#2806

Testimony

of the

Pennsylvania Coal Association

before the PA Environmental Quality Board

regarding

Proposed Amendments to

25 PA Code Chapter 95

Wastewater Treatment Requirements

39 PA Bulletin 6467

By

Josie Gaskey

DEP Cambria District Office

Ebensburg, PA

December 15, 2009

Good evening. My name is Josie Gaskey and I'm Director, Regulatory and Technical Affairs for the Pennsylvania Coal Association (PCA). PCA is the principal trade organization representing bituminous coal operators - underground and surface, large and small - as well as other associated companies whose businesses rely on a thriving coal economy. PCA member companies produce over 85 percent of the bituminous coal annually mined in Pennsylvania. We are the fourth leading coal producing state, mining 68 million tons last year. Our members produce bituminous coal by surface methods and by underground mining methods. They also operate coal preparation plants and engage in other coal mining activities, including performing environmentally beneficial reclamation work.

As important, the Pennsylvania mining industry is a major source of employment and tax revenue. Last year, it created 49,100 direct and indirect jobs with a total payroll in excess of $2.2 billion. Taxes on these wages netted over $700 million to the coffers of federal, state and local governments.

PCA appreciates the opportunity to comment and opposes this proposed rulemaking. We bring to your attention that PA Department of Environmental Protection's (PA DEP) Water Resources Advisory Committee (WRAC)-- made up of environmental groups, academics, industry representatives, and others --considered this proposed rulemaking on July 15, 2009 and recommended to DEP that it NOT proceed with the rule as proposed. The Committee instead recommended that the DEP work in conjunction with WRAC to form a statewide stakeholders group to analyze the issues and develop appropriate solutions, in lieu of proceeding with the proposed rulemaking.

Supporting Data

PCA engaged CME Engineering to perform an impact analysis of the proposed strategy for high TDS wastewater discharges on the bituminous coal mining industry and PCA's comments are supported by this analysis. Data received for this analysis accounts for 85 percent of the 68 million tons of coal produced annually in Pennsylvania and potential flows to be treated of 26,725 gallons per minute.

At PCA's request dated August 4, 2009, DEP provided their supporting data and information used in the development of the proposed rulemaking. The proposed rulemaking is based on data collected from the Monongahela River during a 2 ½-month period in the fall of 2008 during an exceptionally low-flow period. This data collection ceased at the end of December 2008 when tests indicated TDS and sulfates levels were no longer elevated. Based on an analysis of DEP's response, PCA believes there is inadequate scientific justification for the proposed Chapter 95 regulation changes and that DEP has not conducted the appropriate studies to determine there is a real sustained threat and not just a seasonal flow event from TDS concentrations, the extent of any threat, or the correct parameters and concentrations to control TDS.

PCA's analysis of this data and information indicates numerous issues with DEP's response. PCA questioned which streams and waterways were "at risk" for sustained elevated concentrations of TDS, sulfates and chlorides. DEP indicated there were 36 active water quality networks during the above time period—-28 were considered "at risk" and eight were not. The eight reference sites' Chapter 93 classifications identify these waters as Exceptional Value—the best water quality streams in Pennsylvania. DEP indicated the at-risk sites were chosen because one or more of the chlorides, sulfates or TDS values were magnitudes higher than the values at the eight reference sites.

PCA evaluated the mean chloride, sulfates and TDS concentrations data provided by DEP for the 28 at-risk sites. Of the 28, only 6 of those had TDS and/or sulfate concentrations that exceeded the proposed limits. In addition, sampling for the 36 sites was not conducted on a regular basis and none of the water quality sampling data provided by DEP showed a chloride concentration greater than 250 mg/l.

The Preamble lists the Beaver, Shenango, Neshannock, Moshannon and the West Branch of the Susquehanna Rivers showing upward trends but not an exceedance of the proposed TDS concentration limits. DEP has repeatedly indicated the above in public forums. Data supplied in response to PCA's request reveals TDS and sulfate levels for these

waterways significantly below the proposed TDS and sulfates limits. No data was provided for the Neshannock or Moshannon rivers.

PCA looked back 10 years at EPA STORET data for the South Pittsburgh Mile point 4.5 monitoring station on the Monongahela River. At no time did the sulfates or chlorides levels rise above 180 mg/l for the past 10 years. We examined Consumer Confidence Reports for 2008 for water systems utilizing the Monongahela River because every water system in the Commonwealth is required to submit a Consumer Confidence Report to its customers. There was no mention of TDS, sulfates or chlorides violations or problems in these reports.

The West Virginia University's Water Research Institute (WVWRI) has collected and analyzed data from the Monongahela River over a period of years and has produced two presentations in 2009 regarding TDS. WVWRI monitored the Monongahela River at Point Marion, PA Mile point 90.8 during the period 1999 to 2006. During this time frame, the Point Marion monitoring location showed declining trends in chlorides, sulfates and TDS concentrations.

