Pipeline Watch Training Module

May 11, 2013, Milford PA Training

DELAWARE RIVERKEEPER NETWORK™

J.Wagner – TGP NEUP, April 2013

DELAWARE RIVERKEEPER®

Delaware Riverkeeper Network – Working for the Rights of the River and All Communities Who Depend Upon It.

www.delawareriverkeeper.org

Training Outline

- Purpose and goals
- Pipeline construction basics & sequence
  - Types of water crossings
- Pipeline Impacts on Environment
- BREAK
- Best Management Practices and E&S 101
- Examples of good and bad BMPs and what to look for in the field
- TGP ECP & Alignment Sheets
- Visual Assessment Datasheet
- Importance of photo documentation for watch dogging role
- Landowner permissions and monitor code of ethics – do not trespass

Purpose and Goals

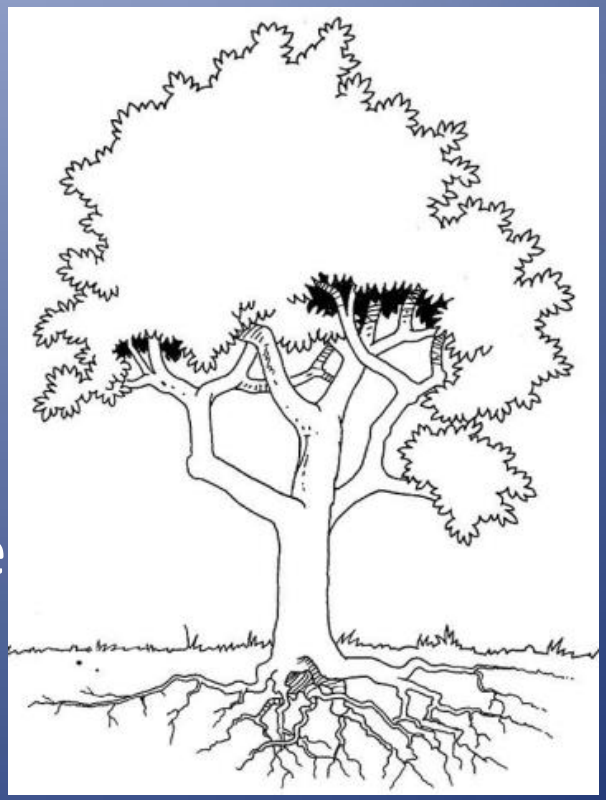
Hold Pipeline Companies Accountable & Obtain Evidence of Problems

- Recognize common BMPs
- Recognize BMP problems
- Photo document potential issues & sediment pollution
- Assist DRN with important documentation to report problems & follow through

TGP NEUP 325 Loop: Photo courtesy of J. Wagner

Natural Gas Pipeline Delivery Systems

- An “Arborist’s View” of pipeline delivery systems:
  - Gathering Lines (roots)
  - Transmission Lines (trunk)
  - Distribution Lines (branche



Gathering Lines

- From the well, the natural gas goes into "gathering" lines (the roots).
  - The natural gas industry is currently constructing an expansive web of these lines across Pennsylvania to create the infrastructure to get the gas from wells to market.
  - Gathering lines are medium size steel pipes (usually under 4-18" diameter but some are as large as 24") that carry unodorized, raw gas at a pressure of approximately 150-1000 psi.
  - Gathering lines carry corrosive content that can affect pipeline integrity within a few years.
  - The construction of this particular network of pipelines poses a significant threat to the health of Delaware River watershed.

Amwell Township, Pennsylvania gas pipeline.

http://www.aga.org/Kc/aboutnaturalgas/consumerinfo/Pages/NGDeliverySystem.aspx

Gathering Lines

Well pad located in Hop Bottom, Pennsylvania. The pipe for the gathering line can be seen being laid off to the right of the pad. At this location there are 3 pads located within a mile and a half of each other, all to be connected together with gathering lines.

Transmission Lines

- From the gathering system, the natural gas moves into the transmission system. (e.g. Tennessee 300, Columbia Pipeline)
  - Composed of hundreds of thousands of miles of pipe ranging from 20 inches to 42 inches in diameter.
- Transmission lines move large amounts of natural gas thousands of miles from the producing regions to local distribution companies (LDCs).
- The pressure of gas in each section of line typically ranges from 200 pounds to 1,500 pounds per square inch, depending on the type of area in which the pipeline is operating.
- Transmission pipelines can fail due to seam failures, corrosion, materials failure, or defective welding.

Tennessee Gas 300 upgrade line. Pike County, PA. 2011

http://www.aga.org/Kc/aboutnaturalgas/consumerinfo/Pages/NGDeliverySystem.aspx

Transmission Lines

Tennessee Gas/Kinder Morgan – 300 line upgrade

Compressor Stations

- Compressor stations are located approximately every 50 to 60 miles along each pipeline.
  - Boosts the pressure that is lost through the friction of the natural gas moving through the pipeline.
- Natural gas moves through the transmission system at up to 30 miles per hour.
- Along the way, there are many interconnections with other pipelines and other utility systems.

*Photo of the **Lowry Compressor Station**, one of a new network of **MarkWest** compressor stations being constructed in Washington County, PA. These compressor stations often start out with one or two compressors, and shortly thereafter are expanded to four or five 1340 horsepower compressors that run on natural gas.*

http://www.aga.org/Kc/aboutnaturalgas/consumerinfo/Pages/NGDeliverySystem.aspx

City Gate Stations

- City Gate stations serve three purposes:
  1) Reduce the pressure in the line from transmission levels (200 to 1,500 pounds) to distribution levels (¼ pound to 200 pounds).
  2) Add an odorant, the distinctive sour scent associated with natural gas.
  3) Measure the flow rate of the gas to determine the amount being received by the utility.

http://www.aga.org/Kc/aboutnaturalgas/consumerinfo/Pages/NGDeliverySystem.aspx

Distribution Lines

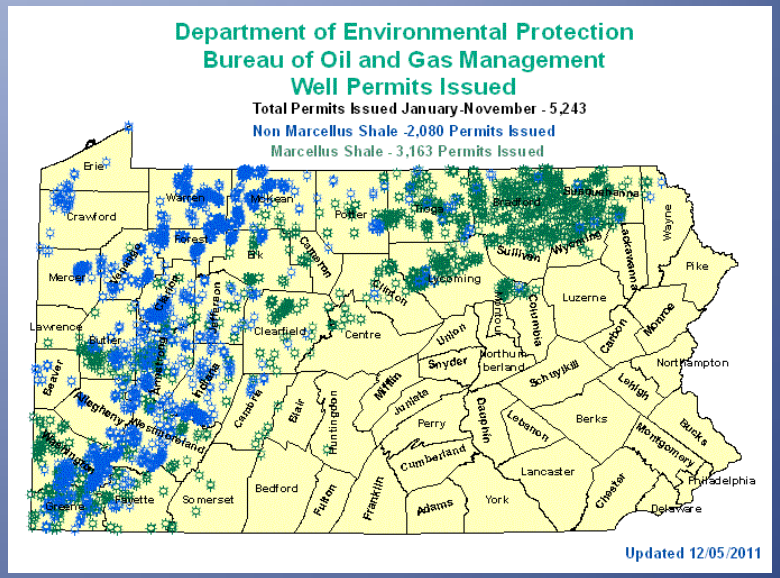
- From the gate station, natural gas moves into distribution lines or "mains" that range from 2 inches to more than 24 inches in diameter.
- Generally speaking, the closer natural gas gets to a user, the smaller the pipe diameter is and the lower the pressure is going to be.

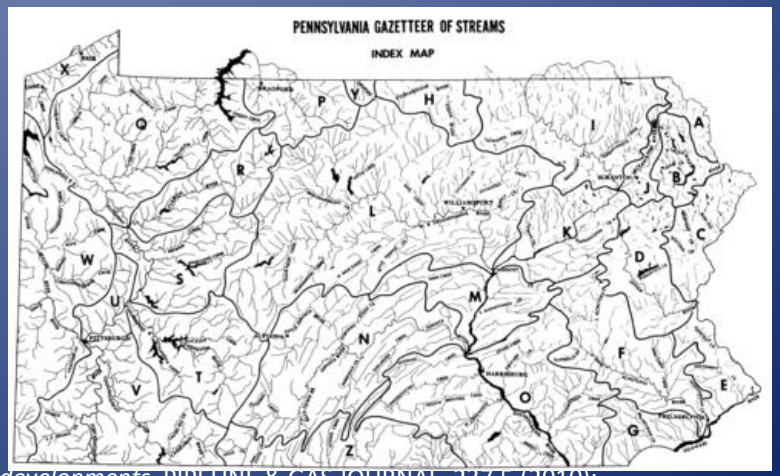
http://www.aga.org/Kc/aboutnaturalgas/consumerinfo/Pages/NGDeliverySystem.aspx

Pipelines Linked to Natural Gas Drilling/Fracking

Pipeline Stream Crossings

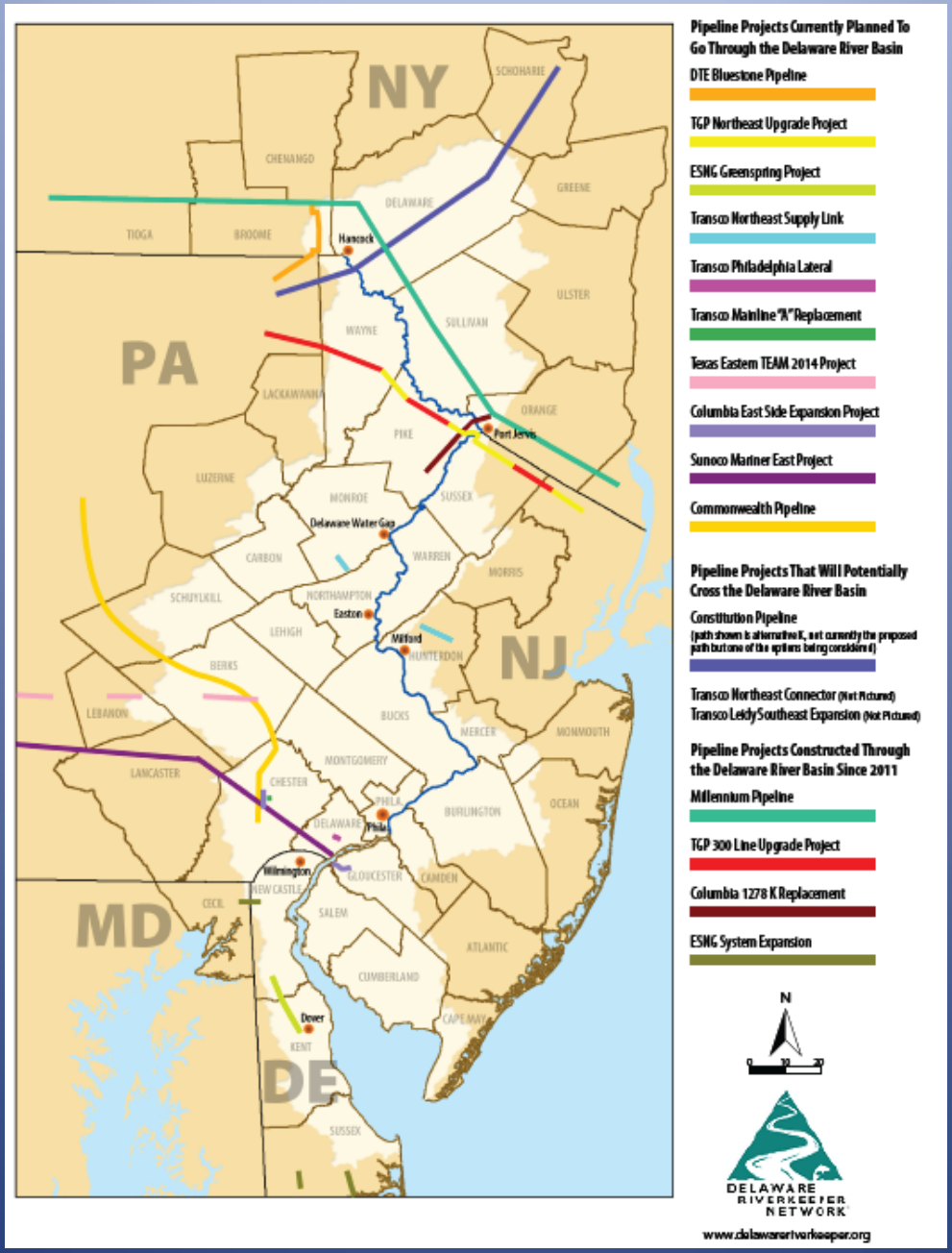
- Every natural gas well needs a pipeline connected to it.
  - Jan – Dec 2011= 5,728 drilling permits issued (23 permits daily). **2,907 wells were drilled** and DEP detected 4,382 violations during inspections
  - Some estimate that over 60,000 wells could be drilled in total.
- Pennsylvania is the home to approximately 83,000 miles of streams.
- Pipeline construction activities will have significant negative impacts on the long term health and viability of Pennsylvania's waterways.





Derek Weber, *From Drake to the Marcellus Shale gas play--midstream developments*, PIPELINE & GAS JOURNAL, 237.5 (2010);
http://geocommons.com/overlays/10990

The Delaware River Basin has over 13 major pipelines proposed in the Basin



Why The Community Needs Citizen Monitors

Northeast Upgrade Project

Safety and the Environment

At Kinder Morgan, we are committed to public safety, protection of the environment and operation of our facilities in compliance with all applicable rules and regulations. We work closely with local, state, and federal agencies to protect environmentally sensitive areas.

Kinder Morgan uses best management practices such as erosion control, irrigation restoration, and other protective measures to give landowners active use of their land, including farming and recreation activities after the construction is completed.

