LOWER MONONGAHELA RIVER NAVIGATION SYSTEM FEASIBILITY STUDY

FINAL MAIN REPORT

December 1991

U.S. Army Engineer District, Pittsburgh
1000 Liberty Avenue
Pittsburgh, Pennsylvania

SYLLABUS

This report on Monongahela (Mon) River Locks and Dams (L&Ds) 2, 3 and 4 was prepared as an interim effort under an authorizing resolution adopted by the Committee on Public Works and Transportation of the United States House of Representatives on 23 September 1976. A "survey" or "feasibility" level of analysis is provided and is sufficient to support a recommendation to the United States Congress on the advisability of authorization of necessary improvements.

The area of investigation included the "Lower" Mon River from the "Point" in Pittsburgh at river mile (r.m.) 0.0 to r.m. 41.5, the site of Locks and Dam (L&D) 4. L&D 2 is located in Braddock, PA at r.m. 11.2 and consists of a fixed crest dam with a 110' x 720' main chamber and 56' x 360' auxiliary chamber. The dam is about eighty-five years old and the locks are about 37 years old. L&D 3 is located in Elizabeth, PA at r.m. 23.8 and consists of a fixed crest dam with a 56' x 720' main chamber and 56' x 360' auxiliary chamber. Both the dam and locks are about eighty-four years old. L&D 4 is located in Charleroi, PA and consists of a gated dam with a 56' x 720' main chamber and 56' x 360' auxiliary chamber. The dam is about 24 years old and the locks are about 59 years old.

Two major problems were identified with the existing Lower Mon River navigation system: poor structural conditions and inadequate navigational features. Poor structural conditions include unstable foundations and deteriorating concrete. The possible consequences of inaction are continued deterioration and movement of concrete wall monoliths which would lead to unscheduled lock chamber closures or even loss of pool. The structure in the worst condition, L&D 3, is also one of the most heavily utilized in the Pittsburgh District. Inadequate navigational features include small locks and short approach areas. The main chambers at L&Ds 3 and 4 are 56' wide whereas all locks upstream are or soon will be 84' wide and all locks downstream on the Mon and Ohio Rivers are 110' wide. Tows that can single lock through upstream facilities must double lock through L&D 4. At L&D 3 the tow must downsize and double trip because of a short upstream approach area.

The primary objective of the planning process was to identify the most cost effective plan for solving these problems. Specific objectives included the need to provide safe and reliable navigation, to minimize towing inefficiencies, and to maintain or improve environmental conditions. A range of plans was developed with varying degrees of success in meeting these objectives. The plans were evaluated according to economic, environmental, acceptability and other criteria with the findings weighed and balanced to arrive at the "best" plan for recommendation.

Because of the number and magnitude of structural problems at the projects, the development of the baseline or "without" project condition ("without" plan) required a significant effort. A number of alternatives were developed and evaluated ranging from maintenance of the system with ordinary operations and maintenance (O&M) expenditures to reconstruction of entire projects. Given the need to provide a safe and reliable system, the alternative designated as the most probable "without" was fairly extensive in terms of work effort and cost. This effort includes the rehabilitation of Locks 2 by the year 2022, the reconstruction of the Dam 2 by 2002, the reconstruction of L&D 3 by 2002, rehabilitation of Locks 4 by 2002 and their reconstruction by 2027. The total first cost would be $739.3 million. Nonstructural measures were evaluated as a means of improving system performance and were included in the "without" plan when they were shown to be economically justified.

The "without" plan would adequately address the condition problems and the use of helper boats would partially address the navigation problems. However, the high cost of the "without" plan and the significant navigation problems that would remain indicated that alternative solutions should be explored. The remaining navigation problems were the bottlenecks created by the 56' x 720' and 56' x 360' chambers at L&Ds 3 and 4 which are only partially eased by the use of helper boats. Therefore, improvement plans were developed and evaluated that included larger lock sizes.

In addition to larger lock sizes, alternatives were developed to reduce the number of navigation projects on the Lower Mon by exploring the potential of alternative sites and pool changes. Such plans would provide transportation efficiencies by eliminating a lockage cycle and reducing project construction and O&M costs. Weighed against the reduction in direct project costs are the cost of adjusting shoreside facilities. Formulation included the development and evaluation of "2 for 3" as well as "3 for 3" project replacement plans with consideration to all project related costs. Because of the large number of alternatives, all were evaluated based on the construction of twin 84' x 720' locks at L&Ds 3 and 4 by the year 2002. The first stage of screening concluded with the identification of the best "2 for 3" and best "3 for 3" improvement plans.

