operations. These components of the pipeline are all above ground and are neither benign nor passive operational elements of the system.

While the pipeline itself is 36" in diameter, there will be a 50 foot wide <u>permanent</u> right-of-way (ROW). However, during the pipeline's construction the actual work corridor will vary between 90 feet to 125 feet in width. The temporary and permanent ROWs greatly increase the overall footprint of the pipeline project and the total amount of environmental damage that will be accrued. Once the ROW is cleared it will be kept in a cleared state after the completion of the project in order to facilitate the required periodic inspections and required maintenance of the pipeline. Along other pipeline routes it has been shown that restoration measures undertaken in constructions zones do not result in near-term ecological restoration and in some cases are themselves a source of enduring impact as the result of high levels of soil compaction. Thus the effects of the project will extend far beyond the actual point in time that the pipeline is installed and construction activities completed.

The balance of this white paper discusses how the PennEast Pipeline will irreversibly disturb and alter the ecological properties of natural waterways including high quality waters, a variety of habitats, preserved farmland and preserved, public open-space.

Figure 1 Proposed Pathway of PennEast Pipeline



2. Environmental Consequences of the PennEast Pipeline

2.1 Environmental Impact Analysis

The National Environmental Policy Act (NEPA) of 1969 defines the procedural requirements used by all federal government agencies to comprehensively evaluate the environmental impacts and risks of a project. The findings of the evaluation are then presented in an Environmental Assessment (EA) and/or an Environmental Impact Statement (EIS). The NEPA process is designed to ensure that all the project's positive and negative environmental factors are equally weighted and appropriately appraised as part of the official decision-making process. The evaluation process must include an assessment of alternatives to the preferred project approach, including a No Action alternative. The evaluation process also involves the solicitation and utilization of public comment and input.

The Natural Gas Act of 1938 (NGA) governs all aspects of interstate transportation and sale of natural gas, and gives the Federal Energy Regulatory Commission (FERC) authority over all such pipeline projects. FERC is an independent federal agency that regulates the interstate transmission of electricity, natural gas, and oil. FERC is charged by Congress "with evaluating whether interstate natural gas pipeline projects proposed by private companies should be approved". The Energy Policy Act of 2005 gave FERC additional responsibilities as outlined in an updated Strategic Plan. As part of that responsibility, FERC approves the siting and abandonment of interstate natural gas pipelines and storage facilities. This must involve the analysis of the project's environmental impacts, with that analysis conducted in a manner consistent with NEPA requirements.

The Clean Water Act and the State issued Water Quality Certificate serve as the links triggering the need for a thorough environmental review and documentation that State environmental requirements are being met. Both the New Jersey and Pennsylvania wetland and surface water regulations are linked to Sections 401 and 404 of the Clean Water Act.

2.2 Overview of Environmental Concerns Associated the PennEast Pipeline Project

The PennEast Pipeline will convey gases extracted from the Marcellus Shale fields located in Luzerne County, PA. Defined as an unconventional gas, the Marcellus Shale gas differs from conventional gas resources in a number of ways including the means by which the gas is collected and transported from its point of origin to its point of distribution.

As noted above there is more to the PennEast pipeline than the pipeline itself. As per the Pipeline Safety Coalition (www.pscoalition.org), the infrastructure associated with any Marcellus Shale pipeline, including the PennEast pipeline, consists of the following:

- Well Head and Well Pad (where the gas is extracted)
- Water Lines (Fresh Water and Flowback; associated with the fracking process)
- Production Lines

- Gathering Lines
- Gas Processing Plants
- Gas Transmission Pipelines
- Compressor Station
- Valves Smart Pig and Smart Pig Launchers (elements associated with various on-going maintenance, inspection and cleaning operations of the pipeline)
- Citygate (the point where the local pipeline connects to an interstate or distribution pipeline)
- Distribution Lines

The siting of the pipeline occurs under the oversight of the Federal Energy Regulatory Commission (FERC). However, FERC does not issue any of the environmental permits needed for the construction of the pipeline, and where required (as is the case with the PennEast pipeline) any State Water Quality Certificates. In this case, the environmental review of the pipeline's construction and the eventual issuance of the majority of the required permits (including all Water Quality Certificates) is the responsibility of the Pennsylvania Department of Environmental Protection (PADEP) and the New Jersey Department of Environmental Protection (NJDEP), with additional permitting required from the US Army Corps of Engineers and a Docket issued by the Delaware River Basin Commission. As will be discussed in further detail in Section 3 of this white paper, it is the collective responsibility of PADEP and NJDEP, and these other regulatory bodies, to <u>rigorously</u> evaluate and assess both the short-term environmental impacts associated with the construction of the pipeline as well as the long-term environmental impacts resulting from its construction, operation and maintenance.

PennEast asserts in its project Fact Sheet:

> *"Our team of engineers and consultants planned this route by balancing the most direct route for the pipeline with numerous environmental, structural, conservation and land use factors. The route is designed to minimize any impacts to the environment and communities along the way."*[1]

However, along its path in both Pennsylvania and New Jersey, the proposed PennEast Pipeline will cross through environmentally important and critical lands. These include Pennsylvania State Game Lands (#40 and #128), Hickory Run State Park, Boulder Field Natural Area (a National Natural Landmark), Mud Swamp Natural Area, Weiser State Forest, Beltsville State Park, the Kittatinny Ridge, the Appalachian Trail Corridor, the Sourland Mountain Preserve, other State and County parklands, preserved farmland, and areas of cultural significance. Along the route the pipeline traverses steeply sloped areas characterized by erosion prone soils. Many of the affected areas provide critical habitat to a number of threatened and endangered species and species of concern including Bald Eagle, Harrier Hawk, Bobolink and other grassland bird species, Wood Turtle, Bog Turtle, Indiana Bat, Northern Long-Ear Bat, Brook Snaketail Dragonfly and Dwarf Wedge Mussel.

[1] http://penneastpipeline.com/wp-content/uploads/2015/01/PennEast_Overview_11-7-14.pdf

The pipeline will also cross under the Susquehanna River, the Lehigh River, and the Wild and the Scenic Delaware River. Although these larger pipeline crossings will be accomplished using directional boring techniques, the crossing of more than 80 smaller streams and tributaries will be accomplished using basic excavation and back-fill techniques. Many of these smaller waterways are ranked within Pennsylvania as Exceptional Value (EV) and High Quality (HQ) and in New Jersey as Category 1 (C-1). Among the affected streams are Mud Run, Wild Creek, Pohopoco Creek, Aquashicola Creek, Spring Mills Brook, Harihokake Creek, Hakihokake Creek, Nishisakawick Creek, Little Nishisakawick Creek, Locatong Creek, Wickecheoke Creek, and Alexauken Creek. These waters are documented trout production and trout maintenance streams. This includes streams pristine enough to support viable populations of native brook trout. Clearing of the forest canopy and vegetation growing adjacent to these streams alters their thermal properties and nutrient and sediment loading dynamics thereby threatening their ability to sustain a trout fishery. These changes to the adjacent stream corridors can also affect the food chain dynamics of the system by altering the composition of the benthic and aquatic insect communities and increasing the propensity for algae blooms.