In PCA's request to DEP, we requested all information and support data that DEP used in setting the proposed limits for TDS, sulfates and chlorides. DEP provided no economic analysis as part of its response and has not acknowledged how much historical data it reviewed and considered prior to proposing these revisions. However, Section 5 (a)(5) of The Clean Streams Law (35 P.S.§691.5) clearly requires DEP determine the immediate and long-range economic impact on the Commonwealth and its citizens when setting new standards.

We note that EPA has established National Primary Drinking Water Regulations that set mandatory water quality standards for drinking water contaminants. These standards establish primary and secondary maximum contaminant limits (MCLs) for substances in drinking water at the point of use, not intake. Primary MCLs are established based on the hazard potential to human health and Secondary MCLs are established as non-enforceable guidelines highlighting contaminants that may cause aesthetic effects (such as taste, odor or

color) in drinking water. EPA recommends secondary standards to water systems, but does not require systems to comply. EPA has not established primary MCLs for TDS, sulfates and chlorides choosing instead to establish secondary MCLs at the levels of 500 mg/l TDS, 250 mg/l sulfates and 250 mg/l chlorides.

TDS Treatment Options

If the proposed Chapter 95 rulemaking is approved, it will have a devastating impact on the bituminous coal mining industry due to the limited treatment technologies available to reduce TDS and the extremely high capital and O&M costs associated with these technologies. PCA evaluated all the treatment options to reduce wastewater TDS concentrations and presented this information to the WRAC TDS Stakeholders group on September 22, 2009. We looked at:

- managed discharge,
- managed treatment,
- electrodialysis,
- precipitation,
- liquid-liquid extraction,
- reverse osmosis (RO), and
- evaporization crystallization.

Currently, the only technology possibly able to reduce TDS to the limits in the proposed rulemaking for the bituminous coal mining industry is a system of reverse osmosis, combined with evaporation and crystallization and pretreatment. Even this approach is highly suspect as this technology has not been operationally tested for use with bituminous mining wastewaters. There are many problems with the use of this technology, some of which are:

- Reverse osmosis requires a rigorous pretreatment process to remove scaling agents and biological activity which promotes fouling,

- These RO units are custom built to the unique chemistry of the water and are not "turnkey systems" items. Due to the variation in water quality, a feasibility study would need to be conducted for each source to be treated.
- Certain applications require corrosion-resistant specialty metals with high cost and long lead times for delivery.

Bituminous Mining Impact

A reverse osmosis treatment system combined with evaporation and crystallization and pretreatment is the only technology possibly able to reduce TDS, sulfates and chlorides to the proposed concentrations. Treating the average volume of water reported in the CME analysis—26,725 gpm—is estimated to cost the bituminous coal mining industry:

- $1.325 billion in capital expenditures.
- Yearly operation and maintenance cost of $133 million.
- Perpetual treatment bonding required by DEP for this system of $134 million.

These costs do not include costs associated with land acquisition, site development, utility extensions, etc. necessary to construct the plants. The lead time required to design, construct and implement a TDS treatment system is estimated at 2 ½ to 3 years. According to the proposed rulemaking, DEP's compliance date is January 1, 2011. Nor does it include treatment costs at future sites. Furthermore, the energy costs are unknown, particularly with the rate caps coming off, and given the energy demands of the treatment technologies.

A more specific example is a coal company with 3,000 gpm combined flow and annual coal production of 1 million tons. To meet these proposed limits, it would need to construct six treatment systems costing $138 million and $10.8 million per year to operate. These expenditures would increase the cost of a ton of coal produced by $17.70 not including interest or inflation. The bond required if the company were required to perpetually treat their discharges would be $806 million.

Timeframe

PCA believes the timeframe in the proposed rulemaking is unrealistic, unachievable and the deadline is artificial. Even assuming there is a need for controls, for such huge

expenditures there is insufficient time to complete the feasibility, design and permitting stages, acquire the equipment, construct the treatment facilities and test. In addition, cumulative market lead times for materials have not been taken into consideration.

Additional Environmental Concerns

There are other associated environmental concerns to this technology that coupled with the required energy demand and limited disposal options make this treatment technology questionable not only financially, but with respect to the overall goal of a greener Commonwealth. For example,

- The power to reduce billions of gallons of wastewater to a solid is huge. The energy required to treat, evaporate and crystallize the discharges will be 429,000 megawatts per year at a conservative yearly cost of $42.9 million.
- Disposal of the solid waste is not addressed in the proposed rulemaking and we are uncertain if PA's landfills will even accept this waste for disposal. Residual solid waste will be generated at a rate of 650 tons per day or 237,000 tons per year. If the wastewater is not evaporated to a solid, the volume of residuals in the form of a concentrated brine will equal nearly 1 billion gallons annually.
- CO2 emissions under Cap and Trade at $20 per ton of carbon credit, would cost $136,000 per year per facility.

Conclusion

PCA believes the proposed Chapter 95 rulemaking is not supported by data and lacks comprehensive scientific and economic analyses particularly in light of the enormous expenditures for all industries, not just mining. Under The Clean Streams Law, PA DEP is required to consider a number of factors including the state of scientific and technical knowledge and the immediate and long-range impact upon the Commonwealth and its' citizens. DEP has not taken the time to collect and analyze the data necessary to develop recommendations on effective and balanced regulations. The technologies available to treat high TDS wastewaters create significant technical, economic and feasibility issues and additional environmental issues. The staggering cost to the mining industry coupled with the

potential loss of thousands of stable mining jobs in an uncertain economy demands a more scientific and deliberate approach to this issue.