The best "2 for 3" and best "3 for 3" plans were then evaluated to determine the optimum lock size and time-table for construction. As a result of this effort, a third improvement plan that included the deferral of construction of new locks at L&D 4 until the year 2027 was carried forward for further evaluation. The optimum size of the locks remained twin 84' x 720'.

"recommended project"

The three improvement plans and the "without" plan were then evaluated according to the criteria set forth in the Principles and Guidelines (P&Gs). Consideration was given to the magnitude and significance of the impacts of each alternative in the areas covered by the criteria to arrive at the recommended plan. The tentatively selected plan is a "2 for 3" replacement plan (Plan 1) that involves the construction of a gated dam at L&D 2, r.m. 11.2, the removal of L&D 3 at r.m. 23.8, and the construction of twin 84' x 720' locks at L&D 4, r.m. 41.5, with all work completed by 2002. A new minimum pool would be established at elevation 726.7 in the new Pool 2, thereby raising the minimum pool from r.m. 11.2 to r.m. 23.8 by 5.0 feet and lowering the minimum pool from r.m. 23.8 to r.m. 41.5 by 3.2 feet. The total economic cost is estimated at $734.7 million based on October 1991 price levels. This includes the Federal first cost of $556.5 million, $111.2 million of non-Federal cost and $67.0 million for rehabilitation work at Locks No. 2 that will be accomplished under existing authorities. The average annual costs would be $74.2 million and average annual benefits are estimated at $304.5 million. The benefit to cost ratio would be 4.1 to 1.

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(none requested)

Subject: Impact of FY 92 Interest Rates on Economics of Recommended Plan of Lower Mon River Study

1. The interest rate used in the Lower Monongahela River Navigation Study was the FY 91 rate of 8 3/4 %. The FY 92 rate is now available and is 8 1/2 %. The affect of the change in interest rates on project benefits and costs were computed in order to provide up-to-date information on the economics of the recommended plan.

2. Total costs and benefits of the without and recommended plans and the incremental costs and benefits of the recommended plan over the without plan at the new and old interest rates are provided in the following table. NED benefits are the incremental net benefits which are also shown in the table. The new (lower) interest rate further increases the National Economic Development (NED) benefits provided by the recommended plan (Plan 1).

Lower Monongahela River Navigation Study
Affect of Change in Interest Rates on NED Plan 1/
(Millions of October 1991 Dollars)

	FY 91 8 3/4 %	FY 92 8 1/2 %	Change - 1/4 %
Without			
Costs	$ 68.3	$ 66.5	- $ 1.8
Benefits	265.8	265.8	+ 0.0
Net Benefits	197.5	199.3	+ 1.8
B/C Ratio	3.9	4.0	+ 0.1
Recommended Plan (Plan 1)			
Costs	77.3	75.0	- 2.3
Benefits	304.5	305.0	+ 0.5
Net Benefits	227.2	230.0	+ 2.8
B/C Ratio	3.9	4.1	+ 0.2
Incremental Values			
Costs	9.0	8.5	- 0.5
Benefits	38.7	39.2	+ 0.5
Net Benefits 2/	29.7	30.7	+ 1.0
B/C Ratio	4.3	4.6	- 0.3

1/ Average annual equivalent benefits and costs.
2/ NED benefits.

The three improvement plans and the "without" plan were then evaluated according to the criteria set forth in the Principles and Guidelines (P&Gs). Consideration was given to the magnitude and significance of the impacts of each alternative in the areas covered by the criteria to arrive at the recommended plan. The tentatively selected plan is a "2 for 3" replacement plan (Plan 1) that involves the construction of a gated dam at L&D 2, r.m. 11.2, the removal of L&D 3 at r.m. 23.8, and the construction of twin 84' x 720' locks at L&D 4, r.m. 41.5, with all work completed by 2002. A new minimum pool would be established at elevation 726.7 in the new Pool 2, thereby raising the minimum pool from r.m. 11.2 to r.m. 23.8 by 5.0 feet and lowering the minimum pool from r.m. 23.8 to r.m. 41.5 by 3.2 feet. The total economic cost is estimated at $734.7 million based on October 1991 price levels. This includes a project cost of $556.4 million to be cost shared jointly by the General Fund (50%) and the Inland Waterways Trust Fund (50%), a private cost of $111.2 million and $67.1 million for rehabilitation work at Locks No. 2 that will be accomplished under existing authorities. The average annual costs would be $77.3 million and average annual benefits are estimated at $304.5 million. The benefit to cost ratio would be 3.9 to 1.