The pipeline also runs through wetlands, floodplains and riparian areas that are part of the functional ecosystems of the EV, HQ and C-1 waterways. Each of these is a high quality ecosystem and each is an intrinsic element that adds to the ecological functionality and complexity of each waterway. As per the NJDEP Landscape database, the lands through which the pipeline traverses once in New Jersey includes lands mapped as providing habitat for Species of Concern (Rank 2), State Threatened (Rank 3) and State Endangered (Rank 4) species. Filling and/or draining these lands will change not only their hydrologic properties but could negatively affect the hydrology of the adjacent stream ecosystems. Additionally, changes to the plant communities of the traversed wetlands, floodplains and riparian areas can cause trickle down effects on the food chain dynamics of the streams with which they are associated.

One of the immediate "disconnects" related to work conducted in the above noted EV, HQ and C-1 waters is that PennEast uses the FERC definition rather than the State definition of waterways when discussing stream and river crossings. Referencing the PennEast authored fact sheet on stream crossings[2], streams are divided into three categories:

- Minor (streams ≤10' wide at the water's edge at the time of construction),
- Intermediate (perennial stream crossings >10' wide but <100' wide at the water's edge at the time of construction), and
- Major (crossings >100' wide at the water's edge at the time of construction).

The pipe installation technique implemented at each stream crossing will largely be determined by the stream crossing's designation; minor, intermediate or major. Simple, open ditch techniques will be employed for the "minor" crossings while directional boring will be reserved for the "major" crossings. Obviously, the smaller streams, which include headwater, ephemeral

[2] http://penneastpipeline.com/wp-content/uploads/2015/01/PennEast_Crossing_Rivers.pdf

and intermittent waterways, will receive the lowest level of construction sensitivity even though these are the waterways of greatest environmental sensitivity and importance.

Although the focus of this paper is on the environmental impacts attributable to the pipeline, it is important to note that the PennEast Pipeline also traverses through populated areas creating along those sections of the pathway a risk to the health, safety and welfare of the affected populous. For example, over its length the pipeline disturbs wellhead areas that function in the critical recharge of potable water supplies. Each of these transgressions represents a potential impact to a unique public drinking water supply. Pipelines and associated compressor stations are also a source of air pollution contributing to climate change and air quality degradation.

Thus, even when assessed on a superficial scale it is evident that the proposed PennEast Pipeline project brings with it a number of significant and unavoidable environmental impacts. This project will irreversibly and negatively affect the ecological and environmental status of the Delaware River and its tributaries, and decrease the ecological services and functions of the upland, riparian and wetland areas through which the pipeline transects.

2.3 Types of Environmental Impacts

The types of environmental impacts assessed as part of major FERC reviewed projects typically fall into one of four categories:

- Temporary,
- Short Term,
- Long Term, or
- Permanent.

Temporary or acute impacts are typically those manifested during the construction phase of the project and are associated with the major changes to a site including the removal of vegetative cover, site grading and site preparation. FERC labels impacts of short-term consequence as those which may take as much as three (3) years for the affected resources to recover. The focus of many of the mitigative measures proposed for a project usually pertains to lessening a project's short-term impacts. The success of a mitigative measure is normally gauged by the ability of the affected site to return to pre-construction conditions. Conversely long-term impacts are those that will take a considerably longer amount of time for the affected site and the site's resource to recover and/or return to pre-construction conditions. The Bureau of Land Management recognizes that for projects involving the extensive modification of native grasslands and forested lands, it may take 5-10 years for recovery for long-term impacts to even commence. Thus the negative effects of a project's long-term impacts may be realized over an exceptionally long period of time. A permanent impact (which more often may be referred to as an unavoidable impact) are those causing an alteration of the site and/or the site's resources of a nature from which, regardless of the mitigative measures employed, the site never returns or recovers to pre-construction conditions. Even so, FERC may only recognize a permanent impact as being significant if it leads to a "substantial adverse change" in the environmental and ecosystem attributes of the affected site or the site's resources.

FERC reviewed projects must follow the EIS guidelines and requirements established through NEPA. Although the content may vary from project to project, the following are among the various specified elements of a complete and valid NEPA EIS:

- Purpose and Need
- Alternatives Analysis (Proposed Action, No Action, Alternatives and Environmentally Preferred Alternatives)
- Affected Environments
- Impacts (Direct, Indirect, and Cumulative impacts), and
- Proposed Impact Mitigation.

Within this white paper, the environmental impacts that will be created by the PennEast Pipeline are divided into three distinct but inter-related categories: acute, long-term and cumulative.

The acute impacts are largely a function of construction related activities. The acute impacts will result directly from the clearing of forests, crossing/filling of streams, draining/altering of wetlands and riparian areas, and other pronounced changes to the waterways and landscape of the Delaware River basin. These impacts are represented by PennEast as unavoidable, necessary aspects of the basic installation of the pipeline, the creation of the pipeline ROW and the construction of the supporting pipeline infrastructure.

The long-term impacts can be even more threatening than the acute impacts as they affect the ecological services and functions of the various ecosystems of the Delaware River watershed that will be compromised during and following the construction of the pipeline and its ROW. Some of these impacts are triggered by the acute short-term impacts of the project and some are associated with the pipelines long-term operation and maintenance. These long-term impacts are linked to the fragmentation of habitat, reduction in water quality, alteration of land cover, changes in the watershed's hydrologic and hydraulic properties, increased water temperatures, introduction of invasive species, creation of "edge habitat", lost or altered spawning and breeding habitat and changes in the amount and quality of stormwater runoff discharged to the Delaware River and its tributaries. Regardless of any proposed mitigative measures implemented to lessen the acute impacts of the project, owing to the nature of the impacts and the sensitivity of the affected environments, once the pipeline is constructed the resulting long-term impacts to the overall ecological properties of the affected lands and water resources are irreversible and cannot be mitigated.

The cumulative impacts add another layer of ecosystem damage. The cumulative impacts arise due to the accumulation and synergistic affects of harms across the length of the proposed project, as well as the accumulative and synergistic impact of the proposed pipeline with other past and future pipeline and power transmission projects occurring in the same general region and affecting the same environments as the PennEast Pipeline. Each of the projects has caused, or will cause, similar alterations and impacts to the upland, water, riparian and wetland resources of the Delaware River and its tributaries that have a compounding affect which magnifies the damage inflicted by any one individually. Examples of projects that will contribute to the cumulative effects of the PennEast pipeline are the Leidy Southeast Expansion Project, the proposed Texas Eastern TEAM 2014 Project, the Susquehanna-Roseland project, Columbia's East Side Expansion Project and the proposed Diamond East Pipeline project. The individual impacts associated with each linear development project essentially exacerbate the project specific impacts associated with the proposed PennEast Pipeline project.

