# LITTLE NESCOPECK CREEK
# Watershed Rehabilitation Report

**PaDEP**

**December 1998 Version**

# Little Nescopeck Creek Watershed Rehabilitation Report

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# Little Nescopeck Creek Watershed Rehabilitation Plan

**I. Introduction**

A major primary sources of non-point source pollution (NPS) in Pennsylvania's waterways is acid mine drainage (AMD). There is a significant legacy of problems associated with mining activities that occurred prior to 1977 when the U.S. Surface Mine Control and Reclamation Act was passed. There has been an increasing focus on using a watershed approach to cleaning up the waters of the Commonwealth of PA. In 1994, with funding from EPA 104(b)(3) program the Department of Environmental Resources (DER) District Mining Operations Offices were to develop a Comprehensive Mine Reclamation Strategy (CMRS) on a select watershed in their district.

To address these problems, the Department of Environmental Resources (DER) adopted the Comprehensive Mine Reclamation Strategy (this strategy uses the same watershed approach that EPA is advocating for Federal 319 Non-point Source Pollution Abatement Program). DER has selected six watersheds to serve as demonstration projects for the application of new and existing technologies in the abatement of AMD.

The Nescopeck Creek watershed was designated a medium priority on the May 1994 Degraded Watershed List. This rating was established prior to the existence of the federal Appalachian Clean Streams Initiative and Pennsylvania's Comprehensive Mine Reclamation Strategy. Through these programs, the Nescopeck watershed was chosen as a high priority demonstration project. This, coupled with the extensive local community involvement, merits the watershed's listing as a high priority on the Degraded Watershed List.

The Nescopeck Creek watershed was selected as one of the six watersheds in the Commonwealth. Realizing that a cohesive partnership is a must for the successful abatement of AMD, the Wildlands Conservancy and the Susquehanna River Basin Commission is working with the DEP's Bureau of District Mining Operations Pottsville on the Nescopeck Watershed Demonstration Project in Luzerne County. Included in this partnership are several universities, other local citizens group, and the USGS.

1 - A) The purpose of this rehabilitation plan is to guide the improvements of the 7.0 miles (11 km) of the Little Nescopeck Creek and 19.6 miles (31.5 km) of the Nescopeck Creek that are impacted by the Jeddo Tunnel mine discharge.

1 - B) Location and Description: The Nescopeck Creek, nearly all of which is located in Luzerne County, is a tributary of the Susquehanna River and, ultimately, the Chesapeake Bay. The main area of concern on this watershed is the non-point source (NPS) pollution that results from the discharge of the Jeddo Mine Tunnel.

The Jeddo Tunnel discharges into the Little Nescopeck Creek, a tributary of the Nescopeck Creek, near the villages of Kis-Lyn and Fritzingertown. AMD discharge from the Little Nescopeck Creek's Jeddo Tunnel is the only identified source of major NPS pollution in the Nescopeck Creek watershed. For this reason, this project will focus on the Little Nescopeck Creek / Jeddo Tunnel system. This project is unique in that the impacted watershed is not directly affected by mining activities. Another watershed (Hazleton Basin) with its mine pools and affected mine lands is drained by the Jeddo Tunnel which ultimately discharges into the Little Nescopeck Creek.

The Little Nescopeck is a cold water fishery which drains 14 square miles (36.3 $km^2$). The Jeddo Tunnel drains approximately 32.5 square miles (84.2 $km^2$) of the Eastern Middle Coal Field and discharges 40,000 gallons of AMD per minute (150 $m^3$/min) into the Little Nescopeck. The main problems with the discharge are AMD, sediment and suspended solids loading.