Accordingly, PCA believes that DEP should withdraw the proposed regulation and undertake the necessary studies to determine if there truly is a TDS problem, the extent to which the active mining industry contributes to the problem, and a cost/benefit analysis including an evaluation of the additional environmental and carbon footprints. A review of literature studies and toxicity tests to determine what in-stream parameters should be regulated to protect the aquatic life use and what the appropriate in-stream concentrations should be, needs to be performed before developing proposed TDS, sulfates and chlorides rulemaking.

Impact Analysis of the High TDS Strategy on the Bituminous Mining Industry

presented to the PA DEP WRAC TDS Subcommittee

September 22, 2009

Objective: Assess Functional, Logistic, Economic and Environmental Impacts of the TDS Strategy on the mining sector

- ✓ Using a conservative interpretation, evaluate how the mining industry would comply with the proposed limits
- ✓ Evaluate how potential solutions would be implemented, infrastructure needs, time to complete
- ✓ Evaluate the economic cost of potential solutions, both direct and indirect cost to communities
- ✓ What, if any, environmental impacts may result from implementation and compliance with proposed standards, unintended consequences

Background PA Coal Industry

- Pennsylvania is the 4th leading coal producing state, mining 68 million tons in 2008.
- Federal Energy Information Administration (EIA) estimates that Pennsylvania has 27 billion tons of bituminous coal reserves.
- 571 active mining permits were on record as of Jan. 2009.
- The industry employs 7,649 employees, for a total of 54,000 direct and indirect jobs.
- Total payroll exceeds $2.2 billion, with paid tax revenues of $749 million.

Operations Affected:

- **NEW and EXISTING OPERATIONS**
  - Underground Mines
  - Coal Preparation Plants
  - Coal Refuse Disposal Sites
  - Surface Mines
  - They have approved NPDES Discharges that were issued to insure water quality standards were met.
  - With regard to water treatment, the economics of these operations were predicated on meeting the requirements of 40 CFR 434.

Operations Affected cont.

- **REMINING**
  - The program as set forth in PA law, regulations and 40 CFR 434 is predicated on pollutional loading not being increased, but hopefully in long run decreased.
  - The program was designed to improve water quality and encourage remining in areas previously impacted by mining and reduce pressure on areas not previously mined.
  - Under the regulations, TDS and sulfate levels would be tied to pollutional loading, not end-of-pipe effluent limitations.

Operations Affected cont.

- **LEGACY MINE DRAINAGE TREATMENT**
  - Companies have completed mining, but as a result of operations are now obligated to treat water long-term.
  - Costs of maintaining these operations will increase significantly and place these operations in jeopardy, resulting in State having to treat.

Operations Affected cont.

- **ABANDONED MINE DRAINAGE**
  - Projects involving wetland treatment of mine drainage are designed to passively treat to provide low iron, low manganese and a pH of 6-9.
  - Projects no longer viable if they have to achieve TDS effluent levels.

Operations Affected cont.

- **MINE DRAINAGE**
  - Studies have been conducted to use mine water for low-flow augmentation.
  - In some cases, water would have been treated using passive treatment technology or minimal treatment requirements, but were not considering treating for TDS and sulfates.
  - Companies have looked at mine pools to supplement stream flow as a means of insuring adequate stream base flow while withdrawing the equivalent amount of water for power generation.

PCA Membership Survey

- Pennsylvania Coal Association (PCA) conducted a survey to gauge the scope of ongoing treatment activities and estimate potential effects of proposed rule making.
- 85% of Pennsylvania's total bituminous coal production is represented by PCA.
- Survey information is representative of the industry, but it is not comprehensive. The total number of discharges and water quality data is incomplete due to time limitations and the nature of existing NPDES permit limits.
- Data was received concerning 41 permitted discharges related to 8 surface and 16 underground coal mines.

PCA Membership Survey cont.