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SECTION 1 - THE STUDY AND REPORT

1. SCOPE OF STUDY

This study is an evaluation of the lower portion of the Monongahela River Navigation System consisting of Locks and Dams 2, 3 and 4. The projects range in age from about 40 to 90 years and their structural condition and ability to serve navigation interests through to the middle part of the next century are questionable. This report describes the general problems caused by their age and the small size of the locks at the projects and how these problems can best be remedied.

2. AUTHORITY OF STUDY

This report of Locks and Dams 2, 3 and 4 was prepared as an interim effort under an authorizing resolution adopted by the Committee on Public Works and Transportation of the United states House of Representatives on 23 September 1976 as follows:

> "Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on the Monongahela River Navigation System, printed as House Document Number 209, 50th Congress, Second Session; House Document Number 288, 67th Congress, Second Session; House Document Number 22, 70th Congress, Second Session; Senate Document Number 100, 81st Congress, First Session, and other pertinent reports with a view toward determination of the need for modifications or improvement of the existing project at this time."

3. PROJECT AREA

The Monongahela River is a commercially navigable tributary of the Ohio River with headwaters in the mountainous region of northwest West Virginia. The river flows in a northerly direction towards Pittsburgh, Pennsylvania where it joins with the Allegheny River to form the Ohio River. The area drained by the river ranges from gently rolling hills to steeply creviced mountains and is generally characterized as a major coal mining area.

Commercial navigation on the Monongahela River is afforded by a series of nine locks and dam projects which provide a minimum channel depth of nine feet and a width of approximately 300 feet. An index map and general plan and profile of the Monongahela River Navigation System are shown on PLATES 1 and 2, respectively. Tows are generally able to operate year-round on the river with exceptions occurring during periods of high water, heavy fog or heavy ice when navigation becomes hazardous or lock facilities become inoperable.

The navigable waterway provided by these lower Monongahela River projects extends from Braddock, Pennsylvania at river mile (r.m.) 11.2 to r.m. 61.2, at the Maxwell Locks and Dam. Major tributaries joining the main stream within this river reach include Turtle and Redstone Creeks and the Youghiogheny River. Locks and Dam (L&D) 2 is located at r.m. 11.2 in Braddock, PA, L&D 3 is at r.m. 23.8 in Elizabeth, PA, and L&D 4 is at r.m. 41.5 in Charleroi, PA.

4. CONTENTS OF REPORT

This report documents the findings of the evaluation of the Lower Monongahela River Navigation System. Two major problem areas are discussed - structural deterioration that threatens reliable navigation and navigation problems arising with the future traffic growth due to the small lock chambers at Locks and Dams 3 and 4. Actions to address these problems were developed and evaluated and are documented in the report.

The major steps that comprised the study are described and summarized in the remaining sections of this report. The information is presented in the sequence it was developed. Including this section, the section number and topics are: (1) introduction; (2) resources of the study area; (3) navigation on the lower Monongahela River; (4) problems with navigation in the area; (5) the development of plans to address the problems; (6) an evaluation of the plans; (7) the recommended plan; (8) conclusions; and (9) recommendations.

This report also includes the Environmental Impact Statement (EIS).

In addition to the main report material, the following appendices are provided: Engineering Technical, Real Estate, Study Area Resources and Economy, Plan Formulation, Structural Condition, Hydraulics, Hydrology, Cost Analysis, Navigation System Analysis, Public Involvement and Fish and Wildlife.