2.4 The Importance of Rigorous Impact Analysis

As noted in Section 2.1 an environmental impact analysis is a required element of any project of this scope, as mandated by both FERC and NEPA. It is unfortunate that, in our professional experience, often Environmental Impact Assessments or Environmental Impact Statements associated with pipeline project do not touch on all of the subtleties of a proposed project or its cumulative impacts. Some of the less obvious, yet important, impacts may never be discussed, are dismissed as "de minimis", or are defended as acceptable/justifiable and capable of being compensated through the implementation of some type of mitigative or restoration measure. Such an approach is not acceptable either when a project occurs in previously compromised environments where restoration measures are already needed, in environments of lower environmental sensitivity where the cascading affects may be more easily ignored, or when the project affects high quality, sensitive environments as is the case with the PennEast project even seemingly small affects can have high consequences in the near term and the long term.

The PennEast Pipeline project innately brings with it acute, long-term and cumulative environmental impacts that affect the Delaware River, its tributaries, and the associated upland, riparian and wetland habitats through which the pipeline transects. Due to the environmental sensitivity of the majority of the areas through which the pipeline will pass, even with the best designed mitigative measures in place this project will cause irrevocable and unrepairable damages to the environment.

3. Acute Impacts of Pipeline Construction

Acute impacts are defined as those that are experienced immediately as a result of a given action. Acute impacts may trigger either significant or minor effects, and although sometimes defined as temporary or short-term, acute impacts often set the stage for longer-term, chronic impacts. The project's acute impacts will occur largely during the construction phase of the project and will be connected to highly evident changes to the landscape. The most prominent and obvious acute impacts are linked directly with the actual installation of the pipeline but also include the preparation of the project right-of-way (ROW) and the construction of access roads, equipment and materials staging areas and other appurtenant structures (e.g. compressor stations). These include:

- Land clearing and the removal of vegetation

- Soil disturbance
- Steep slope disturbance
- Bedrock disturbance
- Stream crossings
- Crossing and filling of wetlands, riparian corridors and floodplains, and
- Alteration of the hydrologic regime of streams.

3.1 Land Clearing, Vegetation and Tree Removal

For pipeline projects, the majority of the acute impacts occur during the pre-construction and construction phases. In upland areas, the terrain is cleared of existing vegetation to create access roads, staging areas and the pipeline corridor construction right-of-way. Similar types of vegetation clearing will occur within the wetland and riparian areas transected by the pipeline. In the case of PennEast the clearing of vegetation affects many hundreds of acres of core forest, wetlands and riparian areas (depending on the route they ultimately select) that exist along the 100+ mile pathway. The survey corridor for the pipeline may be as wide as 400'. It is unclear how much clearing will occur within the survey corridor. However, in order to install the pipeline PennEast will physically clear and prepare a 90-120' wide construction corridor. All major vegetation (mature trees, saplings, shrubs, etc.) occurring within the construction corridor will be removed and the land graded. In some cases it will be necessary to construct access roads to reach the pipeline corridor. Also at designated locations along the pipeline it will be necessary to construct the permanent pads needed to support the various pipeline appurtenances (e.g., gas processing plants, compressor stations, various valving stations, test stations, meter stations, etc.).

When the clearing occurs within wetlands and adjacent riparian and floodplain areas, it will be necessary to bring onto the project site construction mats. The mats enable heavy equipment to access and operate in wetland, riparian and shallow impounded areas characterized by saturated soils and/or subgrade conditions lacking enough physical stability and support. Conventional matting is essentially comprised of large (12" x 12") timbers linked together by means of heavy cables. Mats consisting of lighter composite materials may also be used. In either case the mats need to be transported to the site, positioned, removed and relocated thus increasing the likelihood for added disturbance and overall disruption of a site.

Whether the work occurs in wetland, upland or riparian areas, as vegetation is cleared it must be removed. This requires additional machinery such as chippers and grinders, excavators and dump trucks used to collect, process and transport the vegetation to off-site disposal areas. Conversely it may also result in the impact of additional adjacent lands if the cut vegetated material is discarded or disposed on site.

The magnitude of land clearing is one of the more egregious elements of the pipeline project. It will cause immediate, major changes to the overall condition of the affected areas and set the stage for other acute impacts (e.g., soil erosion) and long-term impacts (e.g., forest fragmentation).

The literature suggests at a minimum once cleared of native vegetation it will take five (5) years for recovery of pre-existing vegetation cover and diversity for grassland communities. The recovery time for shrubland forest communities is at least ten (10) years. But it must be stressed that although cover densities may approach pre-site-clearing conditions, some of the native grasses and understory vegetation may never recover due to changes in sunlight exposure, soil porosity, soil compaction and changes in soil moisture content. Also, none of the trees once growing within the ROW will ever be replanted. Thus as noted above, the acute impact of land clearing sets the stage for longer-term impacts that trigger multiple negative effects on the area's biota and ecological functionality.

3.2 Soil Excavation and Disturbance

The PennEast pipeline is 36" in diameter. The depth to which the pipeline trench must be excavated is established by the DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA). For safety reasons it must be buried deep enough to avoid accidental punctures and to deal with seasonal frost issues. The PHMSA requires pipelines transporting conventional and unconventional gas to typically be covered by 30 to 36 inches of soil overburden. The amount of soil overburden cover may be greater when the pipeline runs under a roadway or when it runs under a stream, river or lake. PHMSA may require additional cover (48 inches to 60 inches) when the pipeline runs under agricultural lands. Less cover however may be allowed (as little as 18 inches) when the pipeline cuts through a consolidated area of bedrock. Nonetheless the amount of excavation required to properly trench the pipe is significant.

Because the placement of the pipe in the trench takes time there is the need to stockpile the excavated soil in areas adjacent to the trench. Each stockpile represents another opportunity for offsite soil migration. This happened during the construction of the TGP pipeline in Northern New Jersey leading to the impact of streams, wetlands and large recreational lakes located adjacent to the pipeline ROW.

In rockier areas, in order to protect the pipe from damage caused by sharp stones it may be necessary to sort the soil. The material sorted from the soil will need to be transported off site. The sorting, stockpiling and off-site transport of the rejected material again increases the opportunity for the offsite migration of soil and impact to adjacent streams, wetlands and other waterbodies.

3.3 Soil Compaction

Right-of-way (ROW) site preparation and construction activities include soil excavation, soil stockpiling, soil removal, operation of heavy equipment, and the blending of topsoil and subsoil materials to produce proper cover. These activities affect the ability of the disturbed soils to sustain their original soil functions. Some of the most pronounced changes to soil health and function are linked to soil compaction. Soil compaction has been documented repeatedly to negatively affect plant growth, the infiltration and retention of precipitation, soil porosity, and microbial composition. Compaction issues will be magnified in wetland and riparian areas due to the more silty, alluvial and higher moisture content of the prevailing soils. Such soils are especially prone to compaction and will readily lose interstitial pore space. Without adequate pore space the movement of water, air, and soil fauna through the soil is impeded leading to changes in the biophysical dynamics of the soils. This in turn negatively affects vegetative cover and the re-establishment of wetland plant species within the disturbed wetland/riparian corridor.