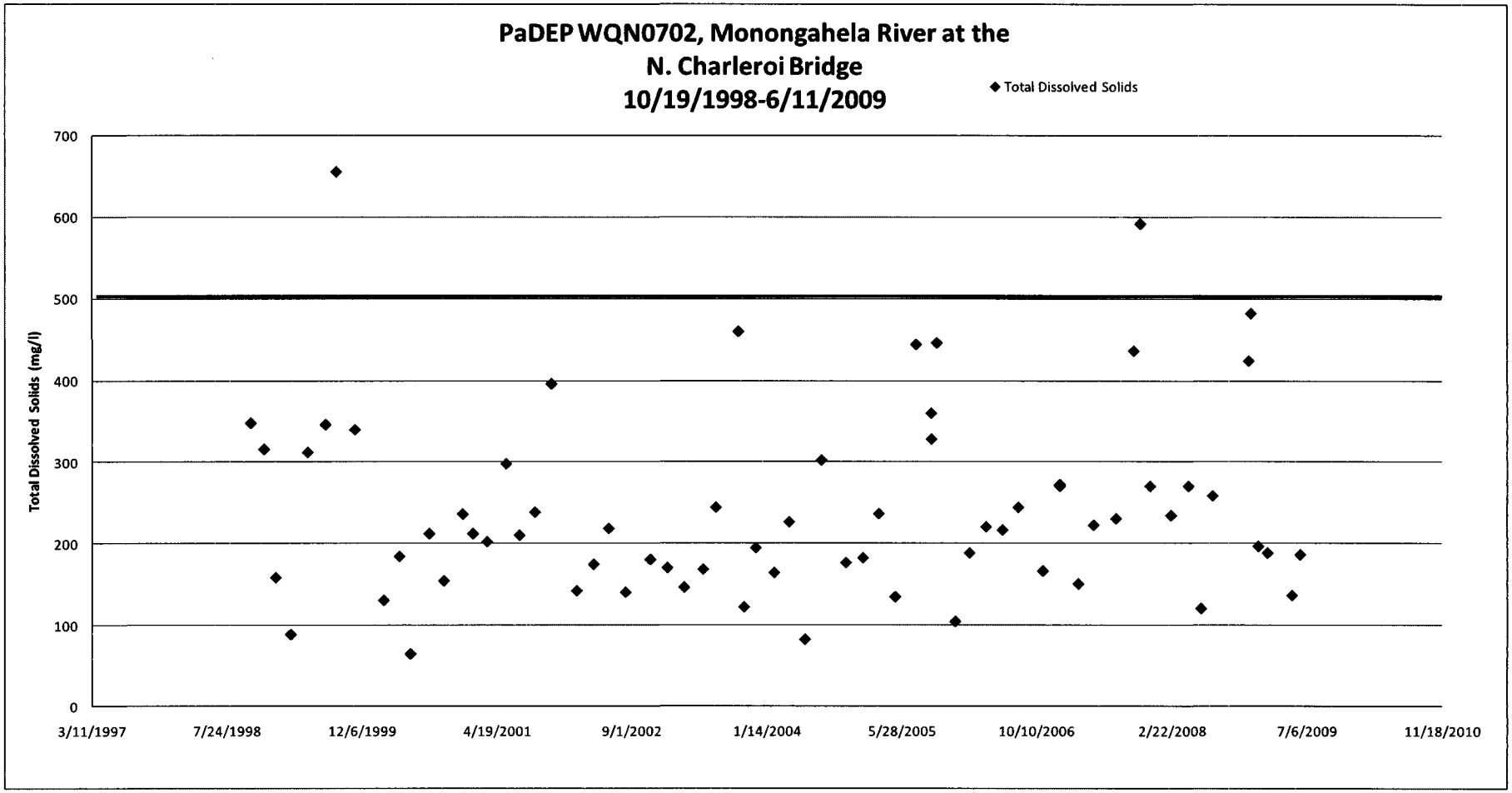
- The combined maximum flow from these discharges is approximately 26,725 gallons per minute (gpm).
- 96% (26 of 27 reporting TDS) report a maximum TDS concentration > 500 mg/l.
- 4% (1 of 27 reporting TDS) had a maximum TDS concentration < 500 mg/l.
- 78% of all discharges (32 of 41) failed to meet at least one of the proposed chapter 95 standards at the end of the pipe.