5. PARTICIPANTS IN STUDY

The Pittsburgh District, Corps of Engineers had the principal responsibility for conducting and coordinating this study, including plan formulation, consolidation of information from prior studies (both Corps of Engineers studies and those of other agencies), preparation of the report and environmental impact statement and development of report recommendations. Other participants included the Ohio River Division Navigation Planning Center, the Waterways Experiment Station (WES) and the US Fish and Wildlife Service (USFWS). The Navigation Planning Center performed the navigation system analysis which included the development of traffic demand forecasts, lock capacities, vessel fleets, transportation rates, and the transportation benefits attributable to each alternative. WES prepared Condition Survey Reports for the lock chamber and appurtenant facilities for each of the three projects. The WES reports included an analysis of existing and projected concrete condition and provided some recommendations for future remedial work and/or study. WES also performed simulation modeling of potential lock and dam replacement sites. The USFWS provided planning aid reports and the Fish and Wildlife Coordination Act 2B Report.

6. COORDINATION AND PUBLIC INVOLVEMENT

Public involvement and coordination with industry and other government agencies has been an on-going part of the Lower Monongahela River Navigation Study since the study was initiated in the 1980's. However, the effort intensified over the past two years as the possible courses of action and their potential impacts became more clear. Initially, most of the coordination was with towing companies and other commercial waterway interests in order to better understand their perceptions of navigation problems and what they felt needed to to correct these problems. Coordination was made through DINAMO (The Association for the Development of Inland Navigation in America's Ohio Valley). The primary concerns of these interests were safety, the unreliability of the nearly 100 year old projects, and the need to provide standard river sized locks. More recently, the involvement has been with individuals and public officials in communities that might be affected by the proposed pool adjustments and disposal plans. The principal concerns of these groups are the possible need for the relocation of some peoples out of their homes, and the adverse impacts that pool changes may have on the economy of the local area. The focal point of contact with these groups was the Public Meeting held on October 22, 1991 in Elizabeth, PA. Several follow-up meetings were held at various locations to meet with specific community groups and governmental entities.

The PUBLIC INVOLVEMENT APPENDIX contains a chronology of public involvement events, describes materials prepared for and distributed to the public, and generally explains the District's approach to providing opportunities for public interaction. All letters received in response to the public meeting and draft report, as well as the EIS review, are provided with the Final EIS in of this report.

7. EARLIER STUDIES AND REPORTS

The Locks and Dams 2, 3 and 4 Feasibility Study evolved from a number of previous studies for navigation on the Monongahela River. However, since many of these navigation studies are outdated, only those conducted by the Corps of Engineers since the 1950's are discussed below.

A study by the Pittsburgh District concerning the replacement of certain locks and dams was documented in a report entitled "Preliminary Design Memorandum, Reconstruction of Locks and Dams, Middle Monongahela River, Pennsylvania", July 1956. This report focused on replacement of those locks and dams that were approaching the end of their useful life or which, due to increasing traffic, had insufficient capacity. A revised report dated May 1957, recommended the construction of the Maxwell Locks and Dam to replace Locks and Dams 5 and 6, and the reconstruction of Dam 4 to accomplish the raising of Pool 4 by six feet. As a result of this report, Maxwell Locks and Dam and a new gated dam at Locks and Dam 4 were constructed in the 1960's.

In January 1981 a Reconnaissance Study of the entire Monongahela River Navigation System was completed. This study identified a number of problem areas within the system that warranted detailed investigation. The most critical area was in the middle reach of the river at Locks and Dams 7 and 8, closely followed by the lower reach at Locks and Dams 2, 3 and 4. Replacements for Lock and Dam 7 (Grays Landing) and Lock 8 (Point Marion) were authorized in the Water Resources Development Act of 1986 and are presently under construction. With the initiation and eventual correction of the middle river problems, the lower reach remained as the final area to be addressed. The detailed investigation of the Locks and Dams 2, 3 and 4 problem is the subject of this report.

SECTION 2 - STUDY AREA DESCRIPTION

The study area was defined as the Monongahela River basin area encompassing northern West Virginia and southwestern Pennsylvania. The area was delineated to contain all of the sub-areas that might be impacted by navigation modifications on the Lower Monongahela River. These sub-areas include those considered as potential disposal sites for dredge material as well as the communities that mine the coal shipped on the river. The general characteristics of the study area are described in this section and are intended to provide a description of the overall setting for the study and as an introduction to some of the factors driving the development of the area, as discussed in the next section, SECTION 3, DESCRIPTION OF LOWER MONONGAHELA RIVER NAVIGATION SYSTEM.