I - C) Previous Investigations: The Jeddo Tunnel, not the Nescopeck Creek, was mostly the subject of

engineering and environmental interests. Ash and others (1949, 1950) monitored the flow and quality of the discharge. In the early 1970's, the Jeddo Tunnel was a subject of a study conducted by the Hazleton City Authority to use its water as a supply source for the municipality. In 1975 and 1991, USGS monitored the flow and water quality of the Jeddo discharge as a part of Water Resources Investigation (Report 95-4243). In 1995 – 1997, the Jeddo Tunnel was under Wildlands Conservancy and Bloomsburg University study to research and document the hydrologic behavior of features contributing to subsurface mine water pool in the deep mines of the Eastern Middle Coal Field.

**II. Summary and Conclusions**

The Nescopeck Creek Watershed Rehabilitation Plan focuses on the assessment and remediation of acid mine drainage (AMD) from the Jeddo Tunnel and the rehabilitation of the Little Nescopeck Creek. The 40,000 gpm (150 m3/min) average [high-157,000 gpm

(594 $m^3$/min) and low 8,500 gpm (37$m^3$/min)]discharge from the Tunnel is the only major source of non-point source pollution in the watershed.

Partnered in this project are DEP's Bureau of District Mining Operations (DEP-DMO) and Bureau of Abandoned Mine Reclamation (DEP-BAMR), DEP's Citizens Volunteer Water Quality Monitoring Program, Wildlands Conservancy, Susquehanna River Basin Commission (SRBC), U.S. Geological Survey (USGS), Friends of the Nescopeck, Bloomsburg University, Wilkes University, Kings College and Pennsylvania State University – Hazleton Campus.

This Little Nescopeck Creek Rehabilitation Plan [Fund 104(b)(3)]will be followed by the Nescopeck Creek [fund 604] Watershed Management Plan outlining remediation actions and implementation schedules. It should be realized that this project is only a portion of the overall project, which should be completed by November 30, 1998 (by SRBC). The goal is to reduce significantly the impact of the Jeddo Tunnel discharge on the water quality of the Little Nescopeck, the Nescopeck, and, ultimately, the Susquehanna River and Chesapeake Bay.

Immediate outcomes of this project are expected to eliminate the number of siltation/blackwater events; reduce the flow of AMD from the Tunnel by relocating streams that are subsiding into abandoned mines, and, subsequently, draining into the Tunnel; and to select and install AMD abatement technologies. Additional monitoring will ensure these outcomes are attained.

DER-BMR has established the Nescopeck watershed as a high priority demonstration project, one of only six, to demonstrate AMD remediation technology. Although the Nescopeck has a medium priority rating on the 5/94 Degraded Watershed List, it was rated prior to its designation as a demonstration project. This new project and the significant local resources dedicated to it, warrant the watershed's listing as a high priority on the next Degraded Watershed List.

**III. Recommendations**

The ecology of the Nescopeck Creek Watershed is degraded mostly by inflow from the Jeddo Tunnel, and also by suburbanization pressure of the entire watershed. This rehabilitation plan, however, focuses only on the mine drainage and mining impact on the water quality and environment. It does not reflect industrial, development, timbering or other negative influences.

To improve the water quality of the Nescopeck Watershed, the Jeddo Tunnel Acid Mine Drainage shall be significantly reduced by discharge volume and discharge loads. The following action shall be taken:

Restoration of the surface flow to reduce the infiltration into the Jeddo Tunnel drainage system. Re-mining and reclamation of abandoned mine lands causing AMD. Using forfeited reclamation bonds and Title IV and other SMCRA funding to reclaim priority sites that are causing AMD.

Utilize local groups to increase public awareness.
Utilize partnerships to facilitate and monitor implementation actions.
Selection of proven and innovative technologies to reduce the pollutants loads of the Jeddo Tunnel discharge.

Prevention of the sewage inflow into the Jeddo drainage system.