The newly-developed Cornell Soil Health Test (CSHT) provides a standard for assessing the important physical, chemical and biological processes and functions of disturbed soil. The CSHT was used to evaluate the impacts of a recently constructed pipeline that transected University-owned land. The CSHT analysis definitively showed that soils within the ROW had significantly lower soil quality levels than the soils sampled in the adjacent areas unaffected by the pipeline's construction. The point here is that reliance on standard erosion control and soil handling techniques was proven to inadequately compensate for or address soil compaction issues within the ROW. As noted above, compacted soils inhibit the recharge of precipitation leading to a greater amount of stormwater runoff. The added runoff can lead to an increase in the mobilization and transport of pollutants and an increased opportunity for overall soil erosion.

3.4 Disturbance of Shallow Bedrock and Steep Slopes

Another set of acute impacts will arise where the depth to bedrock is shallow and the overlying soil mantle is thin. In such areas more aggressive excavation practices will be needed, including localized blasting, in order to achieve the required depth and dimension for the pipe trench. Because of the lack of adequate available soil cover, it may also be necessary to import a larger amount of backfill to cover the pipe after its installation. This added truck traffic increases the extent of site disturbance and disruption of the surrounding neighborhoods. As previously noted, to obtain enough suitable cover as well as protect the pipe from "sharp rocks" the PennEast construction plan recognizes the need to conduct on-site soil sorting and blending. Such activities will be especially prevalent in steeper sloped areas. This again increases the opportunity for off-site soil migration. Work on steeper sloped land will also tax the functionality of erosion and sediment control measures. There will be a greater opportunity for the failure of such measures especially if major storm events occur during or shortly after any work conducted on steep sloped areas. Finally issues may be raised with respect to the introduction of invasive species if off-site soils needed to be brought in in order to satisfy a deficit in the amount of available native cover material.

3.5 Stream and Wetland Crossings

Review of the proposed PennEast pipeline pathway shows it will cross over 80 streams including multiple streams that support, or have the habitat properties needed to support, a cold-water fishery. The affected streams include a number of recognized wild brook trout streams. Where the pipeline crosses each stream, acute impacts will occur as a result of the excavation of the pipe trench, the active de-watering of the trench, the installation of the pipe, and the backfilling of the pipe trench. Each of these crossings thus presents a significant disruption of these well-established fisheries.

The current proposed plan calls for a simple “dig and drop” technique to be used at the majority of the stream crossings. The obvious problems resulting from this technique is attributable to the disturbance of the stream bed and stream banks. The most obvious problem will be an increase in in-stream turbidity. But the disturbance of the stream bottom will also cause a loss of the benthic fauna, benthic fauna habitat and spawning, nursery and foraging habitat critical to the stream’s fishery.

Another inherent problem associated with typical “dig and drop” pipeline crossings is the potential for high flow events to expose or damage the pipe. This occurs quite frequently. As such, a detailed hydrologic analysis of the channel is critical for determining placement of the pipe beneath a stream. Without such data it is difficult to actually determine the proper depth to which to place the pipe. These data are derived from channel degradation and scour analyses. For example, the Bureau of Land Management (Fogg and Hadley, 2007) recommends modeling of the stream using various “mobile-bed hydraulic” models such as HEC-6 (USACOE, 1993 and USACOE, 1995). To date there has been no mention that such modeling will be conducted at any of the multiple PennEast stream crossings. Even when pipelines are placed to the appropriate depth, exposure of the pipe and release of the materials therein is still a risk that has been sadly realized in communities.

3.6 Hydrologic Impacts

Acute hydrologic impacts can be divided into two categories. The first is associated with the above noted in-stream construction activities and the other is associated with the hydrostatic testing of the pipe.

As noted above, the existing PennEast pipeline pathway affects over 80 streams. Work conducted in each of these streams means maintaining a water-free work zone. This means either diverting stream flow around the construction zone or actively pumping water out of the construction zone. Even when the work area is segregated from the stream by some type of diversion measure, the shallow depth to groundwater will require the constant dewatering of the pipe trench. Similar types of acute hydrologic impacts will also occur in the wetland and riparian areas traversed by the pipeline again due to shallow depth to seasonal high water (groundwater), standing water or saturated soil conditions. Again, construction in such areas requires the constant dewatering of the work area. As noted above, the compaction of wetland and riparian soils is to be expected and will have grave consequences in the ability for these areas to become fully restored to their pre-disturbance conditions.

The hydrologic impacts resulting from the hydrostatic testing of the pipe is an acute impact that is neither well understood nor adequately discussed. PennEast acknowledges that part of the standard pipeline construction process is the hydrostatic testing of the pipeline. This occurs once the pipe is in place and construction is completed, but prior to backfilling the pipeline trench. Basically the testing involves filling the pipeline with water and then pressurizing the pipeline to a "level higher than the maximum pressure at which the pipe will ever be operated". The hydrostatic pressure test is conducted for a minimum of eight continuous hours. The first acute impact directly resulting from this testing will occur as water is actively pumped from the supplying waterbody; most likely a nearby stream. As highlighted above, many of the streams that are located near or are being transected by the pipeline are EV, HQ and C-1 waterbodies. Such streams are documented trout production or trout maintenance ecosystems. Multiple opportunities arise for the degradation of the "donor" stream during the pumping process. The means by which water is removed, the total volume of water removed and the frequency of the testing all place a hydrologic stress on the donor stream. To date these impacts have not been acknowledged or discussed. Obviously the removal of even small volumes of water from these streams could cause serious acute impacts that negatively affect the habitat quality and resident biota of the stream. In addition to concerns related to the volume of water being removed, impacts to the biota can arise simply as a result of machinery and pumping equipment accessing the stream and the means by which water is pumped and removed from a stream. Water diversion impacts will be of greater significance in headwater and smaller order streams. These impacts will also be greater during periods of low baseflow. In the summer months removal of large volumes of water not only will have a direct effect on stream flow and in-stream water levels, but could also trigger water temperature impacts due to a depletion of passing flow.

Additionally, once the testing is completed the water in the pipe will need to be discharged back into the stream. Again this can affect stream water temperatures. It can also result in the introduction of pollutants, which directly conflicts with the anti-degradation maintenance requirements for C-1, EV and HQ waterways. Finally, at the point of discharge there is the potential for scour and erosion. To date none of the impacts associated with the hydrostatic testing of the pipeline has been acknowledged or addressed.

3.7 Increased Runoff and Stormwater Loading

The simple action of clearing the land, regrading and smoothing the pipeline ROW, compacting and altering the physical structure of the native soils within the ROW, and replacing forest with ground cover will increase the amount of stormwater runoff generated during each storm event. PennEast has used post-development TR-55 runoff curve numbers in an attempt to support their contention that there will not be an increase in runoff following the completion of the pipeline. However, it is well established that following land development, especially development on steep slopes and resulting in forest clearing, peak flows and total runoff volumes will increase. In addition, the time of concentration[3] will decrease. Undoubtedly there will be both a greater volume of runoff and velocity as the result of pipeline construction. In addition to increasing the volume and velocity of runoff entering stream systems, these conditions will increase the mobilization and transport of pollutants (including sediments and nutrients), increase the likelihood of scour and erosion and decrease the total volume of precipitation infiltrated back into the soil leading to a decrease in the recharge of the surficial aquifer. The long-term impacts of these changes in stormwater runoff will be discussed below in greater detail.