1. PROJECT AREA

a. Location

The projects under study are located on the lower portion of the Monongahela River near the city of Pittsburgh, Pennsylvania. Measured from the Point at Pittsburgh, L&D 2 is located at river mile (r.m.) 11.2, L&D 3 at r.m. 23.8, and L&D 4 at r.m. 41.5. Six other navigation projects are situated on the river upstream of L&D 4 and provide a navigable waterway to Fairmont, West Virginia. There are no projects on the Monongahela downstream of the study projects. At the Point in Pittsburgh, the Monongahela joins with the Allegheny River to form the Ohio. The Ohio flows in a generally southwesterly direction to near Cairo, Illinois where it feeds into the Mississippi River.

b. Physiography

Most of the drainage basin of the Monongahela River is in southwestern Pennsylvania and northwestern West Virginia. The physiography of the region is characterized by a gently rolling upland, deep and narrow valleys, and steeply rising slopes. Maximum relief within the drainage basin is nearly 4,000 feet while the local relief along tributary streams is 200 to 300 feet and along the Monongahela River is 400 to 500 feet. The river falls a total of 147 feet in its 128.7 mile length, or about 1 foot per mile. The normal river level elevation at Pittsburgh is 710 feet and the valley floor is about 1/2 mile wide.

c. **Climate**

The climate of the area is continental, with marked contrasts in temperature and moisture. The average annual temperature is 54 degrees Fahrenheit with warm and humid summers and relatively cold winters. Average monthly temperatures range from a low of 23.7 degrees Fahrenheit in January to a high of 84.0 degrees Fahrenheit in July. The average frost-free period varies from 145 days in the northern part of the basin to 180 days in the south. Precipitation averages 36.2 inches per year with monthly amounts ranging from 2.3 inches in February to 3.8 inches in July.

d. **Vegetation**

Vegetation in the area consists of forested areas dominated by oak, beech and hemlock trees. Upland areas are characterized by white oak-hickory forests while the lowland areas include willow, beech and maple hardwood trees. Native vegetation is still predominant in areas of limited accessibility or rugged topographic relief that do not provide sites suitable for human development. More accessible areas, particularly those near Pittsburgh, are heavily developed with large riverside industrial developments and private residences. Even in this area, however, narrow bands of vegetation persist along the water's edge.

2. ECONOMY

The economy affected by the navigation projects extends from the city of Pittsburgh to communities along the middle to upper river into West Virginia and down the Ohio River to Wheeling, West Virginia. The economy of Pittsburgh is diverse while the economies of the upriver communities are more dependent on single activities, such as coal production. The Pittsburgh economy depends on the river system to receive coal and petroleum products to fuel local industry while the upriver communities depend on the river system to ship coal produced in nearby mines. A more detailed discussion of the study area economy is provided in the STUDY AREA RESOURCES AND ECONOMY APPENDIX.

3. RESOURCES

a. **Human**

The population of the study area is about 2.6 million, the majority of whom reside in the Pittsburgh area.

b. **Industrial**

Industrial activity in the area is most extensive along the lower portion of the Monongahela River near Pittsburgh and includes steel production, coke production and the generation of electricity. Industrial activity along the upper portion of the river consists of coal mining, coal processing, and the generation of electricity.

c. **Mineral**

The area's natural resources include coal, water, limestone, sand and gravel, and timber. However, coal and water are the resources that have contributed the most to the development of the area.

Large amounts of coal are both produced and consumed in the area. The steel industry in the Pittsburgh area developed because of the availability of metallurgical coking coal found in the Monongahela Basin. In the early days of steel production, coal was the single most important raw material in the steel-making process. Coal is also used by local companies in the generation of electricity.

The area contains large reserves of coal. Five percent of the nation's demonstrated reserves of coal are in the Monongahela Basin. The Bailey mine located in the basin is both the largest mine east of the Mississippi River and the largest underground mine in the country. Overall, 13 of the 90 largest coal mines in the country are in the study area. The coal is generally high in heat content and moderate in sulphur content and is used in both electric generation and coke production.

d. **Cultural**

The area has a long history of human habitation, from the Paleo-Indian Period through to the present. Most of the settlements have been in the narrow flood plains along the river and, as a consequence, older settlements have generally been obliterated by more recent settlements. Prehistoric sites are highly disturbed and fragmentary as are some more recent sites. A few structures from as early as the 1840's remain, but the majority date from the late 1800's to early 1900's.

e. **Fish and Wildlife**

The fish and wildlife found in the study area are those generally common to the entire region. The numbers and variety were severely reduced over the past century as a result of industrial and residential development. However, the fish and wildlife resources in the area, particularly the fishery resource, is expanding once again as actions have been taken to reduce and control pollution levels of the water in the area.