## IV. Geology

### IV A.) Geologic Factors Affecting Mine Drainage

The study area, like most of the anthracite region, has a specific hydrologic system which results from extensive underground mining. Past mining has had the greatest effect on water quality in the study area. Underground (deep) mines, surface (strip) mines, coal breakers and coal refuse piles have left a legacy behind which carries a great burden. Extensive deep mining was done over the pat 150 years leaving the subsurface honeycombed with tunnels that are now flooded and now pose the threat of surface subsidence in some areas. The deep mines varied in size from small operations to large complexes which extended several miles. Years ago when deep mines were prevalent. In order to mine underground, great quantities of water were pumped to allow the operations to mine to great depths. As the anthracite industry declined the mines were abandoned and pumping ceased. The deeper workings were filled with surface water entering through some of the original openings, through crop falls and strip pits, and with groundwater percolating through undisturbed aquifers. As the workings become saturated, the flowing water begins to react with the pyrite in the shales adjacent to the coal veins. The underground workings filled with water are called "minepools". These minepools overflow and through the net drainage system they are collected in one discharge, Jeddo Tunnel. The discharge has the average magnitude of 40,000 gallons per minute, and is polluted with acid and various metals, such as iron, manganese, etc.

Most of the minepools are contained to various elevations by a system of barrier pillars. Barrier pillars are section of coal which were left in place underground to separate colliery workings and their water systems. The minepool levels are governed by the elevation of points of overflow to the Jeddo Tunnel drainage system. The existing condition of these barrier pillars is largely unknown. Breaches may have been created in the pillars by "bootleg" deep mine operations (un-mapped) and/or geologic structural failure.

There are 9 major minepools in the watershed which contain great quantities of water, and all of them overflow and discharge AMD through the Jeddo Tunnel. The major minepools are: West Woodside Basin, East Woodside Basin, Harley Colliery Pool, Jeddo No. 7 Fishtail, Jeddo No. 4 Slope B, Cranberry No. 11 Plane Basin, Hazleton Basin, Diamond Basin and the Stockton Basin.

### IV B.) Regional Topography and Stratigraphy

The area of the Nescopeck Creek Watershed is located in the Upper Susquehanna River Basin. The topography is primary mountainous, consisting of northeast-southwest trending ridges and valleys (lies in Ridge and Valley Physiographic Province). The hydrology of the southern part of the area is controlled by a mine dewatering system which ultimately discharge into the Jeddo Tunnel, hence to Little Nescopeck Creek. The northern part represents a natural local groundwater system which drains directly to Little Nescopeck Creek and Nescopeck Creek. The Little Nescopeck Creek Watershed lies mostly in Eastern Middle Coal Fields.

Stratigrafically the area is composed of:

Llewellyn Formation (Upper Pennsylvanian); lithologic character; shale, sandstone, conglomerate, carbonaceous shale, and anthracite coal.

Pottsville Formation (Lower Pennsylvanian); lithologic character; fine to coarse conglomerate and sandstone, siltstone, thin shale and anthracite coal.

Mauch Chunk Formation (Upper Mississippian); lithologic character; shale, siltstone, and fine to coarse grained sandstone.

The rocks of the Llewellyn Formation are present in the coal basins. The Pottsville Group is older and underlies coal seams of coal basins. Beneath these Formations lies older rock formations called Mauch Chunk. The ridges are built of rocks of the Pottsville Group and Mauch Chunk Formation.

### IV C.) STRUCTURE

The geologic structure in the area is rather complex consisting of a series of generally asymmetrical northeast-southwest striking anticlines and synclines.

The area has been subject to severe folding and moderate faulting. In some places the rock units are inverted. The folding and faulting has increased the amount of coal available in the area, since the anthracite coal beds provably would have been eroded if it were not protected in the large synclinal basins.

Faults are minor structural features in this area. Most are small wedge faults that transect only one or several beds and have 3 feet (1 m) or less displacement. Wedge faults lie at small angles (10 to 30 degrees) to bedding; displacement results in lateral shortening and duplication of beds (Cloos, 1961). Joints (i.e., fractures in the rock along which little or no movement has taken place) are developed in all lithologies, but are particularly well expressed in sandstones and siltstones. Strikes of the joints tend to be either roughly parallel to bedding strike (strike joints), approximately normal to bedding strike (dip joints), or markedly oblique to bedding strike (oblique joints). Most strike and dip-joint planes are oriented approximately perpendicular to bedding planes. Dominant jointing set strikes are NW-SE and NE-SW.