The acute impacts arising from the increased volume and rate of runoff will be most pronounced immediately following the pipeline's construction. Until ground cover is re-established storm flows and runoff volumes will be especially elevated; again with the greatest differences occurring within the disturbed steep sloped areas. PennEast, PADEP and NJDEP acknowledge that acute impacts are likely to occur immediately following construction. This is why erosion and sediment control measures must be implemented and maintained. But even PennEast recognizes that these measures will at times fail…

> "Following construction, PennEast will perform routine maintenance on portions of the ROW …. PennEast also will maintain and repair areas that wash away, subside or are damaged due to natural causes."

Each of these wash out, subsidence and damage events represent an irreversible impact to the adjoining natural area, whether it be forest land, wetland, floodplain, riparian corridor or stream ecosystem. Granted it may be possible to remove some of the soil that washed into the adjoining lands, but the process of removing the soil and/or contaminants involves additional disturbance of impacted wetlands, riparian corridor or waterway and in itself stimulates another host of impacts related to accessing and working within these sensitive environmental areas.

Additionally, PennEast is technically responsible for repairs and maintenance of the ROW. PennEast is not responsible for the repair of areas adjacent to the ROW that were disturbed but are not directly associated with the pipeline. As such, if a stream segment down gradient of the pipeline ROW becomes compromised due to construction activities, it is unlikely that this impacted segment will be repaired.

It also must be emphasized that unlike conventional development projects, the pipeline project does not include the implementation of any post-development stormwater management measures. It is acknowledged that during construction PennEast will implement "temporary erosion control devices…installed in compliance with regulations and best management practices". However, none of the standard types of stormwater BMPs such as bioretention

[3] Time of Concentration (Tc) is the time for runoff to travel from the hydraulically most distant point of the watershed to a specific point of interest within the watershed or the point at which the runoff is discharged from the watershed. It is affected by slope, vegetative cover and surface roughness.

basins, detention basins or even vegetated swales will be constructed or installed as part of the project. Thus unlike conventional development sites, there will be no permanent measures in place capable of controlling the rate of runoff, the volume of runoff or the quality of runoff. Again while the lack of true stormwater BMPs will contribute to the pipeline's long-term hydrologic impacts, the absence of such measures during and immediately following the pipeline's construction limits the ability to mitigate or prevent acute stormwater related impacts.

3.8 Operational Impacts

An often overlooked acute impact is associated with the actual operation of the construction equipment. Machinery will need to be refueled and maintained on a daily basis. Given that much of the pipeline path cuts through undisturbed areas with limited vehicular access, fuel and lubricants will need to be brought to the jobsite. This increases the likelihood of spills and leaks, most of which will be far below any reportable quantities. Nonetheless, whether large or small, these spills represent acute impacts that will further compromise and degrade the environment. Similarly, given the fact that the pipeline will cross over 80 streams, many of which are EV, HQ or C-1, the operation of machinery in these streams (and adjacent wetland and riparian areas) present additional opportunities for the release of fuel and lubricants into the water. Operation of such machinery poses an acute risk even under normal working conditions. The risk and likelihood for acute impact will only be magnified with this machinery working in wetlands and riparian areas with exceptional resource value, and waterways of outstanding quality that support highly sensitive and/or unique biota.

4. Long-Term Impacts of Pipeline Construction

4.1 Synopsis of the Long-Term Impacts That Will Be Triggered by the PennEast Pipeline

Linear development projects such as the PennEast Pipeline result in a multitude of long-term environmental perturbations including:

- Destabilization of the traversed ecosystem,
- Diminishment and alteration of the ecological services and functions provided by these ecosystems,
- Negative changes to the assemblage of the biotic community,
- Increased predation/loss of native forest core species due to the introduction of predators and "edge" species,
- Increased opportunity for the introduction and colonization of invasive species,
- Fragmentation of habitat and the loss of key resources, access to key resources or the quality of key resources required for the success of forest core and wetland core species,
- Reduction in the long-term water quality of the bisected streams,

- Increased thermal impacts to streams resulting from a decrease in stream side tree canopy cover,
- Changes in the watershed's hydrologic and hydraulic properties,
- Increased amounts of stormwater runoff, the rate of runoff and the frequency and longevity of erosive flows,
- Increased opportunity for upland and in-stream erosion,
- Increased pollutant loading to wetlands and streams, and
- Decreased infiltration and recharge of the surficial aquifer (critical to the maintenance of stream baseflow and the hydrodynamic properties of wetlands).

To date there has been no acknowledgement of such long-term impacts by PennEast. More importantly though is that these types of long-term impacts cannot be successfully mitigated or avoided, especially, as is the case with the PennEast pipeline, when the project area includes a high percentage of high quality, currently undisturbed forest, wetland and stream environments and ecosystems.

Within this section of this white paper two of the more egregious and obvious long-term impacts associated with the PennEast pipeline are investigated and discussed in greater detail; Habitat Fragmentation and Hydrologic Impacts.

4.2 Habitat Fragmentation

As per Franklin, et. al., (2002), habitat fragmentation can be defined as:

> "The discontinuity, resulting from a given set of mechanisms in the spatial distribution of resources and conditions present in an area at a given scale that affects occupancy, reproduction, or survival of a particular species."

The impacts and problems of habitat fragmentation have long been analyzed and discussed by ecologists especially with respect to the clearing or alteration of core forest areas. The obvious impact of linear development is that it results in the irreversible alteration of the vegetative cover within the pipeline and pipeline ROW pathway. Initially this is the result of the required clearing of trees, shrubs and understory lands, the grading of land and the back-filling of the pipeline trench. Over the long-term, the maintenance of the ROW requires prevention of any tree growth, which is accomplished by periodic mowing and the use of herbicides. It may also involve the periodic trimming, pruning, cutting back and removal of trees and woody vegetation growing along the perimeter of the ROW in order to prevent the migration of such vegetation into the actual ROW. The inspection and maintenance of the ROW means the repetitive access and traverse of the ROW by inspection vehicles and maintenance equipment. This increases overall site compaction and because there are no stabilized access-ways, it also creates repeated opportunity for soil erosion.

The removal of trees, herbaceous vegetation and groundcover can negatively impact the basic habitat requirements of a given species thereby effecting its survival. Fragmentation not only eliminates vital habitat but can separate species from necessary resources and degrade the forage, refuge and reproductive value of the habitat thereby limiting the long-term success of a species. Habitat fragmentation also greatly increases the opportunity for invasive species colonization (both native and non-native), increased predation, increased nest parasitism and other direct and indirect negative impacts to the species that relied on the complexity of the undisturbed core habitat area, whether a mature forest, wetland or riparian floodplain corridor.