Project Facts

- $400 million underground natural gas pipeline project and modifications at 4 existing compressor stations in Pennsylvania and New Jersey, including Pike County.
- 40.9 miles, 30-inch diameter pipeline (consisting of 5 separate pipeline looping segments) traversing Pennsylvania and New Jersey, including Pike County
- Anticipated project construction: Fall 2012 - Fall 2013
- Anticipated project completion: November 2013

TGP's 93% Failure Rate on 300 Line

- In Pike Co alone, no fewer than 45 violations of TGP's ESCPGP-1 during construction of the 300 line
- Incl. 17 instances of sediment discharged to waterbodies
- 7 violations for worksite conditions
- 21 instances of failure to properly install BMPs for erosion and sediment control
- Wayne Co Cons. District documented 15 violations
- 93% failure record indicates TGPs systematic violations of its permit obligations
- Indicates strong evidence of PADEP's failure to ensure proper agency oversight and to conduct adequate enforcement when violations were found

Beth Brelje, Pike County Conservation Official Fed Up With Gas Company's Violations, Pocono Record (last visited March 21 2012), available at: http://www.poconorecord.com/apps/pbcs.dll/article?AID=/20110920/NEWS/109200330/-1/rss01

Ongoing and Continued Non-compliance by TGP/Kinder Morgan

- TGP continues to accumulate NOVs from Conservation Districts. Although the 300-Line was put into service in November 2011, much of the right of way involved in the project has yet to be sufficiently stabilized and re-vegetated in violation of applicable permit requirements. On March 8, 2012, DRN employees observed two construction sites presenting pollution concerns. PCCD was notified and issued an additional NOV to TGP that stated:

  - *The inspection(s) revealed that earth disturbance activities at the TGP 300 Line site are in continued violation of the Rules and Regulations of the Department and the Clean Streams Law. Additional violations were documented on inspection reports dated June 22, 2011 (IR 11-01), July 26, 2011 (IR 11-04), August 15,2011 (IR 11-05), August 24, 2011(IR 11-06), August 31,2011 (IR 11-07), September 10,2011 (IR 11-08), September 13, 2011 (IR 11-09), September 16-17, 2011 (IR 11 -10), September 20 & 21,2011 (IR 11-11), September 26, 2011 (IR 11-12), September 28, 2011 (IR 11-13), October 5, 2011 (IR 11-14), October 14,2011 (IR 11-16), October 20, 2011 (IR 11-17), November 3rd and 4t11 , 2011 (IR 11 -18), December 12, 2012 (IR 11-19) and February 15, 2012 (IR 12-20).*

- This NOV specifically states that TGP's failure to implement effective Erosion and Sediment Control Best Management Practices and to install erosion control matting caused sediment or other pollutant discharges into waters of the Commonwealth.

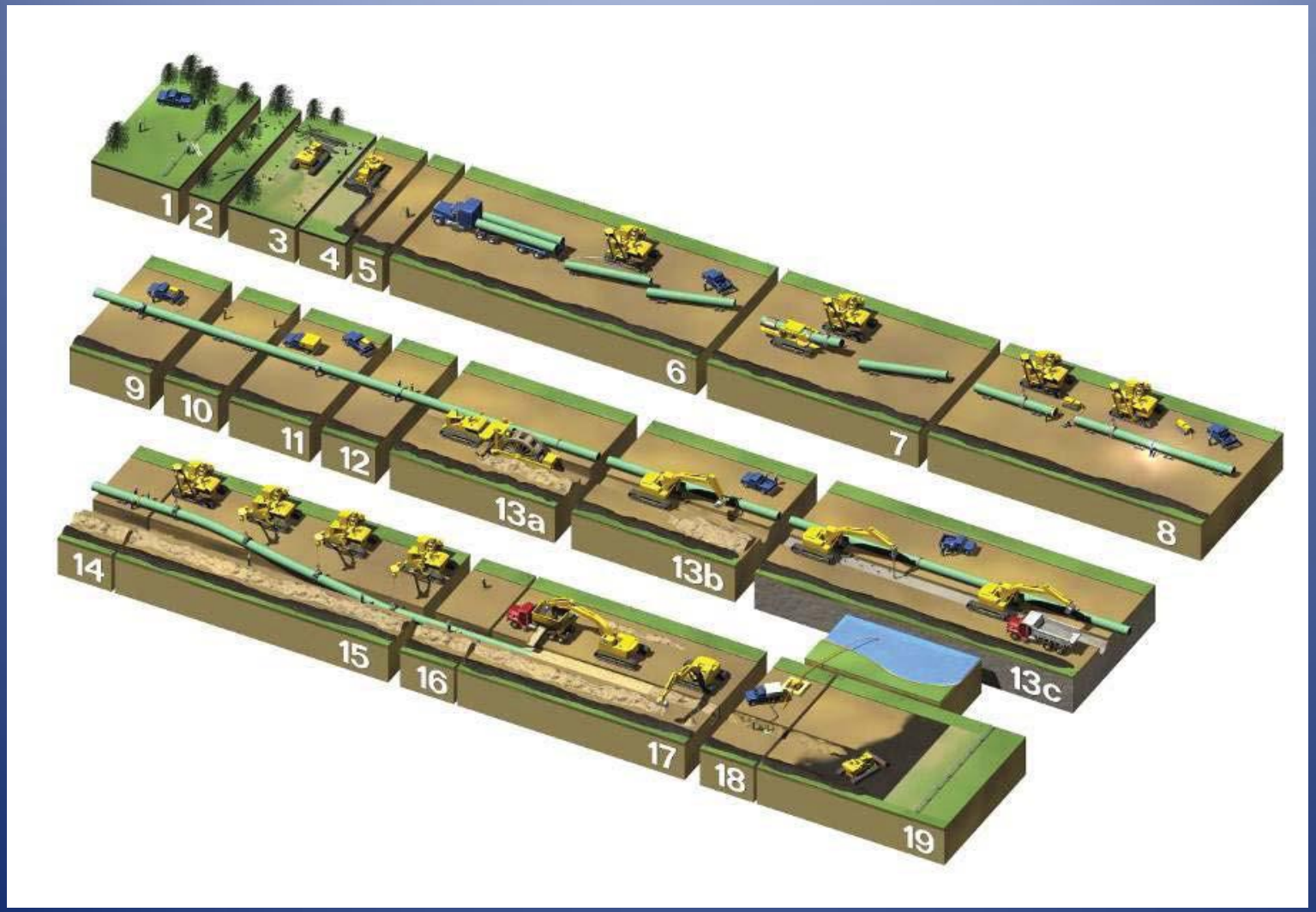
Stream Crossings for NEUP

- Two NEUP loops are located within the Delaware River Basin (Loops 321, 323), which span Wayne, Pike (PA), and Sussex counties (NJ).
- The project includes pipeline drilling activities under the Delaware River, significant new grading and clearing of previously undisturbed forested land and steep slopes, **and over 80 separate water body crossings** within the watershed

Pipeline Construction Basics

J.Zenes – TGP NEUP – High Point SP, April 2013

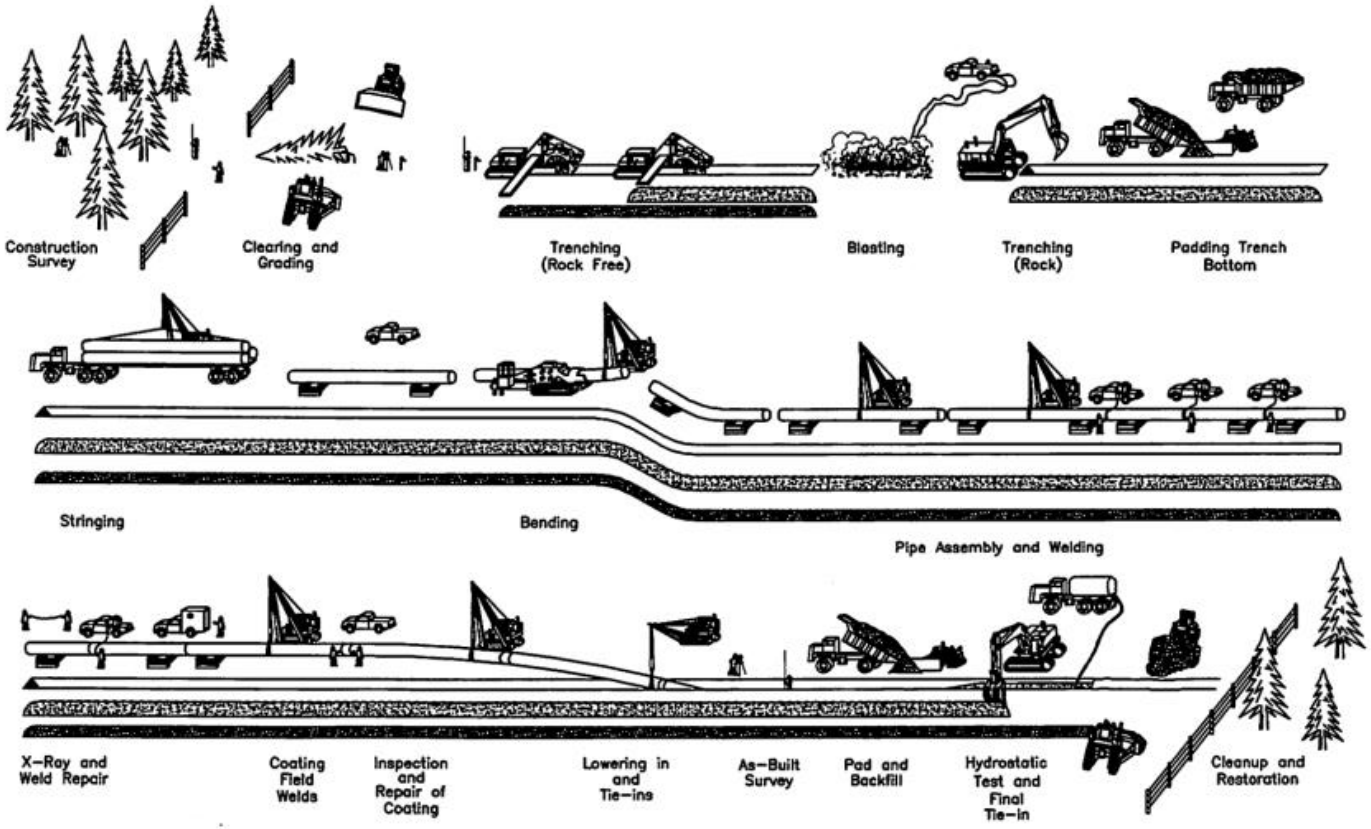
Pipeline construction sequence



Tennessee Gas NEUP Environmental Assessment, 2012

Typical Pipeline Construction Sequence

- Surveys and assessments
- Cutting (tree cutting, Migratory birds) & Clearing the Land
- Trenching (rock free) or Blasting (rock)
- Trenching the blasted rock
- Padding Trench Bottom (NOT with topsoil)
- Stringing Pipe
- Bending Pipe
- Pipe Assembly & welding
- Xray and weld repair
- Coating welding spots
- Inspection of coating & repairs
- Lowering pipe into trench and tying in
- Pad and back fill
- Hydrostatic test and final tie in
- Clean up and “Restoration”



ENG. RECORD		DATE
DRAWN BY:		
DRAWING APPROVAL		
PROJECT APPROVAL		
SURVEY DATE:		
SCALE: NONE		
PROJECT ID:		
FILE NAME:		

Tennessee Gas Pipeline
an El Paso company

TYPICAL PIPELINE CONSTRUCTION SEQUENCE

DWG. NO. CS

REV.

DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Types of Stream Crossings

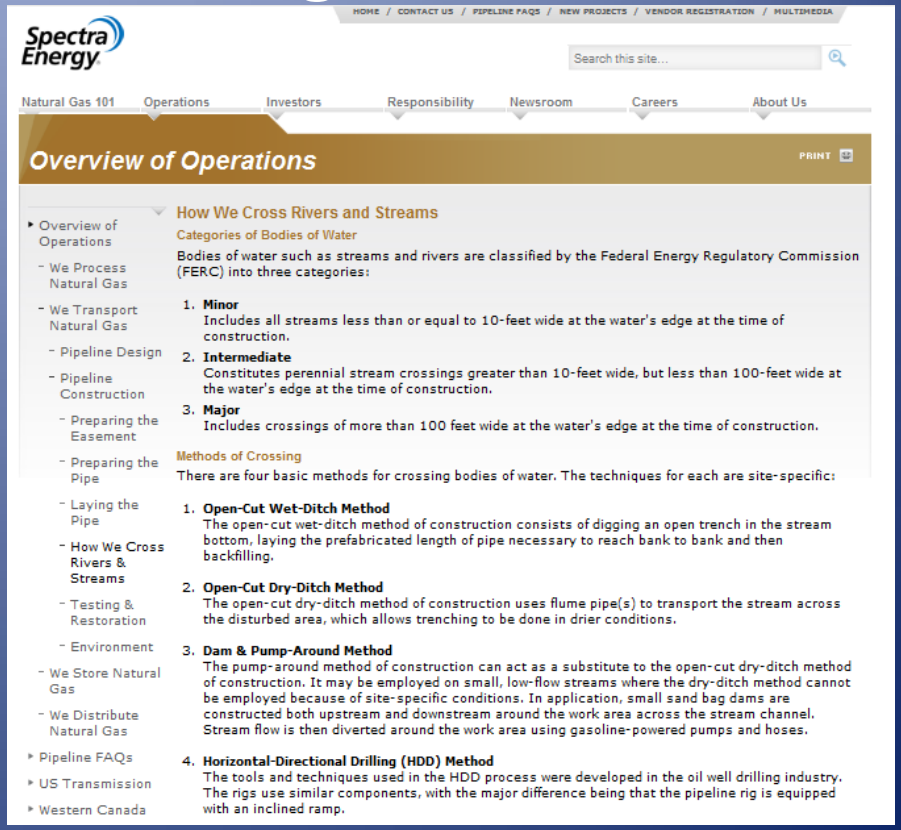
Through the stream: Wet Ditch, Flumed or Partial Diversion and Dam and pump method

Delaware River Keeper Network

http://www.tpm-clynch.com/services.html

Methods of Stream Crossings

- Two general watercourse crossing construction methods:
  - Dry Ditch (Bad)
    - Dam and Pump Method
    - Flume Crossing Method
    - Horizontal Direct Drilling Method
  - Wet Ditch (Worse)
    - In-Stream Method



Spectra Energy

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Overview of Operations PRINT

- Overview of Operations
- We Process Natural Gas
- We Transport Natural Gas
- Pipeline Design
- Pipeline Construction
- Preparing the Easement
- Preparing the Pipe
- Laying the Pipe
- How We Cross Rivers & Streams
- Testing & Restoration
- Environment
- We Store Natural Gas
- We Distribute Natural Gas
- Pipeline FAQs
- US Transmission
- Western Canada

How We Cross Rivers and Streams

Categories of Bodies of Water

Bodies of water such as streams and rivers are classified by the Federal Energy Regulatory Commission (FERC) into three categories:

1. **Minor**
   Includes all streams less than or equal to 10-feet wide at the water's edge at the time of construction.
2. **Intermediate**
   Constitutes perennial stream crossings greater than 10-feet wide, but less than 100-feet wide at the water's edge at the time of construction.
3. **Major**
   Includes crossings of more than 100 feet wide at the water's edge at the time of construction.