There are no endangered federal species residing in the project impact area.

4. SUMMARY

The area has long proved amenable to human development, largely because of its abundant resources and relatively mild climate. One of its most important resources is the Monongahela River, which has long been used for transportation and as a source of water supply. The river served as a transportation corridor for the early Indians and later on, for European settlers. As the coal resources of the area became apparent, the river system developed as a means of transporting coal between upriver mines and the heavy industrial plants in Pittsburgh. In addition to transportation, the river is also important as a dependable source of water for human and industrial consumption. The river remains an important part of the infrastructure of the area for both of these reasons.

SECTION 3. DESCRIPTION OF LOWER MONONGAHELA RIVER NAVIGATION SYSTEM

This section presents a brief history of Monongahela River navigation, a summary of construction and improvements at the lower river projects, and data related to historic and projected commerce, vessel fleet characteristics, lock use, and lock performance. This material provides background information for SECTION 4, PROBLEM IDENTIFICATION.

1. HISTORY OF DEVELOPMENT

The Monongahela River was declared a navigable public highway in 1782, a time when lands that are now the states of Kentucky and Tennessee were battlegrounds between European settlers and native Indian tribes. In those days the river was used primarily to move logs down the river to Pittsburgh for use in constructing rafts which, in turn, were used to transport settlers down the Ohio and into the wilderness country. The first navigational improvements to the river were funded by the Commonwealth of Pennsylvania in 1792 and included the removal of rocks and the construction of low stone dams.

Consistent with its limited use, only a few navigational improvements were made to the river over the next 50 years. The impetus for major modifications was the development of the vast coal resources of the basin. In 1837 the Monongahela Navigation Company was chartered by the state of Pennsylvania and authorized to make improvements on the river from Pittsburgh to the Virginia (now West Virginia) state line. Construction of a system of locks and dams began in 1838 and continued over the next 22 years when work was interrupted by the Civil War. Boats paid tolls to use the company locks.

The Federal Government became involved with the Monongahela River in 1871 with the passage of the Rivers and Harbors Act. It constructed additional navigation projects and eventually bought the locks and dams owned by the Monongahela Navigation Company, making the entire river toll-free. By 1903 the navigation system consisted of 15 projects that extended navigation 131 miles upriver through Fairmont, WV.

Construction activity after 1904 generally consisted of modernization as opposed to extension of the navigation system. New projects were designed to reduce the number of projects and to provide larger locks. Replacement projects with larger (twin 56' x 360') locks were completed at L&D 2 in 1905, at L&D 3 in 1907, at L&D 1 in 1912 and at L&D 4 in 1917.

L&D 3 was equipped with a 56' x 720' chamber in 1924 by lengthening the existing land chamber. At L&D 4, a 56' x 720' lock was provided in 1932 when the entire project was rebuilt. L&D 1 was removed entirely in 1938 with the construction of a gated dam at the project immediately downstream (Emsworth) on the Ohio River. The locks at L&D 2 were replaced in 1953 with chambers measuring 110' x 720' and 56' x 360'. The dam at L&D 4 was replaced in the mid 1960s as part of the improvements to the middle river that were ongoing at that time. As part of the effort at L&D 4, the dam was constructed to accommodate the provision of 84' wide locks at the project in the future. This represents the final improvement to the lower river locks and dams to date.

The projects being evaluated are the three lowermost of the nine navigation projects on the Monongahela River. The three projects furthest upstream on the river were constructed in the 1960's and are single lock projects with dimensions of 84' x 600'. The next two projects are L&D 7 and Point Marion Lock and Dam, which are currently in the process of being replaced with single lock projects measuring 84' x 720'. Downstream of L&Ds 7 and 8 and upstream of L&D 4 is Maxwell L&D, which was constructed in the late 1960's and has twin locks measuring 84' x 720'. All of the construction activity involved enlarging the locks from 56' to 84' in width and from 360' to either 600' or 720' in length. Upon completion of the work at L&Ds 7 and 8, L&Ds 3 and 4 will be the only projects on the river with locks that are less than 84' in width.