## V. MINING

### V. A) HISTORY

Anthracite coal mining was once the mainstay of the economy in the headwaters of the Nescopeck Creek watershed. Mining started in this area approximately 150 years ago and reached its peak during World War I. In 1917 Pennsylvania's anthracite production exceeded 100 million tons (91 million metric tons) which was mined by 156,000 men. The industry has declined significantly over the years duet to changing market conditions and regulations. It hit its lowest projection years in1983 when less than 3 million tons (2.7 million metric tons) were produced. There has been an increase in production in recent years. In 1996 there were 11.5 million tons of anthracite produced by 2,109 men. The increase in production is largely due to coal refuse recovery operations. New markets for the coal refuse have been developed in recent years for the production of electricity and the manufacture of titanium. This market has played a beneficial role in the watershed. There are and were extensive coal refuse piles throughout the study area which produce acid mine drainage. Some of these piles have decreased significantly and others are permitted to be mined due to the current market.

### V B.) CURRENT MINING

There are currently 23 permitted anthracites mining operations in the watershed, 18 are active. The active operations consist of 8 surface (strip) and 10 refuse reprocessing. The remaining operations are either inactive or haven't yet started. There are not active underground mines. According to the 1996 Annual Production Report 166,214 tons (90.744 metric tons) of coal were produced by 52 men in the Nescopeck Creek watershed.

### V C.) FUTURE MINING

Most of coal reserves of Eastern Middle Anthracite Field have been already extracted by intensive underground and surface mining in the past. The original coal reserves in the Eastern Middle Coal Field wear calculated in 1945 by George M. Ashley as 686 million net tons (622 metric tons). The 1948 the remaining reserves were calculated as 74 million net tons (67 million metric tons) in the ground [44 million tons (40 metric tons) in place available; 2.2 million tons (20 metric tons) inundated by mine pools; and 8 million tons for the support of the city of Hazleton and other surface features]. Present reserves of coal in situ are much smaller. This coal can be extracted by stripping method or mining through the whole coal basin. However, the significant amount of coal remain in waste or stock piles and coal banks. The technological progress increased availability of this coal. The processing of coal banks and refuse helps to obtain coal and benefit environment restoring land surface, surface flow and reducing AMD.

### V D.) MINING AREA MAPS

For the purpose of this rehabilitation plan numerous mine maps and plans (OSM Wilkes Barre and DEP-DMO) were reviewed. The reviewing process facilitated the Jeddo Tunnel Water Balance which is actually under final phase of work by SRBC.

SRBC staff has completed several maps including a digital representative of the coal basins and outfalls of the Eastern Middle Field. The GIS coverage are expected to assist in ranking areas of subsidence, pinpointing areas located in the watershed and analyzing the complex issues and problems associated with Jeddo Tunnel. The above map will be a part of the Watershed Management Plan.

### VI. A) GENERAL DISCUSSION-STREAM QUALITY EVALUATION

The Little Nescopeck Creek drains approximately 14 square miles (36.3 $km^2$) and receives a large inflow from Jeddo Tunnel which drains 32.5 square miles (84.2 $km^2$). The Jeddo Tunnel discharge enters the Little Nescopeck Creek near its headwater and affects the stream for most of its approximately seven mile length. Studies conducted by the Susquehanna River Basin Commission (SRBC) in 1982 revealed that no fish were present in the affected portion of the stream.