Methods of Crossing

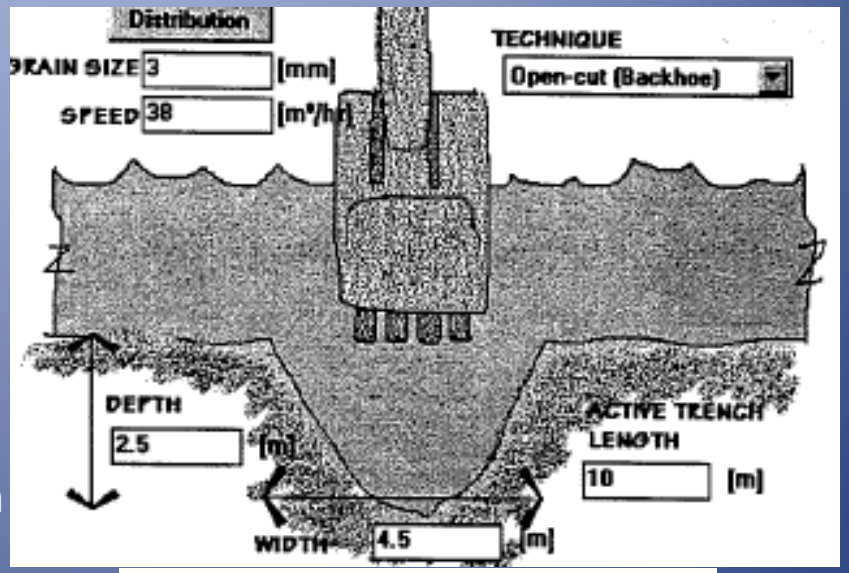
There are four basic methods for crossing bodies of water. The techniques for each are site-specific:

1. **Open-Cut Wet-Ditch Method**
   The open-cut wet-ditch method of construction consists of digging an open trench in the stream bottom, laying the prefabricated length of pipe necessary to reach bank to bank and then backfilling.
2. **Open-Cut Dry-Ditch Method**
   The open-cut dry-ditch method of construction uses flume pipe(s) to transport the stream across the disturbed area, which allows trenching to be done in drier conditions.
3. **Dam & Pump-Around Method**
   The pump-around method of construction can act as a substitute to the open-cut dry-ditch method of construction. It may be employed on small, low-flow streams where the dry-ditch method cannot be employed because of site-specific conditions. In application, small sand bag dams are constructed both upstream and downstream around the work area across the stream channel. Stream flow is then diverted around the work area using gasoline-powered pumps and hoses.
4. **Horizontal-Directional Drilling (HDD) Method**
   The tools and techniques used in the HDD process were developed in the oil well drilling industry. The rigs use similar components, with the major difference being that the pipeline rig is equipped with an inclined ramp.

T.C. Pharris, R.L. Kopla, Overview of the Design, Construction, and Operation of Interstate Liquid Petroleum Pipelines, Argonne National Laboratory (2007);
http://www.spectraenergy.com/Operations/Overview-of-Operations/We-Transport-Natural-Gas/Pipeline-Construction/How-We-Cross-Rivers

Wet Ditch Crossing (In-Stream)

- Technique does not use any method to divert the stream.
- A backhoe or dragline can be used in minor stream crossings to make a ditch for the pipe to rest in.
- The pipe may be fitted with concrete weights to hold it in place against the stream currents and movement of stream bed sediments.
- The pipe is installed and backfilled while the river/stream continues to run through the site.
- Results in substantial sedimentation downstream.

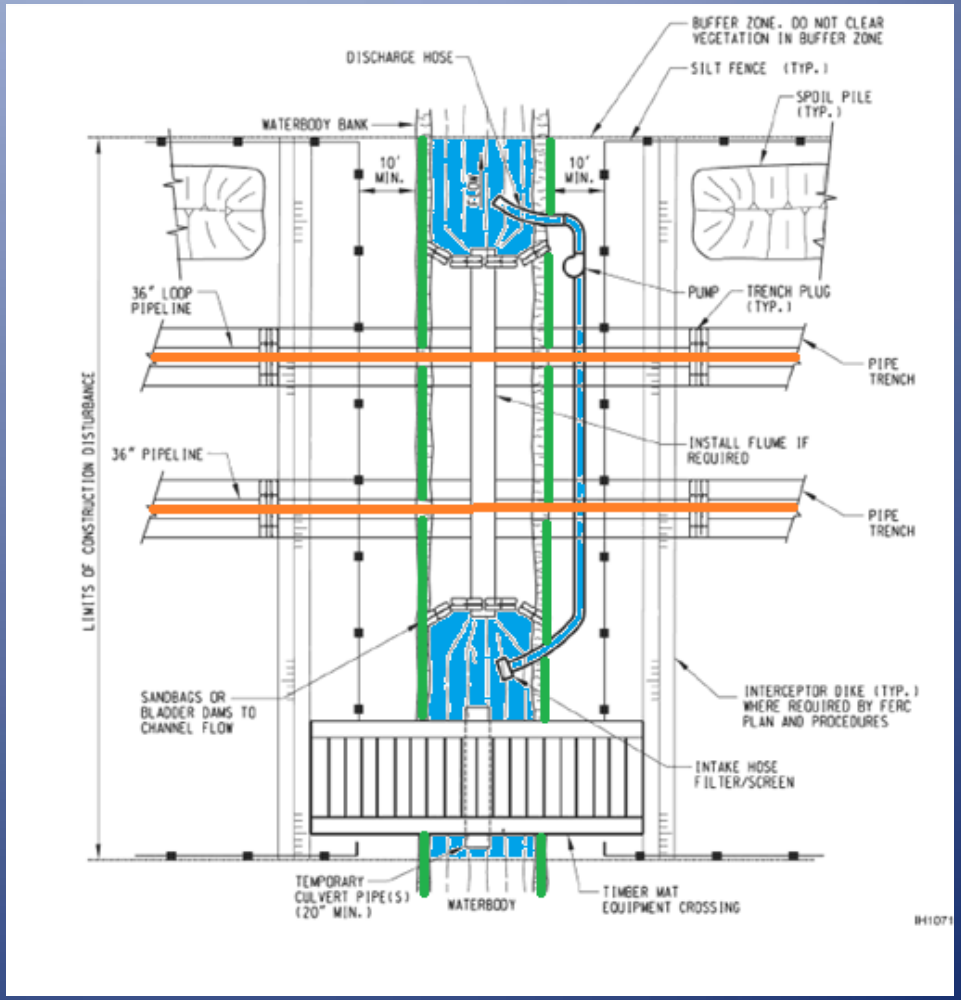


T.C. Pharris, R.L. Kopla, Overview of the Design, Construction, and Operation of Interstate Liquid Petroleum Pipelines, Argonne National Laboratory (2007)

Wet Ditch Crossing – Lackawaxen (HQ watershed)

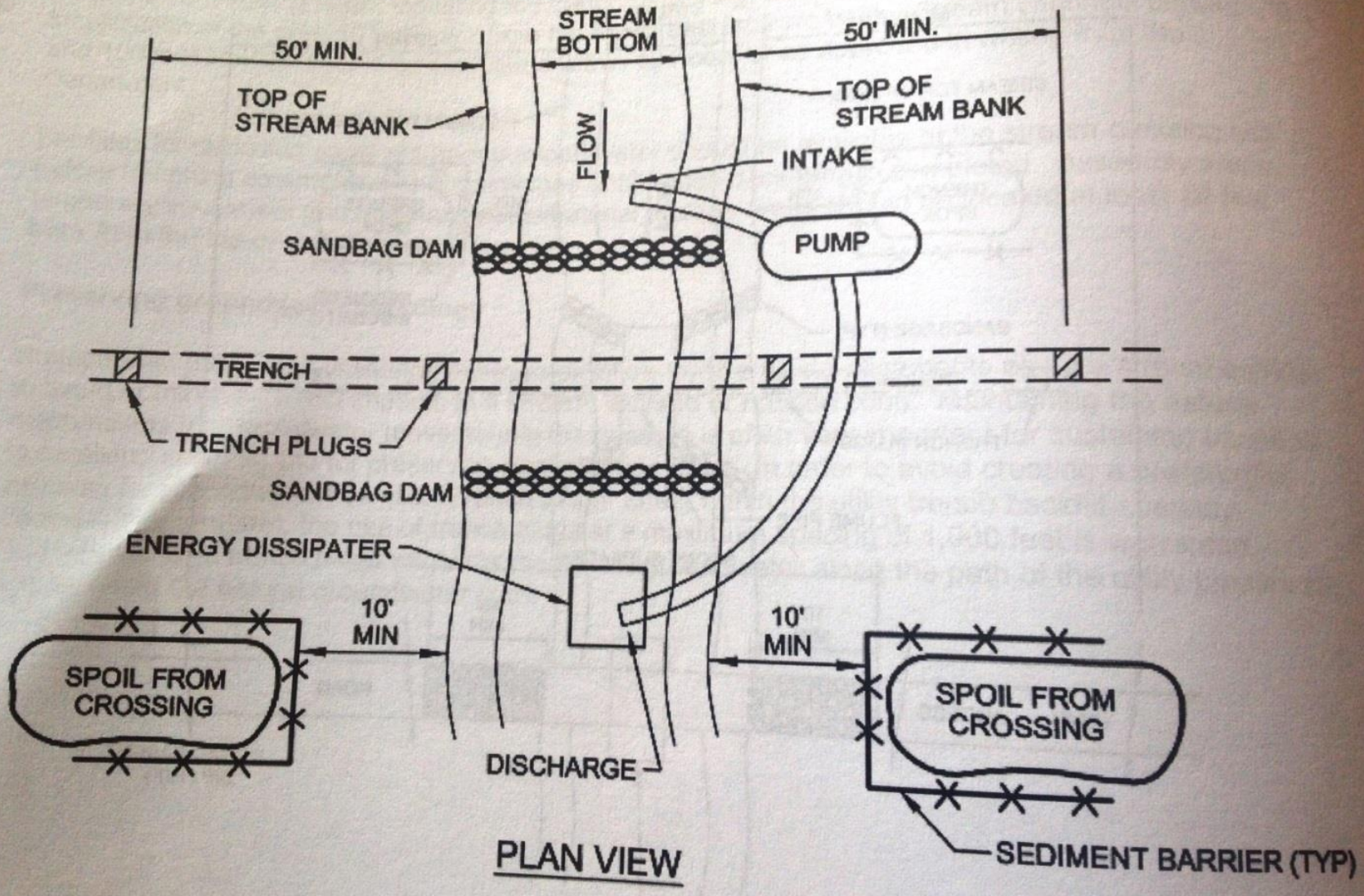
Dry Ditch Crossing (Dam and Pump)

- Stream is isolated and diverted around the pipeline crossing.
- Stream is dammed and water is transferred across the construction site by means of a temporary hose or pipe and pump.
  - Pumps - used to maintain downstream flows.
- Best suited for narrow streams and rivers with flows less than 141 cubic feet per second.