2. PHYSICAL CHARACTERISTICS OF THE EXISTING PROJECTS

a. General Description

Table 3-1 summarizes selected physical descriptors of the lower river projects including their location, lifts (differential between pools), size of locks, capacity of project, and year opened or completed.

Table 3-1
Location, Lift, Size and Age of Lower Monongahela Projects

L&D	Distance from mouth (miles)	Lift (feet)	Lock Size Main (feet)	Lock Size Aux (feet)	Capacity (mil tons)	Locks Open (year)	Dam Completed (year)
2	11.2	8.7	110x720	56x360	62.0	1953	1906
3	23.8	8.2	56x720	56x360	43.4	1907	1907
4	41.5	16.6	56x720	56x360	42.6	1932	1967

Compared to navigation projects downstream on the Ohio River, the projects on the lower Monongahela River are closer to one another, have lower lifts, are older, the locks are smaller, and the capacity to pass traffic is more limited. The average distance separating the projects is 15 miles compared to about 50 miles on the Ohio; the lifts are 11 feet compared to about 21 feet on the Ohio; the average age is 62 years compared to about 30 years on the Ohio; the locks measure 56' or 110' x 720' compared to 110' x 1200' on the Ohio; and the capacities to pass traffic are 40-60 million tons compared to 120 million tons for Ohio projects. The same relationships are generally true when the projects are compared to those upstream on the Monongahela River, all of which have been replaced since 1965 or are in the process of being replaced.

b. **Structural Foundations**

The age of the projects provides some indication of the condition of their structural foundations, which are described below. Foundations not only differ between projects, but often between features at a project because of partial reconstructions over the years to adapt to changing environments. For example, larger locks at L&D 2 were constructed in the 1950's while the dam is the original construction from the turn of the century. As a result, the locks at L&D 2 are founded directly on rock or on steel piling and the dam on wood timbers.

(1) L&D 2

The locks were reconstructed in the early 1950's to provide larger and more modern locks consistent with the needs of the time. The walls are concrete gravity sections with the middle and river walls founded on concrete box caissons, the land wall on rock, and the guide walls on steel piles or cells.

The dam is a fixed crest weir and was constructed from 1904-1906. It is constructed of unreinforced concrete sections founded on wood piles. The dam was shortened and the midstream pier removed during the lock reconstruction (1949-1953). In response to extensive washout of fill material beneath the dam apron, scour protection stone was placed downstream of the dam in 1987.

(2) L&D 3

The locks were constructed in the period 1905-1907 but have been enlarged through modifications since then. All lock walls, except the upper guard wall extension and the extended lower river wall, are concrete gravity types founded on rock. The upper guard wall and lower river wall extensions are each a series of six circular steel sheet pile cells with connecting arcs. The sheet piles were driven to rock, filled with sand and gravel, and capped with concrete, with the exception of the first upstream cell which is totally concrete filled. Due to concerns over the extent of deterioration, the locks were recapped during 1977-1980 as a temporary measure to protect the interior concrete from deterioration caused by freeze-thaw weathering (see the STRUCTURAL CONDITION APPENDIX).

The original dam was completed in 1907 as a partially gated structure founded on wood piles. In 1919 the gates were removed and a concrete section was added to the original concrete to create a fixed crest dam.

(3) L&D 4

The locks were constructed from 1931-1932 and are founded on timber bearing piles. During reconstruction of the dam in 1967-1969, a new river wall section was constructed founded on rock. The new wall section was intended to accommodate the construction of new 84' wide locks at the project.

The dam was constructed in 1967 to provide a gated crest to accommodate a change in pool authorized in conjunction with the replacement of L&D's 5 and 6 by Maxwell L&D. The crest of the original dam was removed and that structure now serves as the apron and stilling basin for the gated dam. The gate sills and the abutment training wall are founded on steel bearing piles, while the dam piers and abutment are founded on rock.

3. HISTORIC TRAFFIC

a. Volume and Type

River commerce on the Monongahela River for selected years from 1951 to 1989 is provided in Table 3-2. The volume has generally varied within a range of 30 to 40 million tons a year.