The effect of the Jeddo Tunnel drainage is also strong enough to destroy the quality of the Nescopeck from its confluence with the Little Nescopeck at Route 92 to its mouth. Again, SRBC studies revealed no fish and few organism in the Nescopeck below its confluence with the Little Nescopeck. Above this confluence, the Nescopeck is a good quality stream with a healthy biological community. According to SRBC documents, if the Jeddo Tunnel discharge could be eliminated, this alone would clean up the Nescopeck Creek. In December 1996 DEP established a monitoring point on the Little Nescopeck Creek. Samples are collected weekly by volunteers Friends of The Nescopeck (Drew Magill), analyzed by DEP lab (DEP donation to the project) and processed by Wildland Conservancy.

### VI B.) MAJOR FINDINGS

The Jeddo Tunnel discharge is a major source of The Little Nescopeck Creek contamination. The water quality of the creek is degraded by acid mine drainage. Major concerned quality parameters are as the following:

pH 4.2 – 5.0
Aluminum 2.7-9.0 mg/l
Iron 0.9-3.5 mg/l
Manganese 0.9-4.1 mg/l
Turbidity

Several years of supporting water flow and quality data which was subsidized with 104(b)(3) funds will be submitted, when summarized by SRBC and Wildlands Conservancy, as it is completed under the "604" funded project (i.e. by November 30, 1998).

## V. POTENTIAL REMEDIATION

### VII A.) GENERAL CONSIDERATION

The remediation plan for the Nescopeck Creek focuses on AMD from the Jeddo Tunnel, as the mine discharge is a major pollutant of the watershed. According to SRBC, if the Jeddo Tunnel discharge could be eliminated, this alone would clean up the Nescopeck Creek. To remediate destructive influence of Jeddo Tunnel numerous activities should be undertaken:

- reclamation of abandonded mine lands causing AMD.
- re-mining and reclamation of abandonded mine lands causing AMD.
- restoration of the pre-mining surface flow system.

- using forfeited reclamation bonds and other funding for a land reclamation and surface flow restoration.
- prevention from the sewage inflow into the Jeddo Tunnel drainage system.
- arrangement of system of the point passive treatment facilities within drainage net of Jeddo Tunnel.

**VII B.) PROJECTS ALREADY UNDERWAY**

**VII B 1.) COLLECTION OF WATER QUALITY DATA**

a. Weekly sampling – Water sampling has been conducted once a week at the Jeddo Tunnel discharge point by Wildlands Conservancy and volunteers for Friends of the Nescopeck since April 1995; samples are analyzed by the DEP laboratory for mine drainage pollutants (17 parameter).
b. Daily sampling – Turbidity is being monitored two to four times a week by Wildlands Conservancy and volunteers from the Friend of the Nescopeck (turbidity meter on loan from DEP).

**VII B 2.) COLLECTION OF RAINFALL DATA**

Rainfall data have been collected since November 28, 1995, by DEP-Bureau of Mining and Reclamation personnel at one location in Hazleton. Data collection is ongoing and precipitation data is included in the project database. Additional precipitation data is being forwarded to Wildlands Conservancy from Penn State University Hazleton campus. Project staff also routinely checks the USGS precipitation gage at the Hazleton airport before making flow measurements. Data collection is ongoing and precipitation data is included in the project database.

**VII B 3.) COLLECTION OF FLOW DATA**

Flow readings have been collected at the gaging station located at the outfall of the Jeddo Tunnel since October 1, 1995, by the U.S. Geological Survey. Wildlands Conservancy has assisted by reading staff gages for QA/QC purposes and has held regular meetings with the U.S. Geological Survey to coordinate data collection. Data collection is ongoing. Unfortunately, several critical months of record were lost due to vandalism.