T.C. Pharris, R.L. Kopla, Overview of the Design, Construction, and Operation of Interstate Liquid Petroleum Pipelines, Argonne National Laboratory (2007)

STANDARD CONSTRUCTION DETAIL #13-2
Typical Utility Line Stream Crossing with Pump Bypass

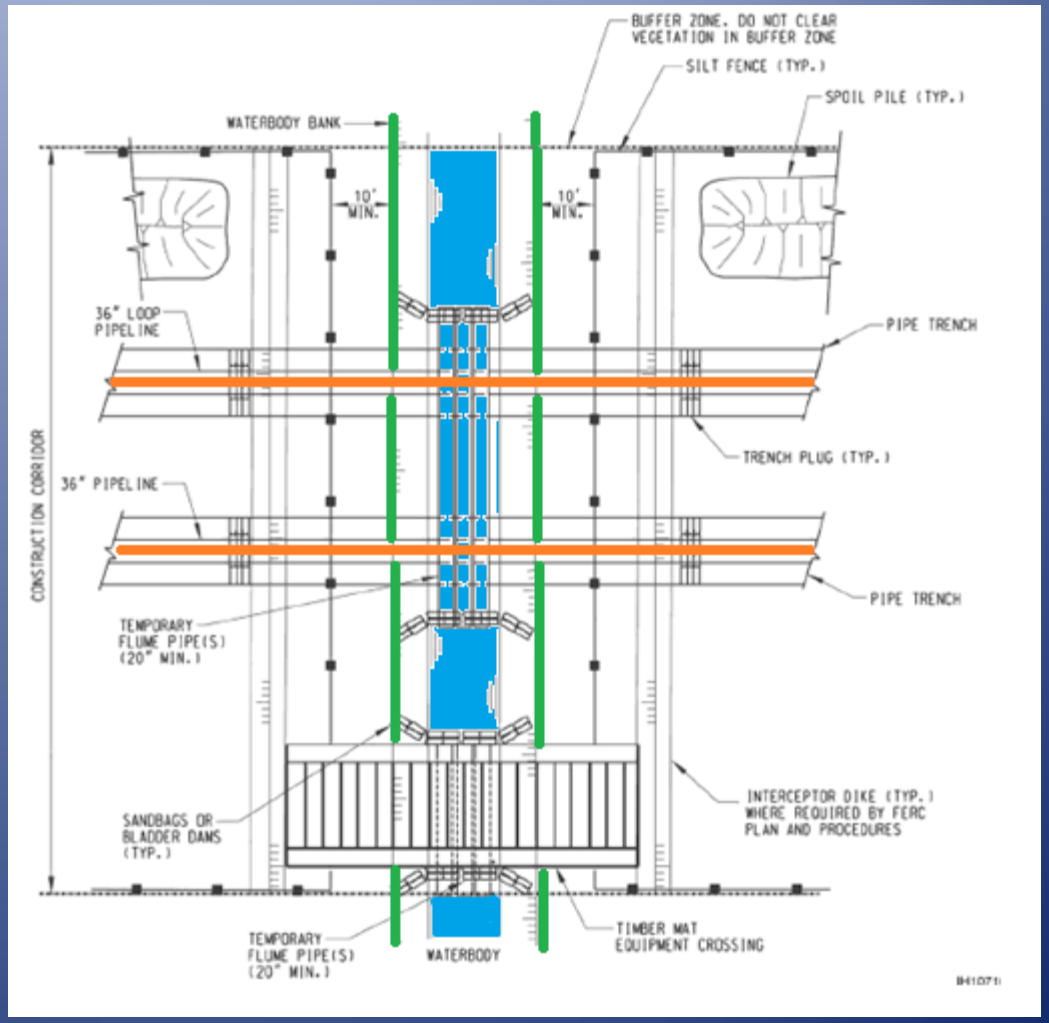


PLAN VIEW

PA DEP

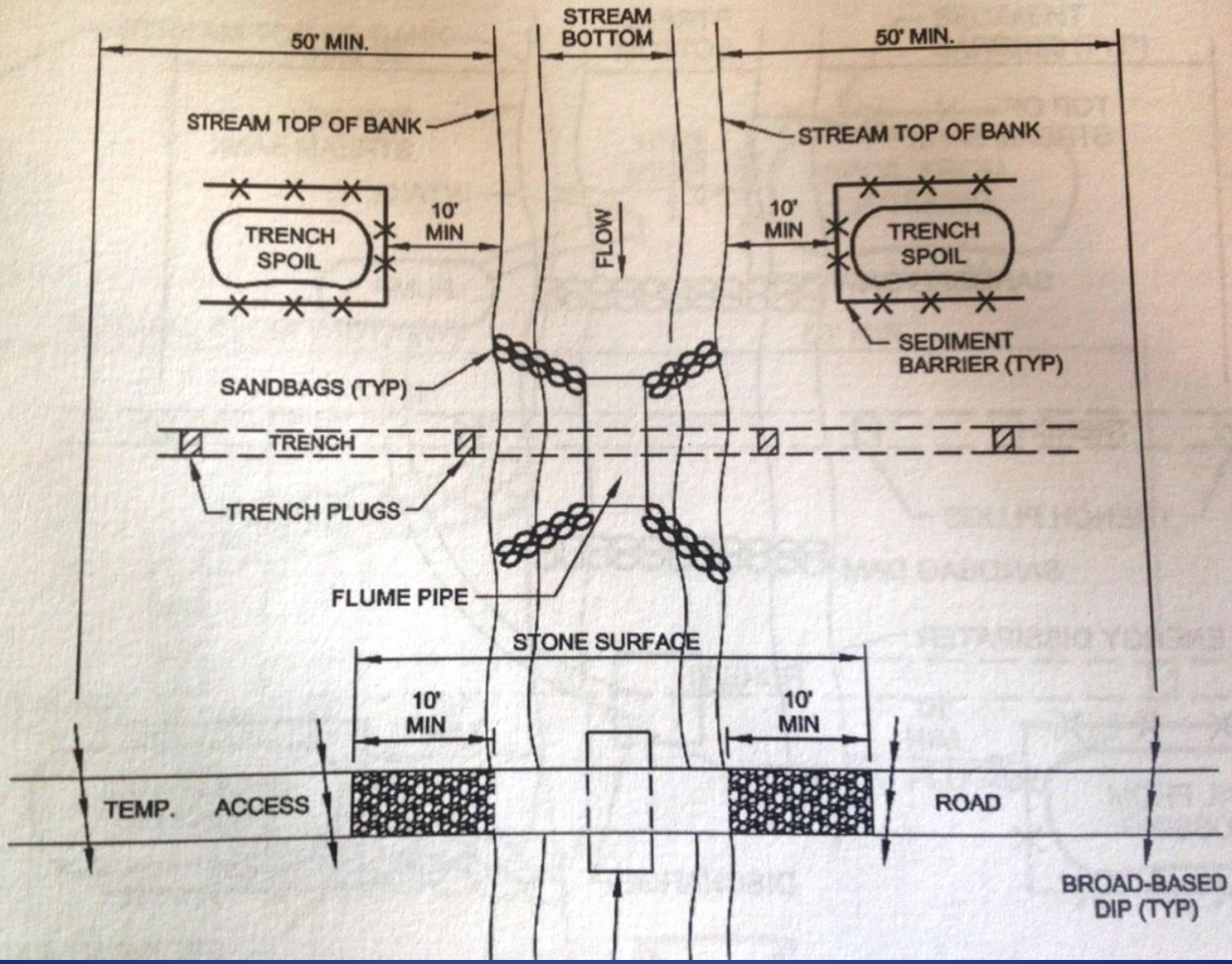
Dry Ditch Crossing (Flume)

- The stream is dammed and a culvert is installed.
- Flume pipe will be installed after blasting (if necessary), but before any trenching.
- Sand bags and plastic sheeting diversion structures, or equivalent often used to divert stream flow through the flume pipe.
- Modifications to the stream bottom may be required to achieve the seal.



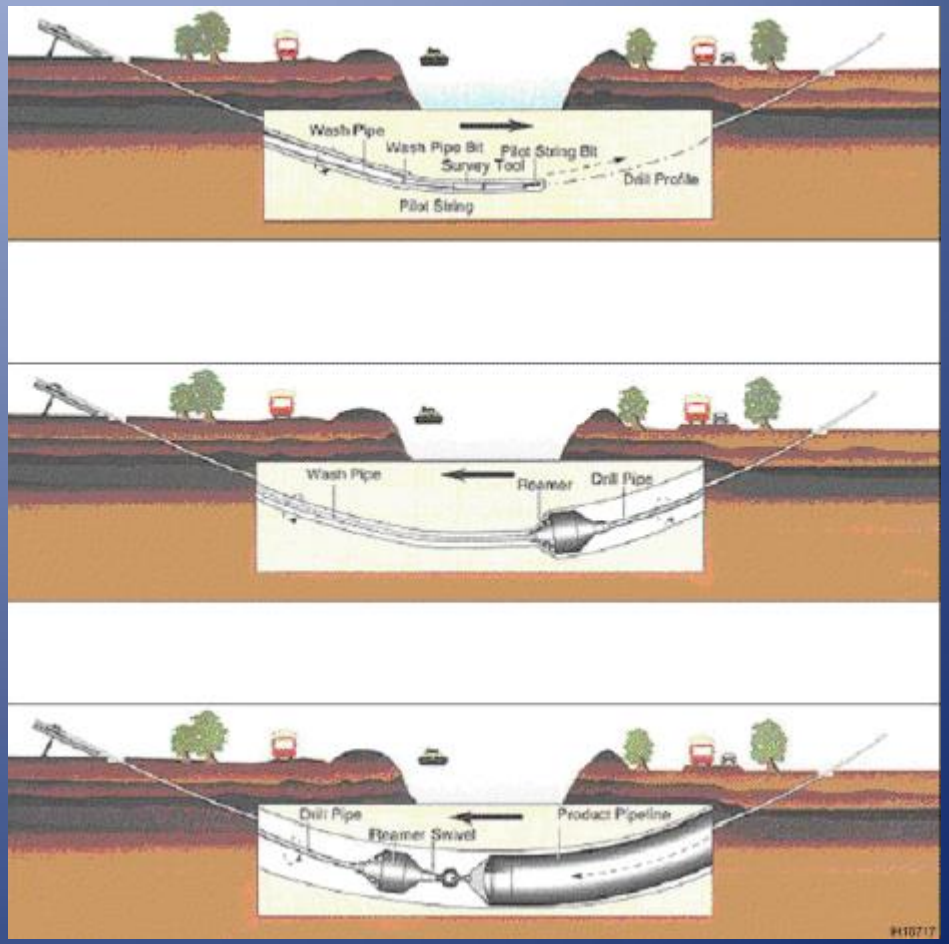
T.C. Pharris, R.L. Kopla, Overview of the Design, Construction, and Operation of Interstate Liquid Petroleum Pipelines, Argonne National Laboratory (2007)

STANDARD CONSTRUCTION DETAIL #13-1
Typical Utility Line Flumed Stream Crossing with Optional Access Road



Dry Ditch Crossing
(Horizontal Directional Drilling - HDD)

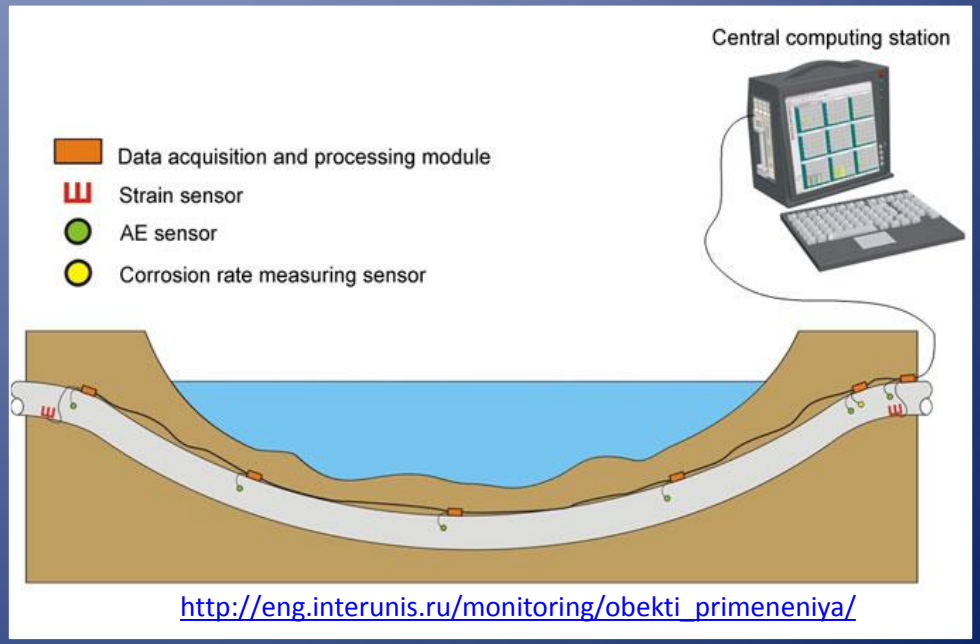
- Requires large areas to be cleared for mud pits, pipe assembly areas.
- A pilot hole is drilled.
- A slurry typically of bentonite clay is used to lubricate the drill and bring cuttings out of the hole.
- The pilot hole is then enlarged to a diameter larger than the diameter of pipe to be installed.
- Prefabricated pipe segment is pulled into the hole, using the same drill rig that bored the initial and enlarged holes.



T.C. Pharris, R.L. Kopla, Overview of the Design, Construction, and Operation of Interstate Liquid Petroleum Pipelines, Argonne National Laboratory (2007)

Under the stream: Horizontal-directional drilling method (HDD)

http://www.geoengineers.com/project/gulfstream-natural-gashdd-design-and-construction



http://eng.interunis.ru/monitoring/obekti_primeneniya/

J. Wagner

HDD Entry Pad (adjacent Tilcon Yard- Loop 325)

Monksville HDD – 12 inch pilot hole about 300 feet - TGP construction report , 5/9/13

Environmental Impacts

J.Zenes

Environmental Impacts of Pipeline Construction

- 1) Sedimentation and erosion
  - Effects on benthic invertebrates
  - Effects on fish habitat
- 2) Forest fragmentation and habitat loss
- 3) Loss of riparian vegetation
- 4) Effects on water quality (thermal, eg)
- 5) Stream geomorphology impacts
- 6) Air Emissions
- 7) Accidents, explosions and Permit Violations
- 8) Soil Compaction/increased stormwater runoff
- 9) Cumulative environmental impacts
- 10) Amphibian declines and disruption of breeding cycles

Sedimentation and Erosion Impacts – Wet Ditch Crossing

Example of a Wet Ditch Crossing:

- Tennessee 300 Line Extension Project across the Lackawaxen River (Summer 2011).

Sedimentation and Erosion Impacts

- EIAs and literature documenting the effects of stream crossing construction on aquatic ecosystems both identify sediment as the primary stressor of construction on river and stream ecosystems.
  - Discrete peaks of high suspended sediment concentration occur during activities such as blasting, trench excavation, and backfilling.
  - The greatest peaks in suspended sediment concentrations are associated with trench excavation.
  - Excavation of streambeds composed primarily of clay or silt sized particles can generate persistent plumes of high suspended sediment concentration or turbidity.