Linear development projects (including roads, transmission lines, pipelines and pipeline ROWs) have been directly linked to a loss of sensitive species (Forman, 2004; Gucinski et al. 2001; Trombulak and Frissell, 2000). Some of these losses reflect the separation of species from needed resources as well as the physical and ecological alteration/degradation of the traversed habitat. The linear fragmentation caused by the pipeline ROW is especially significant as the ROW and pipeline approach and cross streams, especially high-gradient streams. Increased fine sediment loading will occur due to the compromised nature of the wetlands and riparian areas abutting these streams, with those impacts exacerbated by the steeper terrain. These fine sediments are especially impactful to benthic organism, fish eggs, fish larvae and fish fry (Newcombe and MacDonald 1991, Newcombe and Jensen 1996, Gucinski et al. 2001, Angermier et al. 2004, Suttle et. al. 2004).

The above long-term habit fragmentation impacts cannot be mitigated owing to the ecological complexity that they trigger. The resulting ecological losses surpass the compensatory capabilities of the standard mitigation measures proposed as a means of lessening acute project impacts. For example, re-establishing ground cover does not compensate for the changes in the composition of the soil mantle, the complexity of the pre-existing groundcover or the loss of species complexity. Planting trees along the perimeter of the ROW does not compensate for the loss of the ecological services and functions provided by the original core forest. The PennEast pipeline pathway clearly bisects miles of sensitive and unique habitats. The damage to the overall ecological properties of the affected lands and water resources are irreversible. Once the pipeline and its ROW are in place it is impossible to return to or recreate pre-pipeline environmental conditions.

4.3 Hydrologic Impacts

The long-term hydrologic impacts attributable to any pipeline project, including the PennEast pipeline, can be divided into three related categories; increased volume of runoff from the altered ROW, changes in the hydraulic response of runoff from the altered ROW, and increased pollutant loading. These changes in the amount and rate of runoff stem from the alteration of the vegetated cover and the compaction of soil that occurs during the clearing of the ROW, the construction/installation of the pipeline, and the long-term maintenance of the ROW. These impacts will be greater on steeper sloped lands and where the soils have a higher clay/silt content and lower soil saturation coefficient (soils that are easily saturated). Obviously on steeper land there will be a greater tendency for precipitation to runoff as compared to land of minimal grade. Clayey soils that become saturated very easily will also have a greater tendency to generate more runoff than sandy soils having high water retention characteristics. But the long-term changes in the ROW's hydrologic properties will occur regardless of slope gradient or soil type simply due to the inherent amount of soil disturbance, soil compaction and altered vegetative cover that will occur during the pipeline's construction (USDA, 1986).

An increase in volume runoff will occur when forested lands, and their complex understory, are cleared and replaced with grass. Although the surface of the ROW may be stable following the establishment of the replacement vegetative cover, its runoff characteristics will be different. Referring to the TR-55 table of runoff coefficients (USDA, 1986), even for the best drained soils (hydrologic soil group A) the increase in the runoff coefficient value when converting woods to lawns, ranges from 30%-50%. This translates to a substantial increase in the volume of runoff generated by each storm event. Also because the runoff coefficients have increased, this also translates to a shorter time for runoff to be generated and overall results in greater peak runoff flows (the rate at which runoff leaves the ROW). This combination of an increase in runoff volume and runoff rate has been repeatedly demonstrated to be the root cause of stream erosion. On average, a typical deciduous tree intercepts 700 to 1,000 gallons of precipitation annually, and an evergreen (the majority of the trees that will be removed over the course of the PennEast pipeline) intercepts over 4,000 gallons of precipitation annually (PennState, 2014). Removing acres and acres of trees and replacing them with a grass cover will result in major changes in the ROW's runoff characteristics. Although PennEast will implement post-construction site restoration measures, as they themselves note, restoration will never result in a complete return to prior conditions even where that is the goal -- " Restoration continues until the construction work area is restored <u>as close as possible</u> to its original state". Once again, these changes will be greater on steeper sloped lands and greater where the native soils are thin, clayey and have lower water retention capabilities.

As defined by the NRCS (OCSCD, 2011), soil health and quality relates to:

> "The capacity of a specific kind of soil to function, within natural or managed ecosystems, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation."

The health and quality of a soil is a function of its natural physical, chemical and biological properties. Development activities compromise the functionality of soils, impairing the soil's ability to support vegetation and infiltrate runoff thereby making the soil more prone to instability and erosion and causing a greater amount of runoff to be generated. Some of the most severe damage to the soil's natural properties comes about due to heavy equipment repeatedly traversing the soil, as well as standard grading and post-construction "re-vegetation" techniques. The most noticeable change in soil function occurs due the loss of soil porosity resulting from short- and long-term compaction issues of the ROW. This loss of porosity decreases the native soil's ability to absorb, retain and recharge runoff. The other construction related issues that arise that are less obvious but equally problematic apply to changes in the organic content of the soil and changes in the soil's microbial and biological communities. These changes come about as the soils are excavated, sorted, mixed and stockpiled and can negatively affect the ability of the soil to sustain a vegetative cover as well as retain and recharge runoff. There are no provisions in the sediment and erosion control regulations of either Pennsylvania or New Jersey that require the pre-construction restoration of the soils to pre-construction organic content, porosity/permeability or fertility (refer to NJSSCC, 2014 and PADEP, 2012). And as noted earlier, PennEast's commitment with regards to the disrobed soils is only to ensure that they are stable. PennEast is under no regulatory obligation to restore the pipeline and ROW soil properties to pre-construction conditions. The fact of the matter is that these changes in the properties of the soils along the pipeline and within the pipeline ROW will contribute to the predicted increases in the volume and rate of runoff. Along the entire length of the 108-mile long pipeline, these changes in the post-construction hydrology of the affected lands (especially the steeper sloped areas) will invariably alter runoff properties. The end result will be impacts to the streams, wetlands and riparian areas traversed by the pipeline and pipeline ROW and increased opportunity for erosion along the steeper segments of the pipeline and pipeline ROW. Because PennEast is not required to implement any of the conventionally utilized best management measures to collect, treat and control ROW runoff, there is no way to mitigate for these changes other than to revegetate. However, once again the cover type will be different pre to post-construction (e.g. trees to grass) and PennEast is only obligated to achieve 80% post-revegetation coverage with the vegetation type it is using.

Another often overlooked impact caused by pipelines (whether wastewater, stormwater or gas/oil) is that their construction can actually alter the movement of groundwater. Essentially when the pipe and pipe trench intercept the shallow aquifer, groundwater flows can be prevented from flowing normally leading to changes in base flow conditions or the hydrologic properties of adjacent wetlands. The pipeline and pipeline trench can function as a subsurface diversion forcing groundwater away from vital stream and wetland resources.

When all of these factors are taken into consideration it is obvious that the pipeline's construction will lead to substantial changes in the hydrology of the affected lands. The impacts will be greatest in steeper sloped areas and these changes will exert the greatest impact on the EV, HQ, C-1 and lower-order streams. These impacts can either be the result of increased volume and rate of runoff or a loss of baseflow due to a decrease in recharge. These predicted hydrologic changes will also similarly impact the wetlands and riparian areas associated with these environmentally sensitive streams. Over the long-term these hydrologic changes can lead to significant ecological changes including the loss of sensitive species, increased eutrophication and habitat degradation.