**VII B 4.) HYDROGEOLOGICAL STUDY**

SRBC received a contract for the Jeddo Tunnel Water Balance study, the proposed enhancements funded under EPA 104(b)(3). This work is reported below, under 4f.

a. SRBC staff continues to gather hydrologic, geologic, and subsurface mine data to establish the surface and subsurface area draining to the Jeddo Tunnel Complex. DEP-Bureau of Mining and Reclamation has provided a schematic diagram of the mine workings draining to the Jeddo Tunnel to SRBC and its contractor instead of an interpretive report (or the "plumbing" report). In addition, DEP-Bureau of Mining and Reclamation has met with the contractor on several occasions to consult on the more detailed routing study of water flow through the mine workings (to be prepared by a subcontractor under the Jeddo Tunnel Water Balance report by the end of September 1998).
b. SRBC continues to evaluate precipitation data.
c. SRBC staff identified and established access to the four most important sites to make flow measurements where flow now enters the mines. SRBC intends to prioritize the sites in cooperation with Wildlands Conservancy, at least partially based on their potential for remediation (diversion of the flow). SRBC staff conducted flow measurements on May 20, 1997 (partial data set), October 30, 1997 (partial data set due to the drought conditions), January 9, 1998, and March 27, 1998. One additional set of measurements is planned.
d. SRBC has made observations of stream flow monthly, in conjunction with visits for task 4e, and performed synoptic flow measurement of the larger surface flows on May 20, 1997, October 30, 1997 (partial data set due to the drought conditions), January 9, 1998 and March 27, 1998. Although last year's drought is over, most of the sites have intermittent to ephermeral flow under average conditions, and storm events have not provided sufficient runoff for as many measurements as hoped. The 1997 drought precluded the seasonal flow measurements planned. SRBC staff continues to watch several storm events and plans one or possibly two additional set of measurements providing there is sufficient runoff.

e. SRBC staff has serviced the water level recorder, monthly. About one week of record was lost in June when vandals severed the cable (again). Copies of these water level cords are transmitted to Pagnotti Enterprises. SRBC staff also provided copies to Jeff Gittleman of Hawk Mountain Labs in June.
f. Under the Jeddo Tunnel Water Balance, SRBC staff has reviewed mine maps and identified sub-basins for analysis under this agreement, in conjunction with task 4c. Flow measurements were performed as noted above. Water quality data from DEP-Bureau of Mining Operations has been reviewed, along with data form the Jeddo Tunnel. SRBC staff and its subcontractor toured the surface overflows in the Eastern Middle Anthracite field on May 19 and 20. SRBC's subcontractor submitted a draft report for the routing study on May 26, 1998. The subcontractor provides information relative to the coal mine workings in the Eastern Middle Field, including maps of basins with underground min workings, corresponding surface outfalls, and evaluates water circulation routes. On May 20, SRBC staff and its subcontractor toured a re-mining site operated by Coal Contractors. Data for this work element are complete and will be reported in the final project report. Some additional analysis comparing sub-basin budgets to water budget of the Jeddo Tunnel drainage area is anticipated.
g. Prepare a water budget. Flows leaving the Jeddo Basin have been calculated for each set of measurements, water levels from the continuous recorder are being digitized, and precipitation data from several sources are being reviewed. SRBC staff intends to coordinate with USGS on interpretation of tunnel flows. A preliminary budget was completed in July, and will be supplemented with any additional data collected during the last quarter of the study. Precipitation, tunnel discharge, and pool levels will be collected through the end of the water year (September 30, 1998).
h. Prepare a report summarizing the water budget study. A preliminary outline for the report has been prepared.

**VII B 5.) DATABASE MANAGEMENT**

Data collected by the various partners in the study has been forwarded to Wildlands Conservancy for database entry and analysis. All databases are up-to-date and are ready for analysis. This includes last summer's global positioning system (GPS) data that has been entered into the database. Wildlands Conservancy staff has forwarded the GIS database to SRBC for producing area maps and data analysis. SRBC staff has completed several maps, including a digital representation of the coal basins and outfalls of the Eastern Middle Field. The GIS coverages are expected to assist in ranking areas of subsidence, pinpointing problem areas in the watershed, and analyzing the numerous complex issues and problems associated with the Jeddo Tunnel. Some data collection will continue until the conclusion of the water year, September 30.