Scott, Read, Effects of Sediment Released During Open-cut Pipeline Water Crossings, Canadian Water Resources Journal, 1999, 24:(3) 235-251

Sedimentation:
Effects on Benthic Invertebrates

- Reductions in benthic invertebrate densities are attributed changes to the suitability of downstream habitat due to sediment deposition, and high downstream drift rates during in-stream construction. (Anderson et al., 1998)
  - (e.g., the infilling of interstitial voids between gravels and cobbles).
- Downstream changes to the diversity and structure of benthic invertebrate communities (Anderson el a/. 1998).
- "Observed changes in community structure likely resulted from reductions in habitat availability for species dependent on interstitial spaces between coarse substrates."

Scott Read, Effects of Sediment Released During Open-cut Pipeline Water Crossings, Canadian Water Resources Journal, 1999, 24:(3) 235-251

Sedimentation: Effects on Fish Habitats

- Potential direct effects during in-stream construction on downstream fish include:
  - changes to fish behavior (e.g. habitat selection)
  - decrease in abundance and/or type of food organisms
  - decreased survival and/or development of eggs
  - decreased fish survival as a result of mortality or increased stress which can reduce their growth rates and/or resistance to disease (Anderson et al., 1996).
- Immediate post-construction decreases in downstream fish density. (Peterson et. al., 1978); (Schubert et al., 1987); and (Anderson et al., 1998)
- Due to their immobility, egg and larval lifestages are at greatest risk to be affected negatively by increases sediment suspension and deposition. (Dehoney and Mancini 1982)

Scott Read, Effects of Sediment Released During Open-cut Pipeline Water Crossings, Canadian Water Resources Journal, 1999, 24:(3) 235-251

Forest Fragmentation and Habitat Loss

- Introduction of invasive species. (e.g. Japanese Knotwood, phragmites, etc…)
- Native wildlife species decline. (e.g. scarlet tanager vs. cardinals/cowbirds)
- Creation of micro-climates that degrade forest health (sunscald, frost cracking, windthrow) – **pipeline impacts documented over 300 ft outside of ROW**
- Increased human activity. (e.g. off-road vehicles, ATVs, hikers)

Dan Woodring, Forest Leaves, Volume 18, No. 3 (2009)

Forest Fragmentation and Habitat Loss

- An impact assessment conducted by the Nature Conservancy in Pennsylvania, estimates that 60,000-150,000 acres of PA forest could be lost to new pipeline construction

Pennsylvania Energy Impacts Assessment, http://www.nature.org/media/pa/pa_energy_assessment_report.pdf; http://www.bayjournal.com/article.cfm?article=4246

Forest Fragmentation, Soil Compaction, Increased Stormwater Runoff

F.Zerbe

J.Wagner

TGP/Kinder Morgan NEUP
Top: non-colocated section of Loop 323, Milford PA
Right: Sloatsburg Rd and Morris Rd, Ringwood, NJ – Loop 325
February, 2013

Soil Compaction

Soil sampling along TGP 300 Line commissioned by DRN indicates soils in TWS more compacted than specs. for an earthen dam. (Meliora Tech Memo, 2/2013)

F.Zerbe

Loss of Riparian Vegetation

- Loss of vegetation associated with clearing stream banks can affect all life stages of fish.
- Decreased foliage raises stream temperature.
  - Reduces suitability for: incubation, rearing, foraging and escape habitat.
- Inputs of sediment into the watercourse may persist if the approach slopes on the right-of-way have been inadequately stabilized or re-vegetated.

Scott, Read, Effects of Sediment Released During Open-cut Pipeline Water Crossings, Canadian Water Resources Journal, 1999, 24:(3) 235-251

Pipeline Safety Tracker - ProPublica - Mozilla Firefox

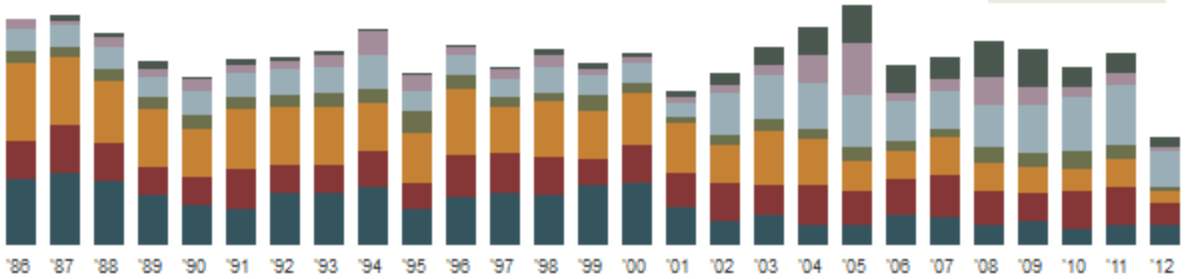
File Edit View History Bookmarks Tools Help

Pipeline Safety Tracker - ProPublica

projects.propublica.org/pipelines/

PIPELINE INCIDENTS BY CAUSE

hover for details



2012 is partial

Pipeline Deaths

Pipeline Injuries

Pipeline Property Damages

PIPELINE INCIDENTS BY THE NUMBERS

7,763	536	2,366	$6.75B	3,918	3,845
Incidents	Fatalities	Injuries	Property Damages	Gas Incidents	Hazardous Liquid Incidents

PIPELINE INCIDENTS BY STATE

State	Incidents	Fatalities	Injuries	Property Damage
Texas	1,669	78	371	$668M
Louisiana	590	20	96	$1.42B
California	573	43	198	$725M
Oklahoma	418	15	42	$84M
Illinois	338	20	99	$178M
Kansas	333	8	54	$93.4M
Not Specified	280	0	0	$810M
Pennsylvania	275	33	137	$133M
Ohio	197	17	93	$96.8M
Michigan	171	23	72	$804M

Find Pipeli

State, City or Operator (e

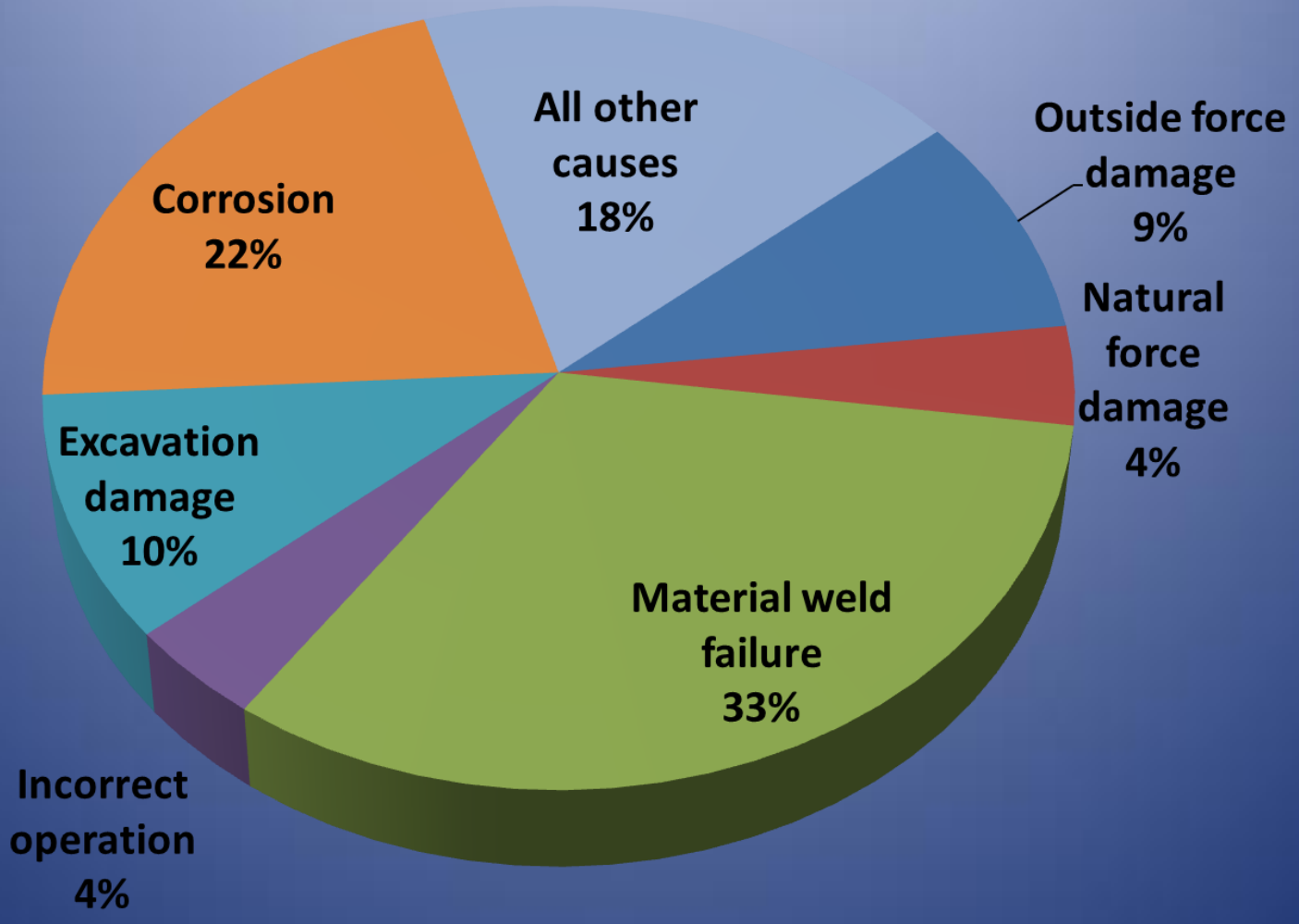
milford, pa

Or see incidents by year:

More on this Data

The map displays only "s
PHMSA, the Pipeline and
Administration, as those
serious injury, cost more

2011 causes of pipeline failure

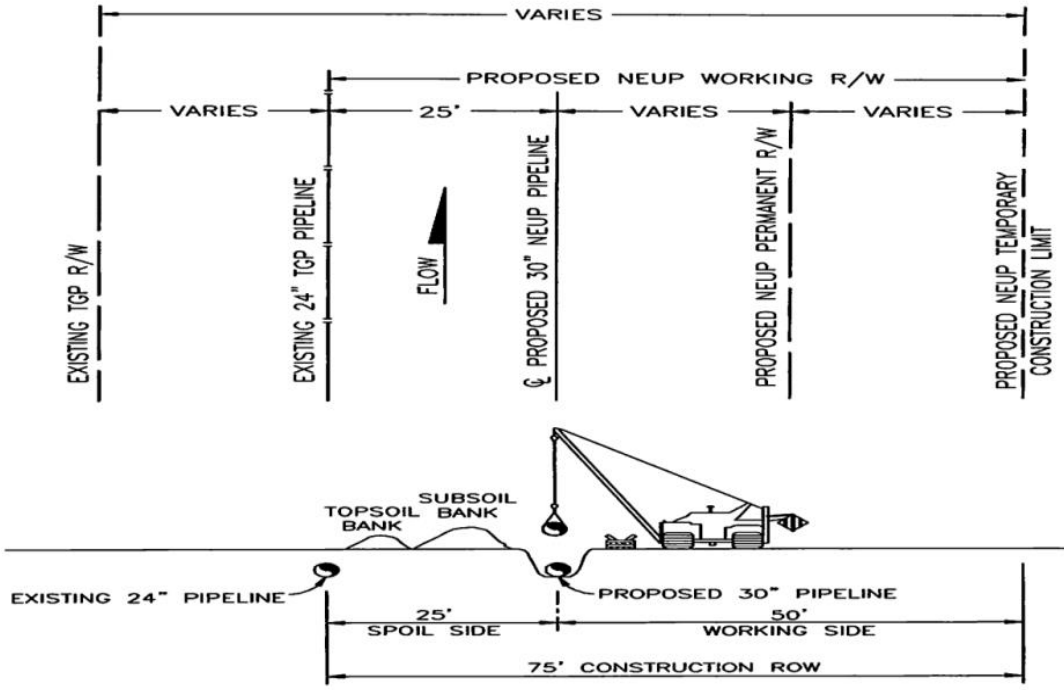


http://blog.enerdynamics.com/2013/02/03/natural-gas-pipeline-safety-a-crisis-or-a-manageable-issue/ - ***Source: http://projects.propublica.org/pipelines/***

Pipelines Fueling Gas Drilling

Frack pad across the Delaware Basin divide in Susquehanna Basin

100 ft ROW for a 30 inch pipe?



NOTES

1. CONFIGURATION DOES NOT INCLUDE ADDITIONAL TEMPORARY WORKSPACE AT CROSSINGS.
2. TOPSOIL WILL ONLY BE SEGREGATED IN DRY STREAM CROSSINGS AND NON-SATURATED WETLANDS.
3. MINIMUM THREE (3) FEET COVER OVER TOP OF PIPE.
4. EXACT TOPSOIL/SUBSOIL STORAGE LOCATIONS TO BE DETERMINED AT TIME OF CONSTRUCTION.