5. Unavoidable Impacts

FERC recognizes that there are certain aspects of any project that can lead to unavoidable impacts, also referred to as the project's "effects that cannot be avoided due to constraints in alternatives. These effects do not have to be avoided…but they must be disclosed, discussed, and mitigated, if possible (40 CFR 1500.2(e)". Some examples of such unavoidable impacts that are likely to arise of any pipeline project include:

- The offsite transport of soil due to wind/stormwater erosion of stockpiled soils or resulting from the movement of equipment to and from the ROW and related construction/staging areas.
- Long-term changes in species composition and community structure (height and density) within the construction ROW and ancillary sites caused by the initial clearing and grading of the ROW and then its subsequent long-term maintenance.
- Increased turbidity and sedimentation occurring during the pipeline's crossings of streams and wetlands.
- Increased long-term pollutant loading due to changes in the stormwater runoff characteristics of the affected lands and the lack of implementation of any actual stormwater BMPs.
- Unplanned releases of drilling muds during directional boring operations at stream crossings.
- Trenching activities as part of the pipeline's crossing of streams leading to disturbance related and/or turbidity/sediment related fish, macroinvertebrate, and amphibian mortalities. Trout species eggs and juvenile life stages are especially prone to such mortalities.
- Stream bed erosion and scour impacts caused by the dewatering of work areas or the diversion of flow around work areas.
- Loss of vital mating, spawning, nesting, feeding and/or nursery habit for species dependent on undisturbed core forests, ephemeral wetland or contiguous grassland habitats.
- Degradation of the aesthetic attributes of the affected areas. These impacts will be most obvious where the pipeline ROW cuts through State Game Lands, State and County Parks and public recreational areas and open space areas. These impacts are also significant with respect to New Jersey's Category-1 streams which by regulation (NJAC 7:9B-1.5B) are protected from "measurable changes in water quality based on exceptional ecological significance, exceptional recreational significance, exceptional water supply significance or exceptional fisheries resource(s) to protect their aesthetic value (color, clarity, scenic setting) and ecological integrity (habitat, water quality and biological functions)".

Mitigative measures may be able to lessen the impacts of some of these types of impacts. However, due to the fact that the PennEast pipeline will traverse documented high quality wetland and stream systems that harbor and support threatened and endangered species and species of concern, even the best implemented mitigative measures will not be able to fully prevent ecosystem degradation and losses. These unavoidable impacts need to be fully disclosed, discussed and taken into consideration as part of the aforementioned "hard look" mandated by NEPA as part of this project's environmental review and analysis.

6. Cumulative Impacts

The PennEast Project is but one of a number of pipeline or utility projects occurring within the eastern Pennsylvania, western New Jersey region. Examples of other regional power transmission projects are the Transco pipeline and the proposed Texas Eastern TEAM 2014 Project and the Columbia East Side Expansion Project. As noted earlier, the cumulative impacts arising from the PennEast pipeline are a function of the additive negative environmental effects caused by other past and future pipeline and electric transmission line projects (linear development). In short, the impacts caused by other regional linear development projects worsen the long-term, ecological, project specific impacts attributable to the PennEast pipeline.

The "most favorable route" for the majority of linear development projects tends to be through undeveloped lands. This is reflected in the proposed PennEast pipeline pathway. Such routes avoid populated areas and the human health and safety issues that must be addressed when running conventional and unconventional gas pipelines or power lines through or near established neighborhoods, schools or public facilities. As in the case with the PennEast pipeline, the "most favorable route" involves the disturbance of environmentally sensitive and protected lands, dedicated public open space and preserved farmland. Each of these projects has a permanent access/inspection/maintenance ROW that can vary from 50' to 150' in width. Again, the permanent ROWs associated with these projects further exacerbate the amount of long-term destruction and ecological losses caused along the entire length of the transmission corridor.

Thus, with each of these projects comes some combination of stream impact, core forests destruction, wetland and riparian corridor disturbance, and clearing of steeply sloped lands. As such, each project has caused or will cause its own unique set of impacts and add another layer of acute and long-term assaults to the environment. Additionally, each new project magnifies the project specific impacts of each prior project. When dealing with environmental impact assessment, each project is evaluated independently; the cumulative impacts of multiple linear development projects are not assessed and the additive long-term impacts of past and future linear projects fail to be recognized.

There is no exact tally of the total miles of pipeline or transmission lines that already exist throughout eastern Pennsylvania (http://stateimpact.npr.org). Although the Pennsylvania Public Utility Commission inspects over 46,000 miles of pipeline alone, this does not include any of the smaller "gathering lines" common to Marcellus Shale gas production. These lines are classified as Class 1 pipelines and are exempt from inspection as per Act 127, the Pennsylvania Gas and Hazardous Liquids Pipelines Act. As such, the total miles of pipeline actually cutting through critical forest, wetland, stream and riparian habitats is difficult to compute and the cumulative impacts of these transgressions on the environment difficult to quantify. The same holds true for the power transmission lines and associated ROWs. Some of the major gas transmission lines already located in eastern Pennsylvania include the Blakeslee, Transco, Humbolt, Shickshinny, Wyoming, Appalachian Basin and UGI gas lines. Similarly, in western New Jersey there are already a number of pipelines and transmission lines transecting the

State's sensitive forests, wetland, and streams as well as preserved farmland. These include the proposed Pilgrim Pipeline and the existing Algonquin, TGP, Transcontinental, Elizabethtown, and Texas Eastern gas lines. Add to this all of the large electrical transmission lines such as the Susquehanna-Roseland line, and it becomes clearly evident that the cumulative impacts of these linear development projects cannot be overlooked or underestimated. It is also obvious that the cumulative impacts of these projects will accelerate the long-term negative effects that come about due to the fragmentation of critical forest, wetland and riparian habitats.

Unfortunately such an in-depth analysis of the cumulative impacts is not a required element of most environmental impact analyses and as such normally fails to be discussed within a project's Environmental Assessment or Environmental Impact Statement. In fact even on a single project, the gas companies are inclined to bifurcate and segment projects in an attempt to lessen a project's total impact. This was most recently evidenced in a case brought by the Delaware Riverkeeper Network, New Jersey Chapter of the Sierra Club and the New Jersey Highlands Coalition against FERC and the Tennessee Gas Pipeline Company's Northeast Upgrade Project. In that case the United States Court of Appeals for the District of Columbia found that:

> "In conducting its environmental review of the Northeast Project without considering the other connected, closely related, and interdependent projects on the Eastern Leg, FERC impermissibly segmented the environmental review in violation of NEPA. We also find that FERC's EA is deficient in its failure to include any meaningful analysis of the <u>cumulative impacts</u> of the upgrade projects."

As such, although a usually avoided and rarely conducted part of the environmental impact analysis, the cumulative impacts of past and future related projects merit analysis and discussion. Again, such analyses thus far are lacking in the impact analyses or assessments conducted to date of the PennEast pipeline.