**VII B 6.) MANAGEMENT PLAN PREPARATION**

SRBC and Wildlands Conservancy developed an outline for the management plan. SRBC and Wildlands Conservancy staff met and identified which sections of the plan are the responsibilities of which project partners. Participation of DEP staff in discussions of potential remediation actions and recommendations is critical to plan development. A timeline for management plan and report preparation. This activity is ongoing.

**VII C.) PROJECT FOR FUTURE CONSIDERATION**

**VII C 1.) DESCRIPTION OF WORK**

a. Diversion of surface streams that are entering the Jeddo Tunnel through mine subsidence.

- WESTERN HAZLETON COAL BASIN – Cranberry Creek drainage to Black Creek Re-establish Cranberry Creek channel downstream of Rt. 924, channel presently drops into surface mine pit.

  Re-establish channel downstream of Grape Run Reservoir to Cranberry Creek, channel presently drops into strip pit just to the northeast of the junk yard.

Re-establish two headwater channels of Cranberry Creek, one just east of the village of Cranberry Ridge and the other just east of Rt. 309 (one of the Nov. field trip stops).

Repair and extend coal basin perimeter drain channel west of the village of Humbolt. The channel diverts the drainage from the western most part of the Hazleton Coal Basin to Stony Creek east of the Humbolt Reservoir.

Re-establish a drainage channel from the area southwest of the I-81 interchange to Cranberry Creek.

- BLACK CREEK COAL BASIN – Black Creek drainage

Remove blockages from the Black Creek drainage channel from Rt. 940 eastward to the power line about 1.25 mi. east of the Stockton Road (SR3019).

Re-establish the Black Creek drainage channel from the power line eastward to the railroad embankment. A settling pond will be necessary to capture the fine grained coal waste presently being transported form upstream of the railroad embankment.

Establish a perimeter drain along the north side of the coal basin from Jeddo westward to Oakdale. Then run the drain southward next to the Stockton Road across the coal basin to connect to the Black Creek channel.

Establish a perimeter drain (called later "perimeter drain") along the north side of the coal basin from Ebervale to and along side of Rt. 940 connecting to Black Creek at the Rt. 940 bridge.

Construct a perimeter channel along the north side of the CROSS CREEK COAL BASIN from the south edge of Freeland to Difton, finally connecting to the channel near Jeddo ("perimeter drain No. 1). The channel would run downslope of an approximately parallel to Rt. 940. The sewage problems at Freeland would have to be solved first.

- LITTLE BLACK CREEK COAL BASIN – Little Black Creek drainage

Remove blockages from the existing perimeter drainage channel on the south side of the basin in the Lattimer area. Then extend the channel westward to drain partly flooded strip pits in the headwaters of the basin. Some backfilling of the pits may be necessary. Condition of old Little Black Creek channel form Rt. 940 to Rt. 309 would have to be checked and constrictions removed. Local street drainage goes through there now.

Divert drainage form the WOODSIDE COAL BASIN that now enters a pit in the LITTLE BLACK CREEK COAL BASIN. A diversion channel would be necessary going westward along the south edge of Pardessville and then turning southward across the LITTLE BLACK CREEK COAL BASIN to the west end of Lattimer. At that point the new channel would connect in with the existing perimeter channel. This would require considerable backfilling of the existing pit but there are two large waste banks to either side of the pit that could be directly pushed into the pit.

- EASTERN HAZLETON COAL BASIN – Hazle Creek drainage

Repair and re-establish perimeter drain along the north side of the coal basin from east of Stockton Road to existing channel of Hazle Creek north of what once was Ashmore Yards.

Re-establish drainage from the village of Hazlebrook westward along-side the railroad to the

existing culvert under the railroad that connects to Hazle Creek. Hazle Creek construction 0.6 mi. (1.0 km) east of Stockton road. The largest single diversion but probably not doable until the sewage problem from Hazleton is solved.