NO	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
REVISIONS					

ENG. RECORD		DATE
DRAWN BY:		
DRAWING APPROVAL		
PROJECT APPROVAL		
SURVEY DATE:		
SCALE: NONE		
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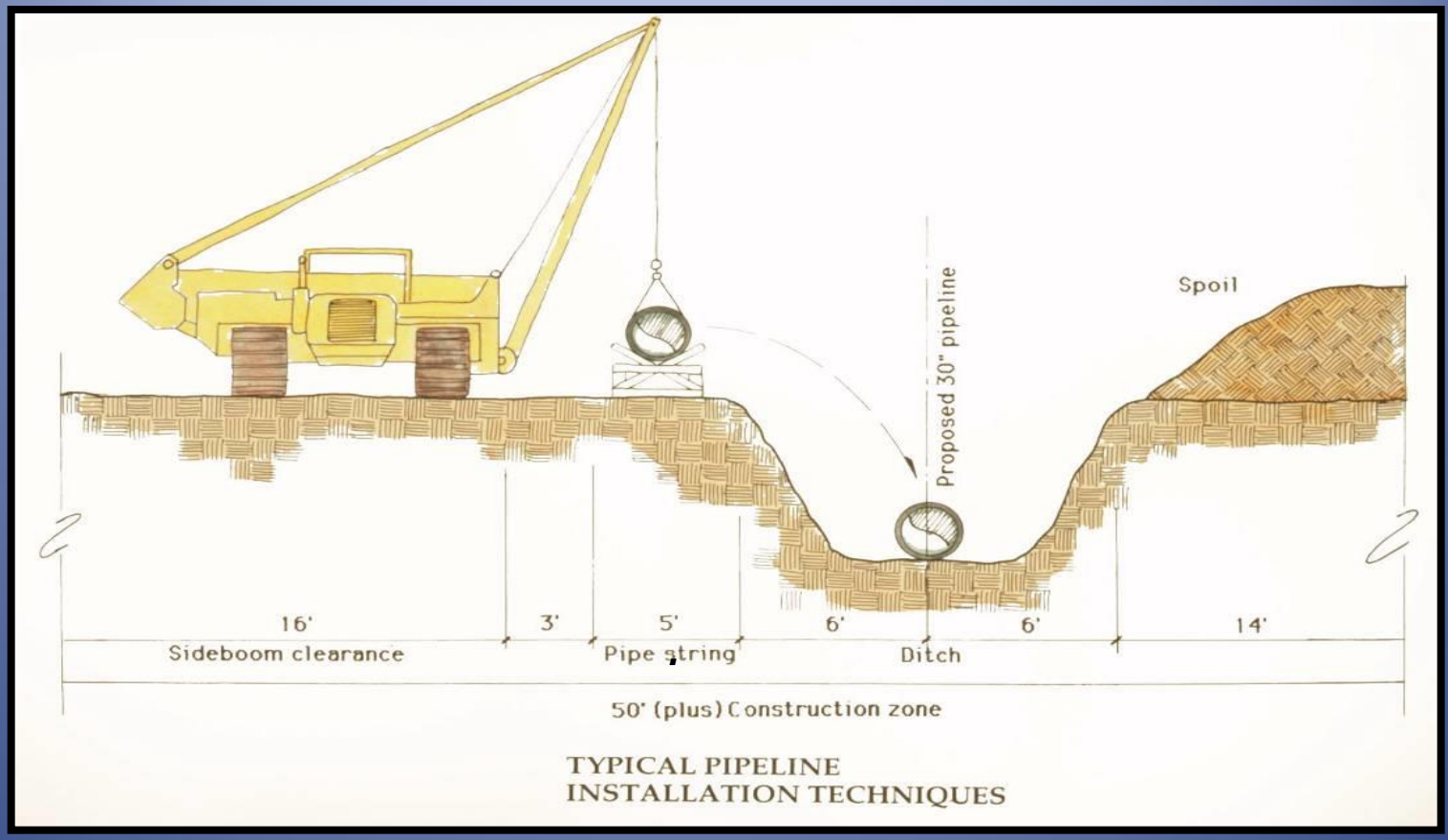
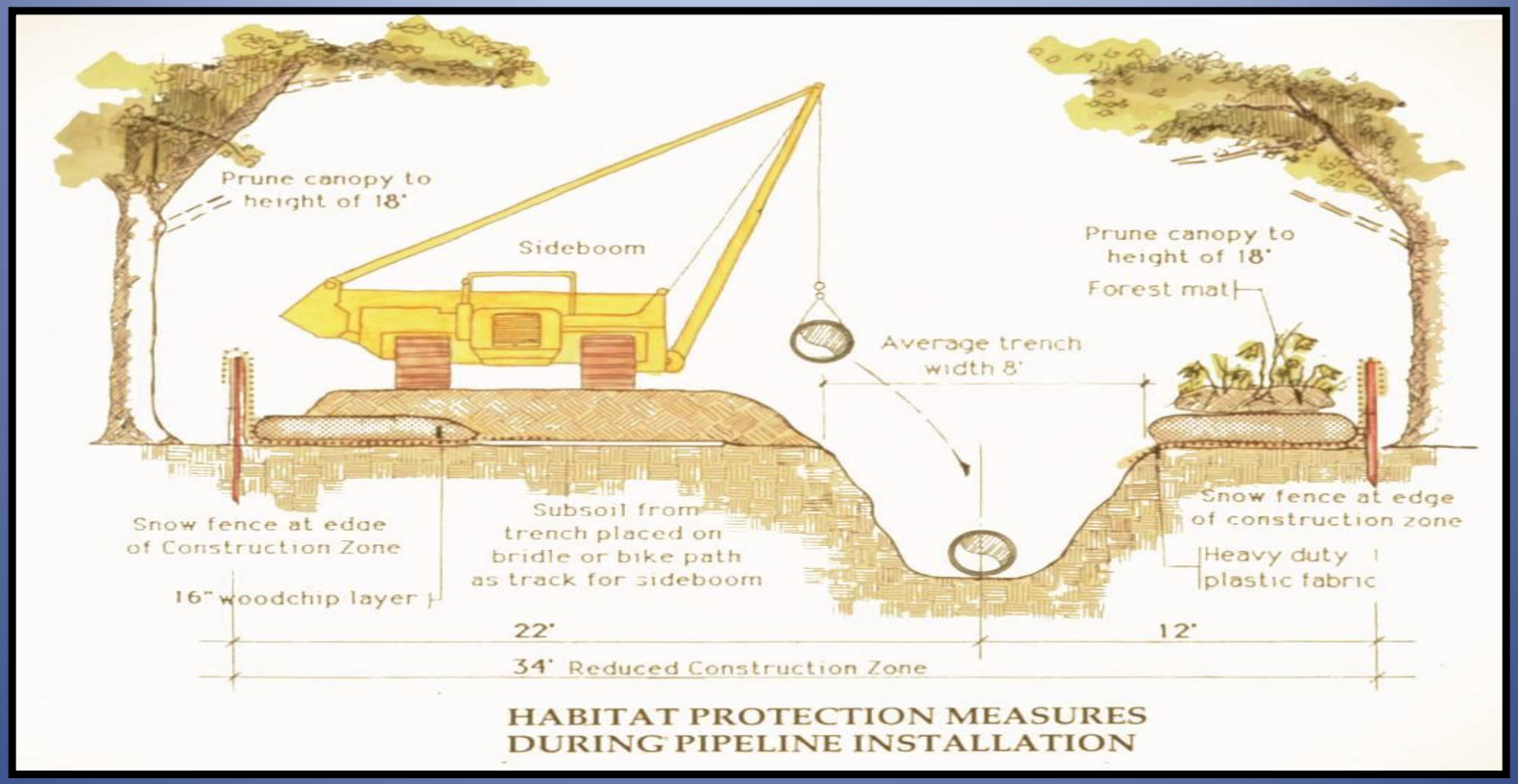
Tennessee Gas Pipeline

TOPSOIL SALVAGE TRENCH ONLY

DWG. NO. R2A



• Up to 100 feet for the ROW is routinely asked for in natural areas and on farms. While it is always nice to have all the room in the world to work, a narrower ROW reduces impacts more than any other action. Morris County rejected proposed 50 foot conventional cross-section.



- Morris County negotiated a very narrow ROW of 34 feet that included:
- Alternate technique- stove-piping
- Smaller side boom
- Woodchips to cushion equipment
- Soil and vegetation 'sods'
- Clearance limited to 34 feet

Part 2 – BMPs and E&S 101

Non-CoLocated Route of NEUP

J.Zenes, High Point SP – April, 2013

What are BMPs?

- BMP = “Best Management Practice”
- “Manage” Stormwater to:
  - Slow down flow speed to prevent erosion
  - Prevent sediment and pollutants from entering waterbodies
- “Best” = appropriate for the site

Outlined goals in PA BMP Manual, 3/31/2012

- Minimize extent & duration of earth disturbance
- Maximize protection of existing drainage features & vegetation
- Minimize soil compaction
- Use other BMPs to prevent or minimize increased stormwater runoff

Steep Terrain and Lots of Water and High Quality Special Protection Waters & Forests

- 80 waterbodies to be crossed by TGP for NEUP in Delaware Basin alone
- Steep slopes – some almost 90% grade (cummins creek gorge, areas in high point state park)

Cummins Creek area - tree cutting L. Klee

TGPNEUP Pipeline Project – Steep Slopes

- Loop 323 (PA) – 6,814 ft of steep slopes
- Loop 323 (NJ) – 6,908 ft of steep slopes
- Loop 325 (NJ) – 6,382 ft of steep slopes

- Loop 321 (wayne co) – 456 ft of steep slopes
- Loop 319 – 0 ft of steep slopes
- Loop 317 – 3,213 ft of steep slopes

Mature Forested Steep Slopes

Steep Slopes

Delaware River/ Mashipacong Island HDD

Visual Assessment

- Document physical status of the construction site and nearby waterbodies
- Identify potential impacts/pollution events
- Report violations and/or suspicious activity

ALLARM

Visual Assessment

What to look for when you're "out and about":

- Anything out of the ordinary that may impact streams
- Accelerated erosion
- Spills
- Pollution incidents
- Suspicious activities

Photo courtesy of PFBC

Key things to monitor for

- Sediment leaving the site – especially during times of rain – running into streams/wetlands
- Signs of sediment pollution after rain – stained leaves etc., turbid standing water
- Ineffective or inadequate perimeter controls
- Too much ditching left open and inadequate mulching and temporary stabilization techniques
- Steep slope issues

Best Management Practices for E&S

Silt fence – perimeter controls

Diversion Ditch

Office of Fossil Energy

Compost Filter Sock

Monitoring E&S BMPs: need to confirm that they are installed correctly and maintained properly.

ALLARM

Earth Disturbances

- Sediment entering streams as a result of any earth disturbance

- Sediment on/from access roads

Common BMPs To Look For

- Construction entrances
- Perimeter controls (compost filter socks (SPWs), silt fencing, sometimes haybales
- Soil stabilization – straw mulch on bare soils
- Soil management – top soil segregation
- Trench plugs
- Narrow travel lanes

Construction Entrances

- Why Important?
  - Entrance is way for sediment to escape from the construction site
  - If you see dirt on the main street from the pipeline construction entrance – document it and take photos
  - Entrances should have good rip rap – good entrances have stone pad underlain with filter cloth – stones should not be muddy

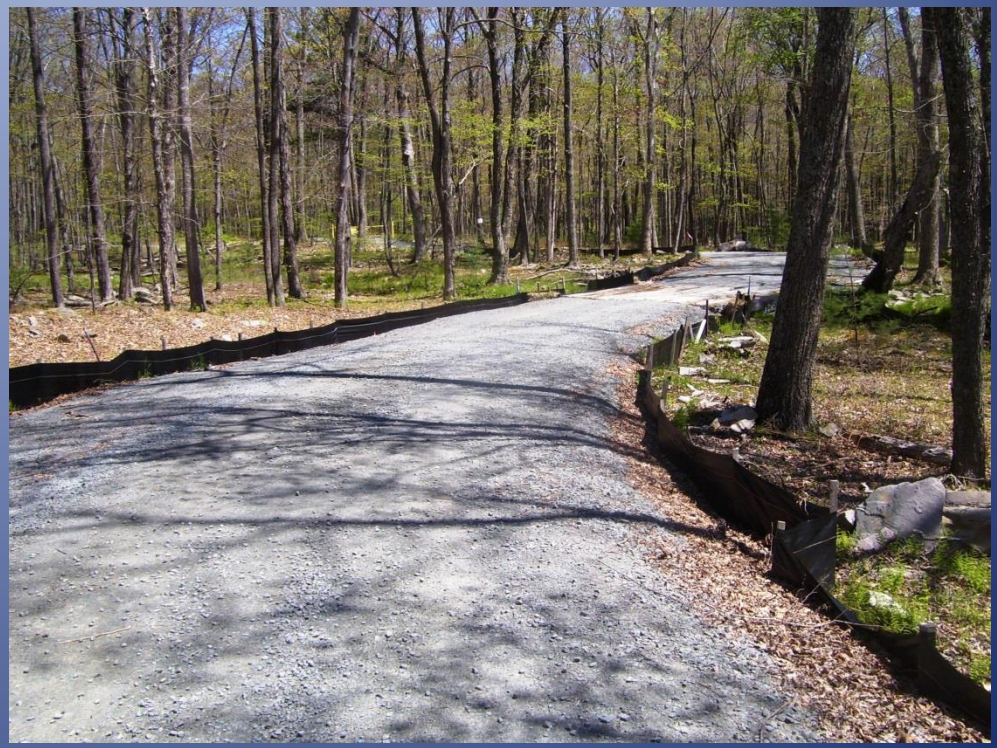
Bad Construction Entrance

- No rock/rip rap present to remove mud from equipment leaving site
- Mud getting tracked on main road and leaving construction site

Follow the mud……

TGP ECP on Construction Access

- 4 inch minimum of stone/aggregate at entrances
- Geo textile underlays the aggregate
- Access entrance road to end at ROW line



Perimeter Controls To Look Out For

- Checking perimeter controls during times of rain can be very telling and help document if controls are working properly and pooling water and minimizing sediment leaving the perimeter

Compost Filter Socks – approved for SPWs and if installed properly better than silt fence