PCA Analysis of PA DEP Data Response

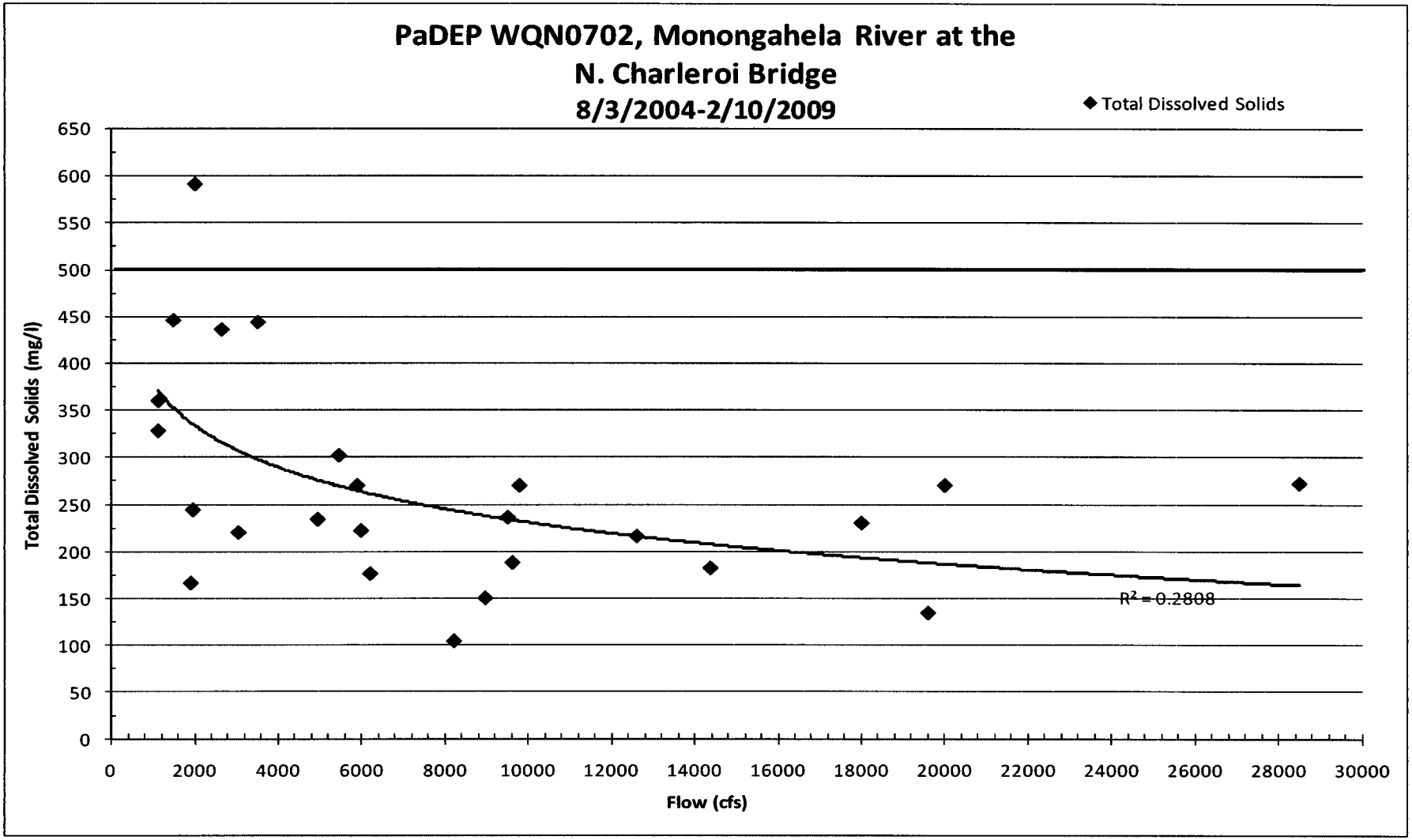
- PCA requested list of waters at risk for sustained elevated concentrations of TDS, sulfates and chlorides
  - 28 WQNs considered 'at risk' and 8 were not
  - Of 28 WQNs, only 6 had TDS and/or sulfate concentrations that occasionally exceeded the proposed effluent limits. None had chloride concentrations > 250 mg/l.
  - Sampling at these 36 WQNs not conducted on regular basis
  - Sampling ceased in December 2008
  - Analytical method used to determine TDS for the Monongahela sampling is not an EPA-approved method.
  - Data provided by DEP is insufficient to support its claim that watersheds statewide are impaired by high concentrations of TDS, sulfates and chlorides.