Backfill a large pit beside the railroad and install 0.35 mi. (0.6 km) of new channel. Additional backfilling along the north side of the existing channel east of Stockton road would be necessary to buttress that side of the channel.

Perimeter drain along north side of the basin from Hazleton border to the Stockton road. The channel would cross the coal basin along the Stockton road. Cannot be done until "perimeter drain No. 1" is done

Perimeter drain along north side of the basin from Rt. 93 to the Stockton road. Cannot be done until "perimeter drain No. 1" is done.

- CROSS CREEK COAL BASIN – Sandy Run Drainage

Perimeter drain along the northeast side of the coal basin form the road to the village of Highland to the Sandy Run water-gap just southeast of the village of Sandy Run. The channel could be extended eastward to capture the drainage from the east end of Freeland but the sewage problem there would have to be solved first.

a. Re-mining and reclamation of abandoned mine lands causing AMD.
b. Using forfeited reclamation bonds and Title IV and other Surface Mining Conservation and Reclamation Act funding to reclaim priority sites that area causing AMD.
c. Utilize local groups to increase public awareness.
d. Utilize partnerships to facilitate and monitor implementation actions.

**VII C 2.) ESTIMATED COSTS**

The cost elements cannot be estimated on this stage of project development.

**VII C 3.) POTENTIAL FUNDING SOURCES**

The funding sources cannot be determined on this stage of project development.

**VII C 4.) PARTICIPANTS**

Planning meetings begun in 1993 resulted in the Nescopeck Creek watershed being selected by DER-Bureau of Mining and Reclamation as one of its six demonstration projects in the Commonwealth. Consequently, Bureau of Mining and Reclamation has dedicated an initial budget amount of $20,000 to the project.

In order to assure the success of this demonstration project, the Wildlands Conservancy has entered into a partnership with DER's Bureau of Mining and Reclamation and Bureau of Abandoned Mine Reclamation and DER's Citizens Volunteer Water Quality Monitoring Program; U.S. Geologcial Survey; Friends of the Nescopeck; and Bloomsburg University. Other partnership alliance will include Wilkes University, Pennsylvania State University-Hazleton Campus, Kings College, and Susquehanna River Basin Commission.

**VII C 5.) TIMETABLE**

The timetable cannot be determined on this stage of project development.

**VII C 6.) ESTIMATED RESULTS**

Implementation of the Rehabilitation Plan should improve water quality in 7 miles (11 km) of the Little Nescopeck Creek and 19.6 miles (31.5 km) of the Nescopeck Creek to a point that a more diverse community of aquatic and semi-aquatic species can survive. Improvements in water quality does not immediately mean a return to a thriving community of macro-invertebrates. The depostion of metals, particularly iron and aluminum, has covered the bottoms of the watershed streams to a point that the food source for the macro-invertebrates has been smothered. Restoration of the food source should occur over time as storm events wash out the stream bottoms.

The Jeddo Tunnel discharge also affects the Susquehanna River, a major tributary of the Chesapeake Bay. Studies conducted in the 1970's showed that the Nescopeck Creek contributed over 90,000 pounds of acid per day to the Susquehanna. No figures are available as to how much sediment the Jeddo Tunnel contributes to the Susquehanna River. However, it should be noted that twenty percent of the sediment discharged to the Susquehanna is associated with coal mining operations. Thirteen percent of this sediment consists of coal fines. About 300,000 tons (272,000 metric tons) are dredged from the river, and the remaining 90,000 tons (81,700 metric tons) are transported to the Chesapeake Bay annually.

**VIII.) ACKNOWLEDGMENTS**

This plan is a result of the information and data subtracted and/or obtained from:

Wildlands Conservancy, DEP (DMO and BAMR), Friend of Nescopeck, SRBC, USGS, Bloomsburg University, Wilkes University, Pennsylvania State University, and Kings College.

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