Alignment

- be installed on existing level grade
- urned upslope at 45^{O} to main barrier
  nent to prevent end-arounds
- most barriers, 8' is sufficient
- ere barrier would have to extend for a long
  ance, a compacted berm tying into the ends
  he barrier may be used

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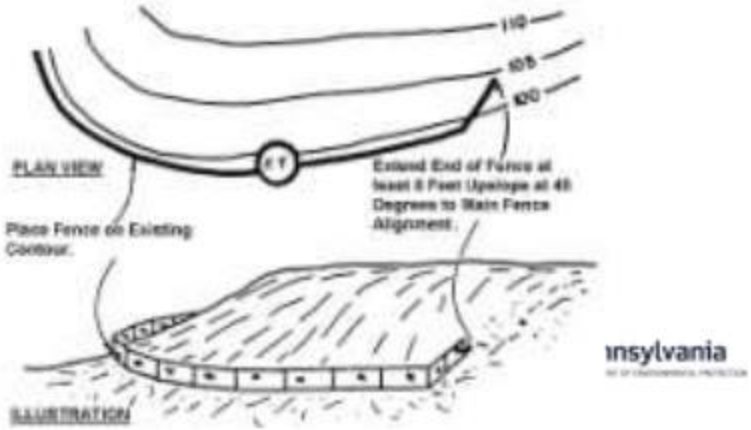
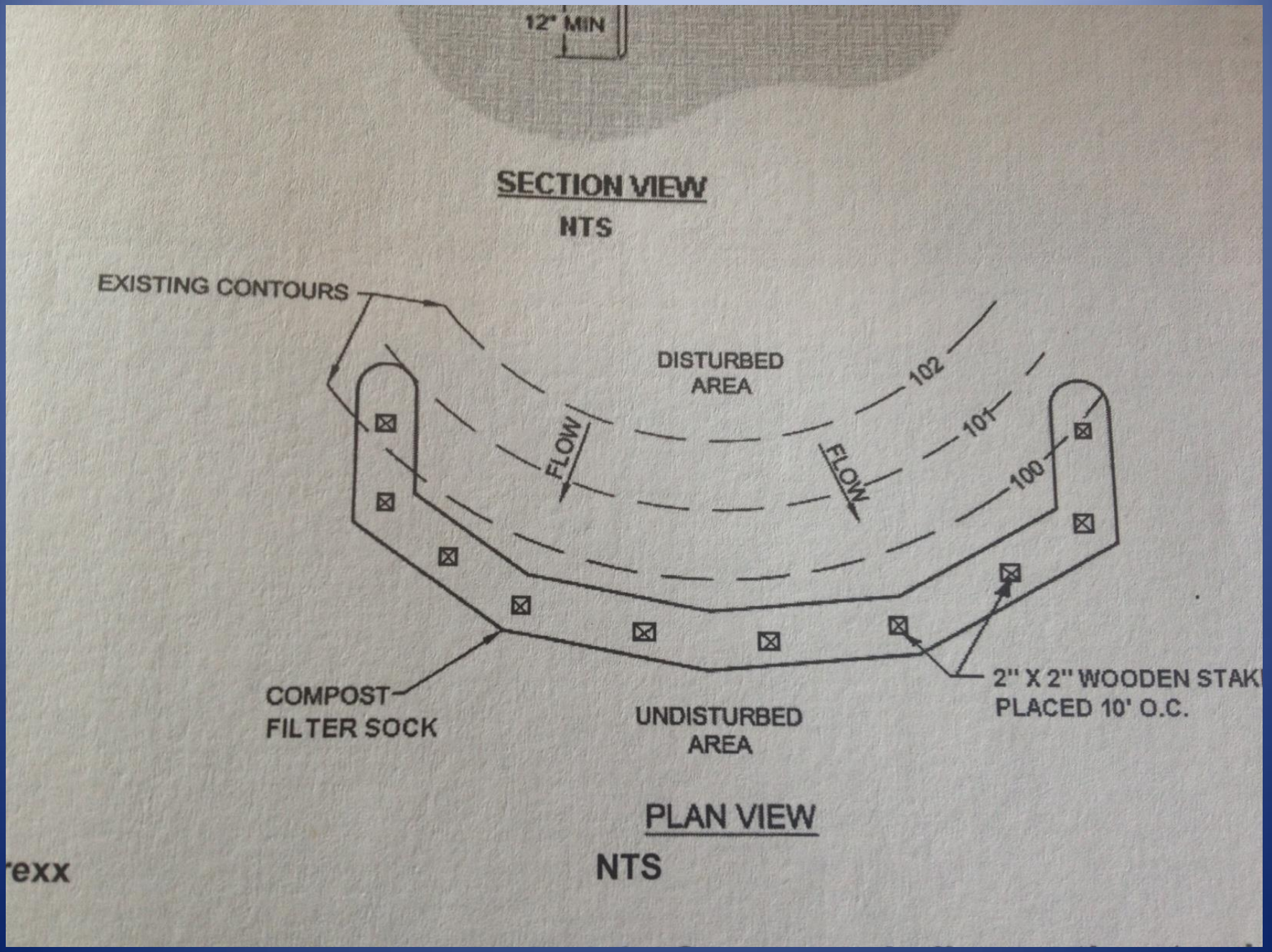
FIGURE 4.1
Sediment Barrier Alignment

Brought back from 1990 E&S Manual




12" MIN
SECTION VIEW
NTS
EXISTING CONTOURS
DISTURBED AREA
102
101
100
FLOW
FLOW
COMPOST FILTER SOCK
UNDISTURBED AREA
2" X 2" WOODEN STAK
PLACED 10' O.C.
PLAN VIEW
NTS

Compost filter socks – required on steep slopes – approved for SPWs – Sediment Removal Efficiency - High:

- Staked every 10 feet minimum
- Socks should be placed parallel to construction but turned up 45 degrees on ends to avoid “run around” and allow pooling behind the sock versus flowing water around the sock ends

Perimeter Controls – Compost Filter Sock and Silt Fence

“Super silt fence” – in SPWs this cannot be used alone
Sediment Removal Efficiency: Low
Note sediment in downslope wetland –

Silt Saver Belted Silt Retention Fence

- Silt saver belted silt retention fence may be installed with the approval of the county CD in lieu of compost filter socks in HQ/EV watersheds (TGP ECP)
- 18-24 inch overlap between layers needed
- Life – approx one year

What is wrong with this Straw Bale Barrier?

2 stakes per bale are needed but stakes are not flush with the bales

The bales are not dug into a trench so are being undermined and undercut

The gap between the bales – stone does not act as a bale!


Steep Slope
BMPs

Steep Slope BMPs (TGP SS plan, 10/2012)

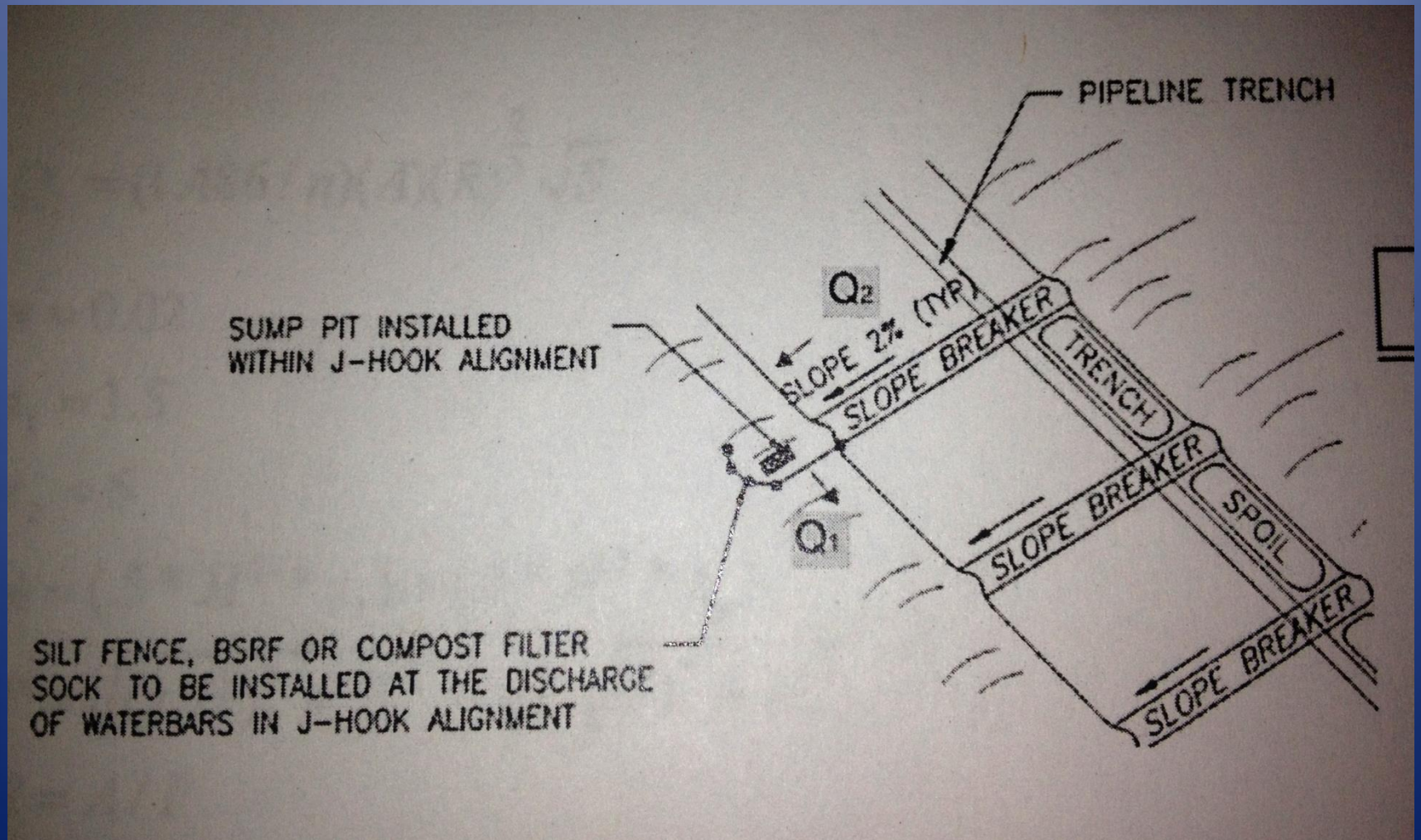
- Limit amount of disturbance prior to ditching for pipe installation
- Steep slopes must be stabilized with mulch immediately after soil is exposed and expected to be left exposed for > 4 days
- Maintain a minimum of 50 foot un-grubbed buffer around water resource located at base of steep slope until crossing is performed. All woody vegetation within this 50 ft buffer must be cleared by hand
- Work on steep slopes during rain events that results in runoff is PROHIBITED
- Ensure travel lane does not become conduit for runoff
- Temporary erosion control measures such as temp slope breakers and silt fence in addition to mulching must be installed as needed by the end of each working day where earth disturbing activity is occurring (grading or ditching) on a steep slope

Steep Slopes Cont'd – Ditching Requirements

- Ditching & pipe installation shall progress from bottom of hill upward
- Ditching shall be limited to one day ahead of pipe lay on steep slopes such that ditch opened today is only as much pipe which can be installed tomorrow, leaving less than 1,000 feet of open trench at the end of each day
- Restoration of the steep slope and installation of permanent BMPs will take place immediately following pipe install except for travel lane where it is needed for future crew travel for subsequent work
- Steep slopes will be inpected daily during active construction, weekly when not active and within 24 hrs of a precip event

Slope Breakers

Slope breakers must go entirely across the ROW to ensure the water does not come back across the ROW needed



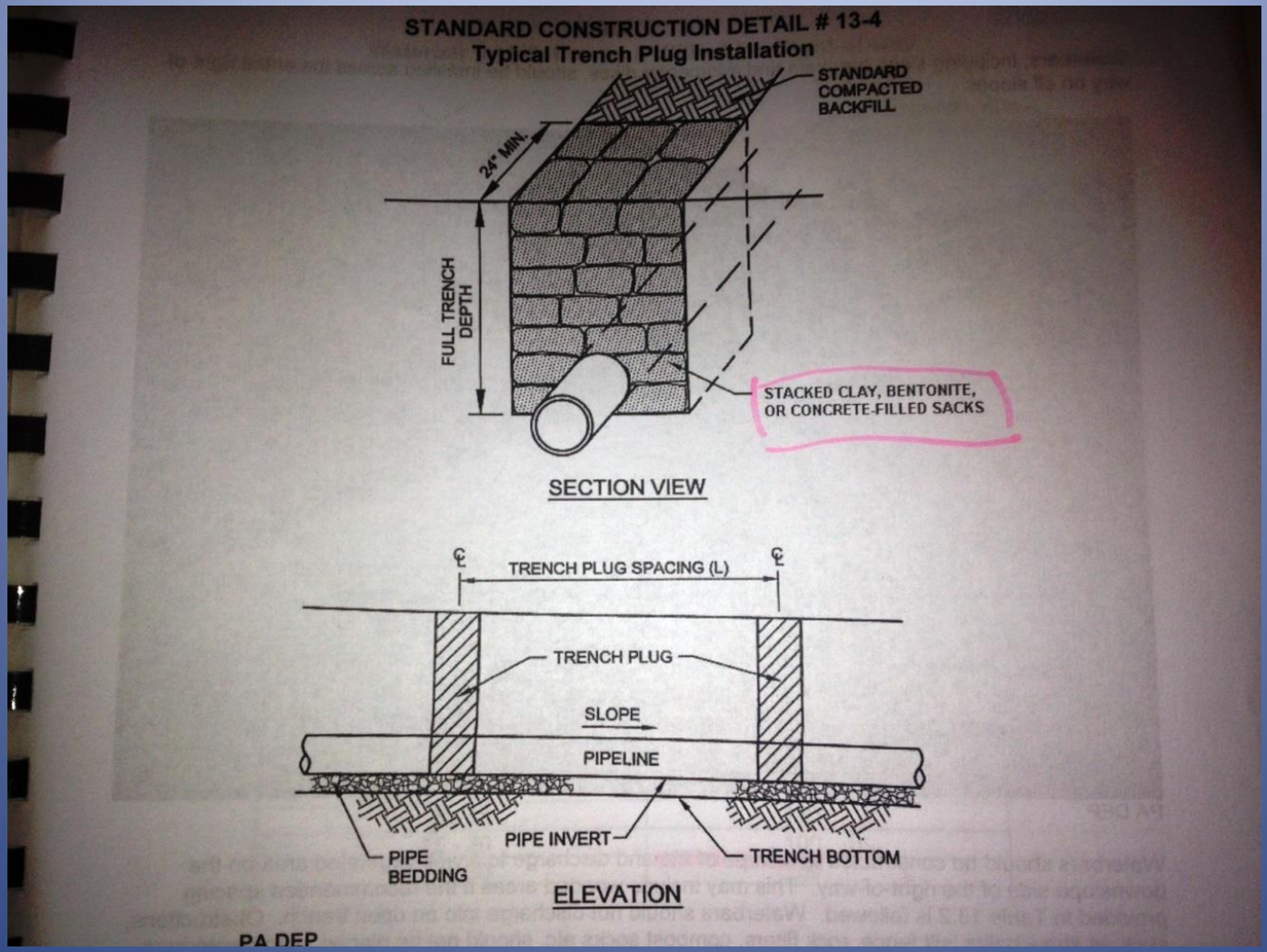
Straw Bale Dewater Structure

Extra layer of protection to help settle out solids in sediment laden water. – water removed from an open trench must be treated to remove silt from the water prior to discharge to a stabilized area offsite. This may be achieved through eithar a pumped water filter bag or a straw bale dewater structure. (Steep slope contstruction plan Exh.A-9_