Monongahela Water Quality Trends

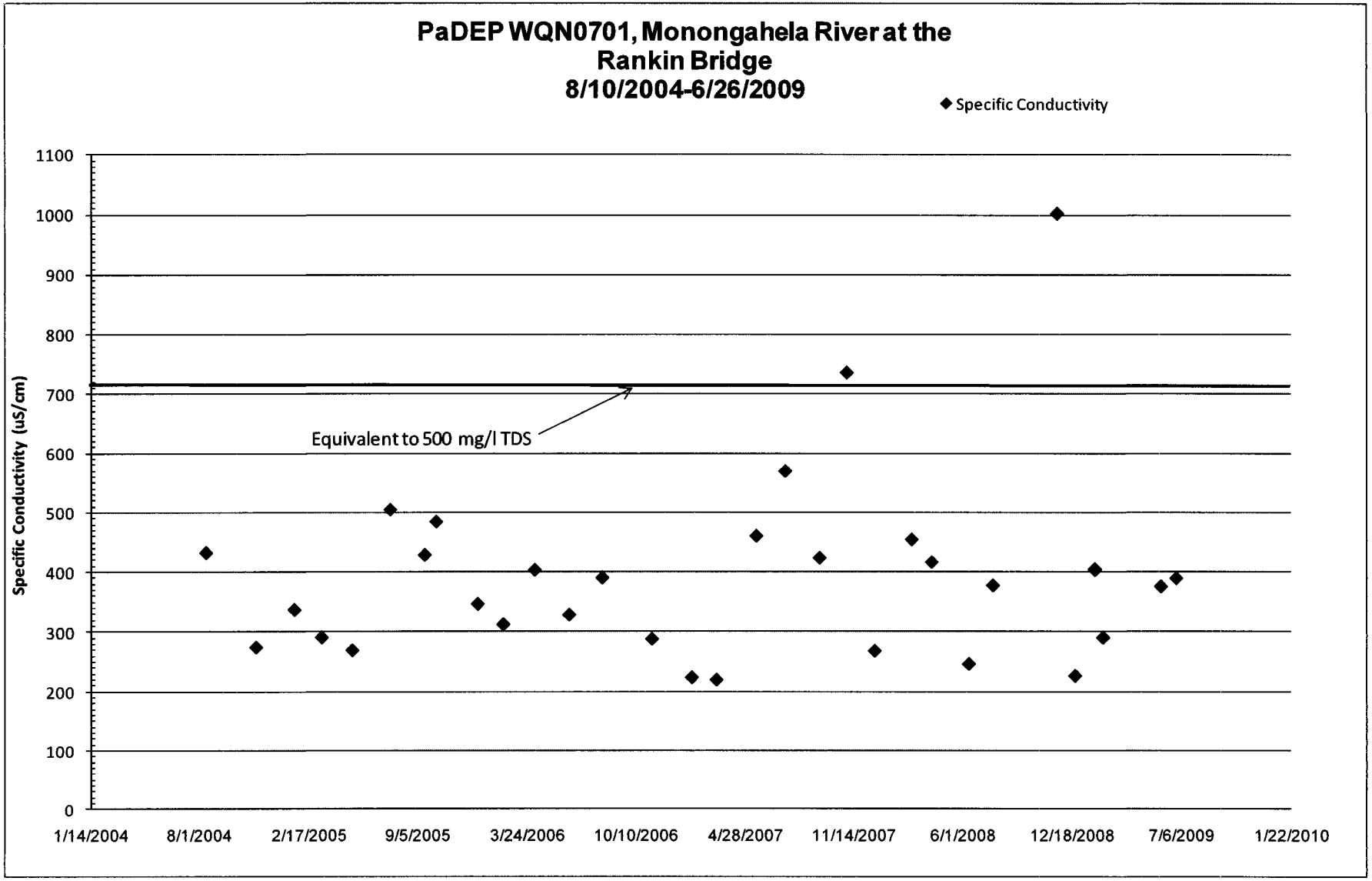
- Most Comprehensive Collection of PaDEP Mon. River Data from Site WQN0702
- Long-Term Data Indicates Exceedances of 500 mg/l TDS Limit are Sporadic
- TDS Exceedances Correspond to Low Flow Conditions



Monongahela Water Quality Trends cont.