7. The Fallacy of Impact Mitigation

The simple answer given to address the obvious acute construction impacts linked to land clearing and grading is to prepare a construction phase soil erosion and sediment control plan and then implement and maintain the measures identified in the plan over the course of the construction phase. However, soil erosion and sediment control plans represent the minimum that is required to control soil disturbance at a construction site and/or the offsite transport of soil and sediment. Soil erosion and sediment control measures focus on the containment of soil and sediment during the construction phase and then the stabilization of the soils after construction is completed. While preventative by design, these measures do not guarantee the prevention of the off-site transport of soil or sediment or that environments adjacent to the project site will be fully protected from any impacts. The limitations of soil erosion and sediment control plans are clearly recognized in PADEP's Erosion and Sediment Pollution Control Manual (Technical Guidance Number 363-2134-008, 2012), which states that measures and BMPs contained in the manual are "expected to achieve the regulatory standard of minimizing the potential for accelerated erosion and sedimentation". The Manual also notes that "human activities…typically increase the rate of erosion to many times that which occurs naturally".

In the upland areas through which the pipeline traverses there will be the need to clear cut and remove a large number of densely growing, large trees. Some of this clear cutting will occur in core forest areas. The clear cutting of the trees at the scale needed for this project will create a major acute ecological problem (as addressed elsewhere in this paper). From the perspective of erosion, the logging activity associated with felling the trees and then removing them from the pipeline right-of-way creates an erosion problem that is much different than that caused by conventional development activity. First, unlike a typical development site there is no intrinsic infrastructure being created to facilitate the tree removal. This means additional clearing will be needed to create access roads and staging areas. Second, much of the upland work occurs in locales characterized by steep terrain. This increases the severity of the erosion problems caused by clear cutting. Third, the native soils in these steeper areas are also shallower and more fragile, and once exposed are more likely to erode and unlikely to be easily stabilized. Thus, although erosion and sediment control measures could be implemented, the topography of much of the area through which the pipeline transects will limit the effectiveness of those measures. Therefore, even with the best developed soil erosion and sediment control plan in place there will be sediment and soil erosion impacts given the scale of the project and the sensitivity of the environments traversed by the pipeline.

With this project the types of acute erosion problems that will be created are not limited to upland areas. Some of the more potentially severe acute and long-term impacts are those caused by the pipeline as it crosses through wetlands and streams. These areas are characterized by persistent standing water, actively flowing water or saturated soils. Such conditions present especially difficult conditions for the proper installation of erosion and sediment control measures. Such conditions also decrease the functionality of most erosion and sediment control measures, which by design are meant to work in dry environments. Those control measures intended to be used in wet environments often require the dewatering of the site to allow the measure to be installed or constructed. This in itself creates an impact to the stream or wetland ecosystem and resident organisms by significantly altering the hydrologic regime. Those measures intended to be used in wet conditions will not be able to fully prevent eroded or disturbed soil from being mobilized and transported down gradient, especially during storm events. There is also an increased need to inspect, re-install and maintain erosion control measures installed in wetland and stream environments. The repeated need to access the area to re-install or maintain the erosion control measures is problematic. By repeatedly accessing and working in the wetlands, stream corridor or buffer areas associated with either further increase the likelihood of erosion, sedimentation and acute environmental damage. Thus, although the pipeline plan may involve the implementation of erosion and sediment control measures, those measures will not be sufficient to protect the transected streams or wetlands from sedimentation damages. In fact, due to the need for repetitive maintenance the installed erosion and sediment control measures may actually exacerbate environmental damages and result in more sedimentation and siltation of these environments. Clearly there is the need to implement proper erosion and sediment control measures, however when working within stream, wetland and riparian corridors the implementation of these measures and their maintenance need to be conducted in a manner consistent with the sensitively of these environments.

A major problem with sedimentation, increased turbidity and siltation in aquatic and wetland environments is the impact this has on the resident biota. Excessive suspended sediments in the water column or prolonged periods of elevated turbidity will directly affect the spawning success of many organisms and impact the feeding of a wide variety of filter feeding species. While these impacts can be damaging at any time of year, the severity is magnified significantly during these ecologically critical times of year. Because different species rely on these streams at different times of year for spawning, nursery or feeding habitat, "working around" certain times of year is not an option.

As noted above, along with the pipeline there will be the need to construct a number of major interconnects and a large compressor station, all of which represent additional large land disturbances. There will also be the need to construct both temporary construction roads and permanent access and maintenance roads, which will further add to the amount of site disturbance and create additional opportunities for soil erosion. Another group of erosion problems will arise as a result of the construction and maintenance of temporary sedimentation basins and dewatering basins. This will again result in more land disturbance and additional opportunities for erosion and sedimentation impacts.

Another erosion problem that has been overlooked is that associated with the excavation and maintenance of the pipe trench. The trench needs to be deep enough to accommodate the pipe, bedding material and cover material. This means in areas where there is shallow depth to groundwater there will be the need to dewater the trench during the construction phase. Until the pipe is placed in the trench and the trench is backfilled, the trench will need to be maintained in a dewatered state between storm events. The repeated flooding and dewatering of the pipe trench resulted in significant turbidity and sedimentation impacts to wetlands and surface waters located with or adjacent to the TGP Pipeline construction zone.

The inadequacies of mitigation also relate to the restoration of each stream that will be crossed as part of the pipeline's construction. Directional boring will be limited to the crossings affecting the Lehigh River, Susquehanna River and Delaware River. A simple "dig and drop" approach will be used by PennEast to traverse the 80+ smaller order, high quality streams. At each of these crossing, some means will need to be implemented to divert flow around the project area and keep the pipe trench dewatered. Again, the trench depth will be at least 5-6 feet below existing stream grade, and could be even deeper to avoid thermal impacts to the stream or to protect the pipe from high-energy event scour and exposure. Overall, this type of construction is very disruptive to the stream and will negatively affect its ecological functionality. The current mitigative measures planned by PennEast, while perhaps addressing short-term erosion and sedimentation impacts, do nothing to restore the streams to their pre-development ecological complexity and functionality. In order to justifiably state that the pipeline has caused "no impact", at each stream crossing the subject stream must have its stream channel restored to the pre-construction width, depth, slope and substrate. The restored substrate would also have to mirror the pre-construction composition of the streambed and bank materials and condition, including restoration of the kind, quantity and quality of rock, sediment, woody debris and vegetation. Additionally, the stream's restoration must allow for natural channel migrations, flows, sediment transport, and stream channel evolutions typical of natural stream flows. None of the mitigation plans submitted to date by PennEast address these issues or demonstrate the ability to fully restore the streams to pre-construction conditions.

The fact is that the mitigation does not require a return to a pre-construction state, but rather only requires that the minimum, basic requirements stated in the regulations are satisfied. For example with respect to the recently completed Leidy pipeline, TGP offered the following:

"Because the waterbody crossings would be completed in accordance with site-specific measures that may be required by State permitting agencies or the Army Corps of Engineers, we conclude that impacts on waterbodies would be minor and temporary".

The fallacy with this is that the lack of impact is predicted on the assumption the regulatory required mitigation will result in the stream being fully restored to its pre-construction state. That is never the case. Additionally, pipeline projects have had a very bad history of failed mitigation (NYSP, undated). These failures only reinforce that the proposed level of mitigation for stream and wetland crossings not only fail to return the stream or wetland to pre-construction standards but is difficult to achieve.

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