Trench Width

Bottom of trench width will be an average of 5 Ft, however under certain cases trench may be 10 feet wide. Minimum of 3 feet to cover the top of pipe

Trench plugs installed at streams and wetlands areas to prevent drainage



Trench Plugs/Trench Breakers

Designed to stop wetlands or streams from being drained – trench plugs should be installed on both side of the wetland if hydrologic conditions would drain the wetland

Top Soil Salvage and Storage

Sand bags used for erosion control

Wetland Crossing

- Avoided wherever possible
- Orientation selected to have least possible impact
- Conform to Chapter 105 permitting requirements

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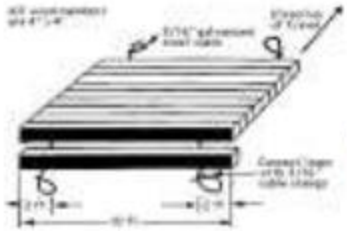
Wetland Crossing

FIGURE 3.5 - Typical Tire Mat Wetland Crossing

FIGURE 3.6 - Typical Expanded Metal Grating Wetland Crossing

FIGURE 3.7 - TYPICAL WOOD MAT FOR WETLAND CROSSING



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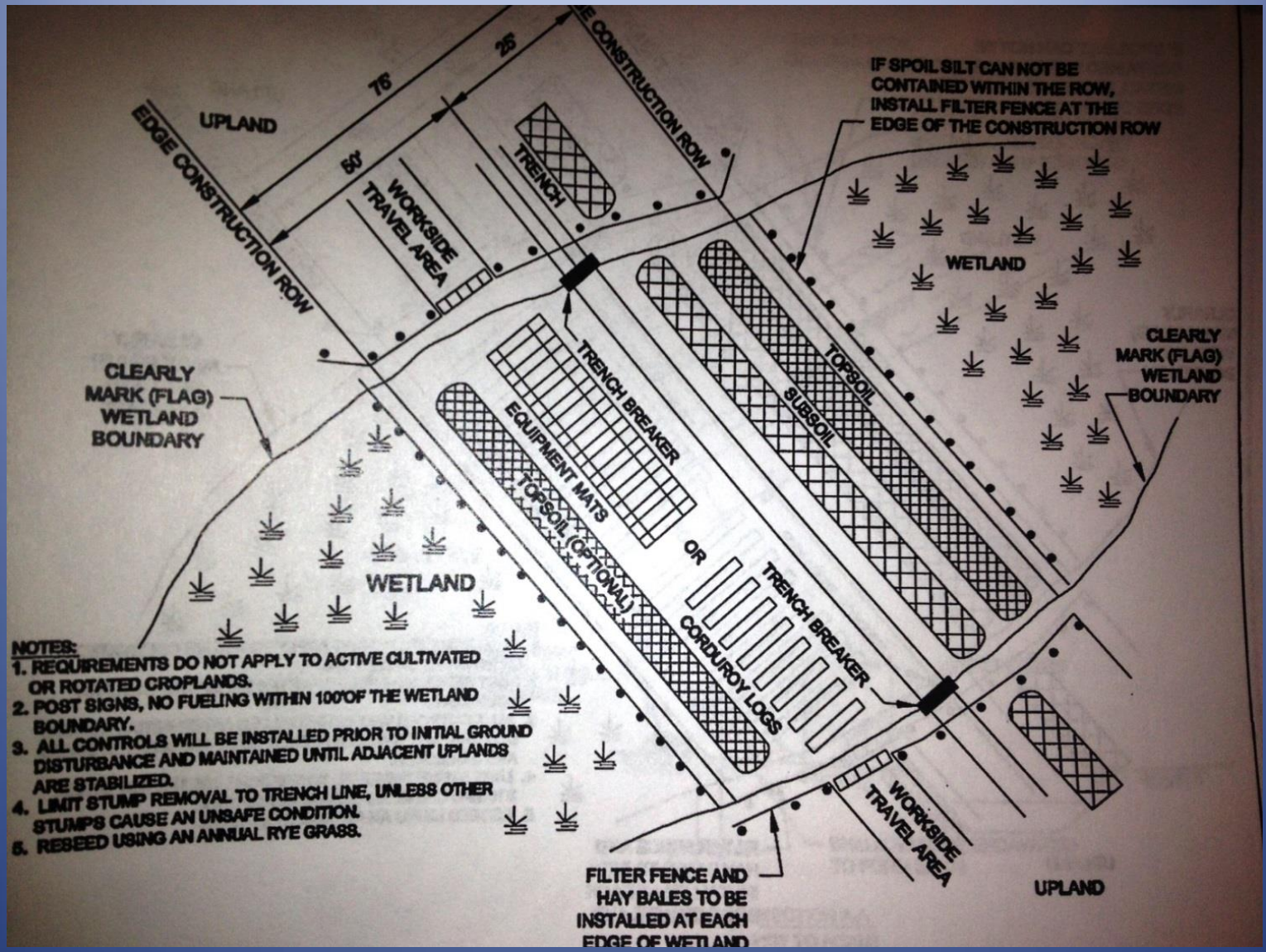


Staging Areas Near Wetlands…..atleast 50 ft from wetland – PA BMP manual

Wood Mats For Wetland Crossings

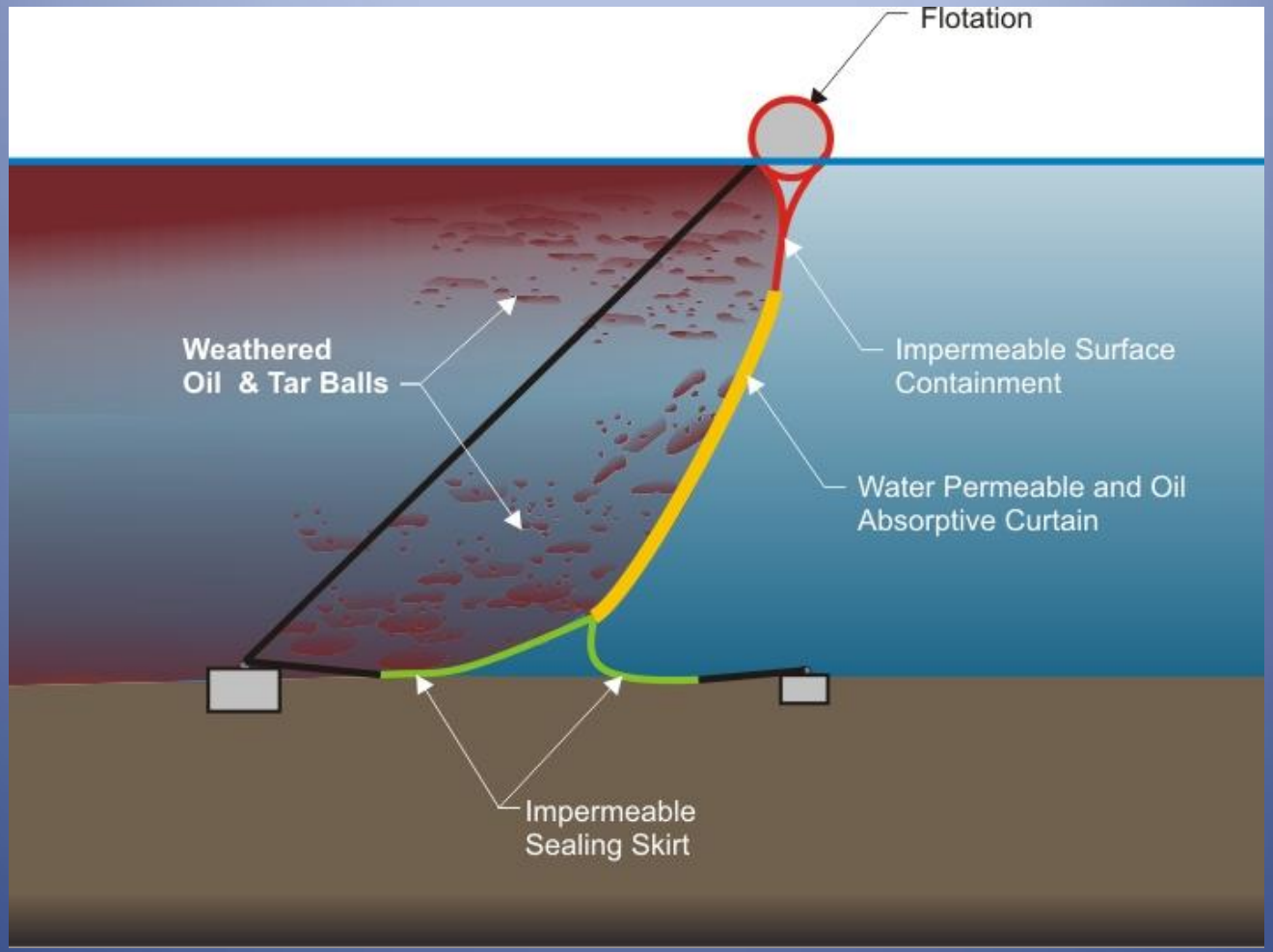
No underlying geofabric here to help minimize sediment entering wetland – lots of mud on the wood mats – TGP added straw mulch to cover mud. - sometimes multiple timbers are added in layers depending on water height

Stream Crossings – Matting Required

ROW areas within 50 feet of streams will be matted with fiber matting to reduce erosion and stabilize soils

Waterbody Crossings

TGP: If a wet crossing cannot be completed within 24/48 hrs, a flume pipe will be installed and removed only to complete trenching, lowering in and backfilling. At no time will a flume be removed for more than a continuous 24/24 hr period.



Turbidity Curtains/Barriers (West Falls Creek)

A heavy geosynthetic fabric suspended vertically in a body of water for the purpose of preventing sediment laden water from escaping a work area

Most effective when used in calm water

Needs to be weighted or anchored at the bottom of waterbody (so sediment does not escape)

Coffer dams may be used instead of turbidity curtains

What's Wrong with This Perimeter Control?

All perimeter controls must be MAINTAINED

Overtopped/breached sediment barriers

What do you notice?

Access Roads

What do you notice with these access roads?

Access Roads

Why could this be an issue?

Main Roads

What's the issue here? Is this reportable?

Sediment from Drill Pad, Storage Pond, & Staging Areas

What's the problem with these best management practices?

Tree Stress/Mortality outside ROW

BREAK

Delaware River - Looking SW at permitted NEUP ROW path

Datasheet Review

Photo Monitoring

- Photo Points
- Spot-photos

Photo Point Establishment Tips

When choosing a Photo Point for the first time:

Include unchanging landscape features that can serve as a reference point in future years. These may include buildings, other structures, or natural features such as rock outcrops, large trees or peaks.

Take a picture of the photopoint for further documentation (see side picture).

Photopoints allow one to do time series – important documentation pre and post pipeline

Before-Lesher Mill, May 2001

Lesher Mill September 2001

Use something for scale if possible

- Clipboard/notebook
- Meter stick
- Person

Photo point for TGP 300 line – valve a constant – note people help with scale

Spot photos

- Use photos to monitor small scale changes at a site
  - Specific bank section
  - Structure or stabilization technique
  - Section of ground to observe cover
  - An unknown plant

Document your photographs

- Visual assessment has plenty of room to document photograph details
- Smart phones can tag photos geo-location automatically
- Zoom lenses and binoculars will be critical for this pipeline monitoring due to restrictions on access

Get Landowner Permission to Access – Never Trespass, Stay off Active Construction ROW, Always Monitor with a Partner

Be Safe Out There

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WEST VIRGINIA EROSION AND SEDIMENT CONTROL FIELD MANUAL

Office of Oil and Gas

Charleston, WV

May 2012

- **West Virginia DEP Hotline - Pollution and Emergency Spills: 1-800-642-3074**

Questions?

- Contact Joe Zenes, Delaware Riverkeeper Network, joe@delawareriverkeeper.org

- Contact Faith Zerbe, Delaware Riverkeeper Network – 215-369-1188 ext 110, faith@delawareriverkeeper.org