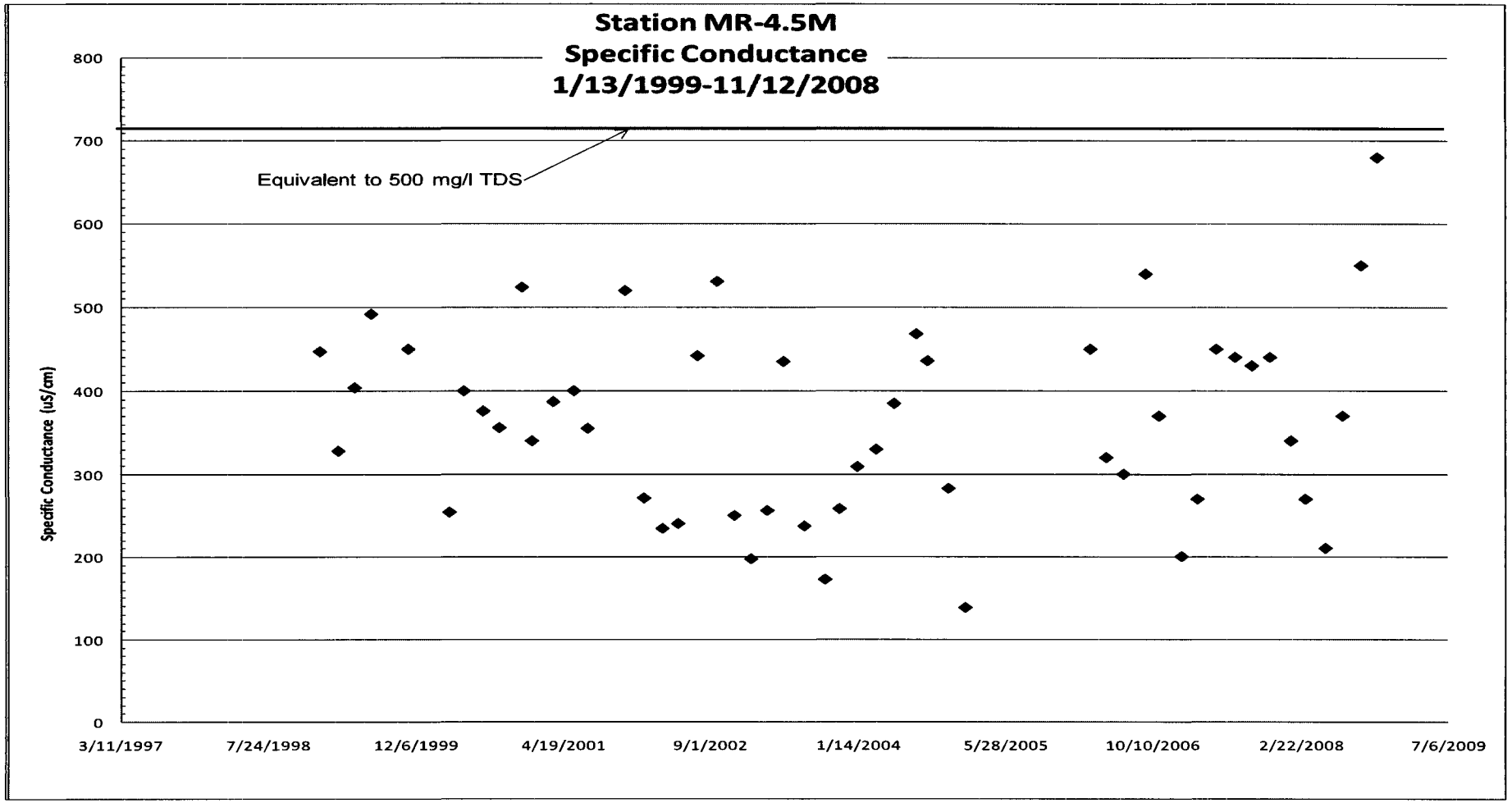


Monongahela Water Quality Trends cont.



Monongahela Water Quality Trends cont.

- Long-Term Specific Conductivity Data From Near Pittsburgh Location Suggests No TDS Exceedances



TDS Treatment Alternatives

- A variety of treatment alternatives were examined, moving from low-intensity alternatives to high-intensity approaches:
  - Managed Discharge / Utilization of assimilative capacity
  - Managed Treatment / Protection of assimilative capacity
  - Electro-dialysis
  - Precipitation
  - Liquid-Liquid Extraction
  - Reverse Osmosis (RO)
  - Evaporation Crystallization

TDS Treatment Alternatives cont.

- Managed Discharge / Real Time Monitoring Network
  - This approach would primarily utilize holding capacity or mine pool storage to reduce or eliminate AMD treatment discharges during low-flow periods of the year when water quality attainment is at risk.
  - Facilities would actively discharge during high-flow periods when excess capacity exists and TDS levels are at seasonal lows.
  - Advantages – protects designated stream uses, utilizes existing capital assets with little modification, low-cost alternative, limited impact on the states economic competitiveness, avoids value chain cost implications
  - Disadvantages - not suitable for all mining activities, cyclic drought conditions may affect "normal" discharge operations, dependent upon dilution, may adversely affect water quality, potential loading shift

TDS Treatment Alternatives cont.

- Managed Treatment / Real Time Monitoring Network
  - This approach would utilize a limited treatment capacity during low- flow periods of the year when water quality attainment is at risk.
  - Facilities would only operate and actively discharge during low flow periods when excess assimilative capacity is lacking and TDS levels are increasing.
  - Advantages – protects designated stream uses, decreases capital requirements and cost exposure though the use of smaller treatment facilities, targeted solution focusing on problem times, decreased secondary waste streams
  - Disadvantages - not suitable for all mining activities, significant capital impact on smaller operators, unknown operational impacts on treatment plants shuttered for long periods, solids disposal

TDS Treatment Alternatives cont.

- Electro-dialysis
  - This approach utilizes selectively permeable membranes and applied current to promote the movement of soluble ions, separating them by their electric charge.
  - Well suited to soluble ions but not iron, manganese or hydrogen sulfide
  - Does not remove non-polarized ions and molecules
  - More expensive than RO at volumes greater than 1000 gpm and typically exhibits problems with membrane fouling in calcium- and magnesium- enriched waters
  - Not appropriate for the treatment of mine waste waters in Pennsylvania

TDS Treatment Alternatives cont.

- Precipitation
  - This approach is an option for discharges high in sulfate, removing the sulfate through the precipitation of gypsum.
  - Well suited to conventional AMD treatment as a post metals removal step
  - ph is increased and excess calcium is added to create a super saturated condition with respect to gypsum, which then precipitates as a solid removing sulfate from the water.
  - Well suited to high sulfate waters associated with some types of mining
  - Unable to remove sulfate to proposed effluent limits of 250 mg/l, or address other contributors to elevated TDS
  - Rejected as a suitable treatment approach

TDS Treatment Alternatives cont.

- Liquid – Liquid Extraction
  - This is an approach where acid mine drainage water laden with sulfate and iron feeds into a treatment circuit where it sequentially contacts, in a counter-current flow path, an extractant solution formulated to efficiently pull these ions from the aqueous phase solution into the extractant phase solution.
  - The extractant, now containing the iron and sulfate ions, overflows an exit weir from the treatment circuit to another chamber where it separates cleanly from the water phase, which underflows the same weir and exits as a separate stream with proportionately less iron and sulfate.
  - Experimental / pilot stage of development
  - Only recently resolved intellectual property litigation
  - Untried on a commercial scale
  - Costs and reliability on a commercial scale unknown
  - Rejected as a suitable treatment option

TDS Treatment Alternatives cont.

- Reverse Osmosis (RO)
  - RO is process where pressure is used to force a solution through a permeable membrane in order to separate the solute from the solution.
  - It's an effective treatment for TDS with concentrations less than 40,000 mg/l. (Some manufacturers claim higher concentrations, but pressures are limited by membrane strength.)
  - Requires a rigorous pretreatment process to remove scaling agents (metals, hardness) and biological films which produces a solid waste
  - Units should be designed for the unique chemistry of the water they will treat, not an off-the-shelf, out-of-the-box fix.
  - Certain applications require corrosion resistant specialty metals with long lead times for delivery.

TDS Treatment Alternatives cont.

- Reverse Osmosis (RO) Cost Estimate
  - Aqua Tech 500 gpm 2000 mg/l TDS single unit
    - Design, permit, construct $ 4,140,000
    - Operation and Maintenance $ 1,062,000
    - This value does not include concentrated waste disposal or an evaporation crystallization step.
  - Concentrated Disposal Circuit: Evaporation & Crystallization
    - 60 gpm evaporator /crystallizer $ 12,000,000
    - Design, permit, construct $ 8,700,000
    - Operation and Maintenance $ 2,266,000
  - Total Cost Combined System w/O&M
    - RO system $ 5,202,000
    - Evaporator Crystallizer $22,966,000
    - Total $28,168,000
    - Ten year total O&M after construction (yrs 2 – 11) $33,280,000

TDS Treatment Alternatives cont.

- Reverse Osmosis (RO) Cost Estimate
  - Major RO Vendor
    - Design parameters: 800 gpm at 6000 ppm TDS with evaporation circuit
    - Capital Equipment $ 13,000,000
    - O&M Cost system design, permit, construct $ 19,000,000
    - Annual operation cost $ 1,712,000
    - Solid waste generated (t/yr) 13,140
    - Waste disposal cost (90% availability @ $64/t) $ 756,000
  - Total System Cost
    - Turnkey system installation $34,468,000
    - Ten year total O&M after construction (yrs 2-11) $24,680,000

TDS Treatment Alternatives cont.

- Time Frames for Reverse Osmosis Implementation
  - Due to variation in water quality a feasibility study would need to be conducted for **each** source to be treated
  - This would then be followed by system design, site layout, permitting and special materials acquisition
  - The following estimated time frames are for the tasks listed below
    - Feasibility study — 6 months
    - Design — 6 months
    - Permitting — 12 months
    - Equipment acquisition & construction — 18-24 months
    - Total Estimated Time Frame — 2.5 - 3 years
      - This assumes no difficulty in obtaining corrosion resistant specialty metals, additional time could range from 12 to 24 months, delaying construction
  - Difficulty obtaining bonds in trust fund situation

TDS Treatment Alternatives cont.

- Estimated Industry Cost Impact
  - Three cost estimates were obtained for a 500 gpm zero liquid discharge (ZLD) treatment system, RO combined with evaporation and crystallization
  - These three estimates were averaged to obtain an order of magnitude technology cost, which was applied to a per gallon cost
  - **The Result: $46,000/gpm to treat, $3,600/gpm for O&M annually**
  - Treating just the volume of water reported in the PCA survey would cost the mining industry $1.325 **Billion** dollars in capital expenditures
  - O&M costs are estimated as $133 **Million** dollars annually
  - Bonding for a 500 gpm ZLD treatment system is $134 **Million** dollars using the AMD treat and bond/trust fund calculation spreadsheets

TDS Treatment & Environmental Concerns

- Handling of resultant waste streams and their impact
  - Estimates of "average" water quality applied to just the reported discharge volume results in approximately 650 tons of solid waste per day in need of disposal
  - Estimated at 237,000 tons annually, without a proven disposal location/option, and representing a 38% increase in production of industrial waste water treatment sludge in PA
  - Resultant solid wastes will be highly soluble and difficult to landfill without significant leachate generation.
- CO_2 emissions Cap and Trade
  - Electricity for RO, evaporator/crystallizer and pumps — 5362 tonne/yr
  - Trucking solid waste — 255 tonne/yr
  - Pretreatment hydrated lime use — 1183 tonne /yr
  - Total (not life cycle, excluding steel & concrete) — 6798 tonne/yr
  - At $20/tonne carbon credit total cost — $136,000/yr/plant

Conclusion

- Available water quality data indicate that in-stream TDS concentrations are strongly influenced by volumetric flow.
- Consistent and widespread exceedance of secondary non-health based MCL's is not occurring, i.e. the Monongahela is **not** affected from the WV border to the point at Pittsburgh.
- The only equipment that may work to treat TDS is either RO or evaporation/crystallization or a combination of both.
- The cost of a ZLD approach for TDS treatment makes this approach **economically infeasible** for the mining industry or the state for its legacy obligations.

Conclusion cont.

- Safe viable disposal options for the secondary waste streams generated from the use of RO / Crystallization are in question, creating the potential for secondary environmental impacts.
- Carbon emissions from the thermal portion of the treatment process have environmental and economic implications for air quality attainment.
- The PCA membership consensus is that, given the lack of pervasive water quality impairment, incomplete understanding of TDS fate and actual toxicity to aquatic life, and significant economic burden and waste disposal issues, the proposed rulemaking is not feasible or justified and should be withdrawn.

Questions??