Coal is the major commodity shipped on the Monongahela River, normally accounting for over 80 percent of all tonnage. Other important commodities include aggregates and petroleum products, which together account for about 10 percent of traffic.

Table 3-2
Historic Monongahela River Commerce
1951-1989, Selected Years
(Millions of Tons)

Year	Coal	Petroleum Products	Aggregates	Metals Products	Chemicals	All Other	Total
1951	26.5	0.8	2.8	1.2	0.2	0.5	32.0
1955	30.3	1.2	2.4	2.4	0.2	1.1	37.6
1960	23.7	1.3	1.6	1.8	0.4	0.7	29.5
1965	32.1	1.5	2.3	2.1	0.5	0.3	38.8
1970	34.7	1.6	2.1	2.5	0.6	0.8	42.3
1975	30.3	2.6	1.9	1.3	0.3	0.9	37.3
1980	28.9	1.4	1.7	1.2	0.4	0.7	34.3
1981	26.4	1.3	2.0	1.3	0.4	0.7	32.1
1982	24.6	1.0	1.9	0.6	0.3	0.4	28.8
1983	22.7	1.0	1.5	0.6	0.2	0.5	26.5
1984	30.3	1.0	1.7	0.8	0.3	0.4	34.5
1985	24.8	0.9	1.7	0.5	0.2	0.7	28.8
1986	27.8	1.1	2.2	0.4	0.3	0.6	32.4
1987	28.8	0.9	1.9	0.4	0.3	0.6	32.9
1988	32.8	0.8	2.0	0.4	0.3	0.9	37.2
1989	34.2	1.3	1.9	0.2	0.3	0.5	38.4

b. River Traffic and the Economy

The major factor driving Monongahela River traffic over most of the past four decades was the steel industry. Traffic levels generally varied with steel production, which was virtually unchanged over most of the period. The cap on river traffic was the productive capacity of the local steel plants.

The recent low point in river traffic was 1983, the year in which a large number of steel plants in the Pittsburgh area were closed. That year marks a major transition point in the economy of the area.

Despite the permanent closure of numerous steel plants, river traffic quickly rebounded and recorded some of the largest single year increases in decades. From 1983 though 1989, river traffic increased nearly 12 million tons, an average of 2 million tons per year. Current traffic levels are higher than when the steel industry was operating at near high production levels (1979). There are a number of reasons for this with the most important being the continued production of coke in the area, record levels of coal moving to electric generating plants, and expansion of coal markets to new geographic areas. Coke production continues in the area because the proximity of the coal fields makes regional production costs among the lowest in the country. The USX (US Steel) Clairton plant in the L&D 2 pool is the largest coking plant in the country and is presently the single source of coke for the eastern steel making facilities of USX. Coal moving to local power plants has increased, partially because of the marketing of electricity on the Eastern Seaboard. Duquesne Light, a major Pittsburgh utility, recently signed an agreement to sell electricity to utilities in the Philadelphia area. As a result, the company is reopening one of its coal-fired plants (Phillips) and a coal mine (Warwick) to assist in producing the electricity represented by these sales. The coal will be transported from mine to power plant by barge. New power line facilities must be constructed to transmit the power to this market.

As a by-product of developments in the steel and electric generating industries, many of the coal mines in the Monongahela Basin changed ownership in the 1980's. Previously, production from these mines was linked to demands in the steel industry, which also was a major market for electricity. As a result, coal production and river traffic fluctuated with changes in steel production. The rationalization of the steel industry led to the divestiture by the steel companies of many of their mines and reserves in the Monongahela Basin, weakening the link between coal and steel production. The new owners are attempting to diversify beyond their traditional markets and in fact are now selling coal to markets as distant as Wisconsin (Dairyland Power), Tennessee (TVA), Canada (Ontario Hydro), and Europe (thru New Orleans). All of new these coal shipments use the navigation system on one segment in their movement to their final destination.

4. PROJECTED TRAFFIC

a. Development of Forecasts

Traffic forecasts for the river were developed as a part of the effort to develop traffic demand projections for the entire Ohio River Navigation System. This work was performed by the ORD Navigation Planning Center in the Huntington District and is documented in a report published by the Center in May 1990 entitled "Forecast of Future Ohio Basin Waterway Traffic, 1986-2050". The effort consisted of a market analysis of the major industries that use or are expected to use the navigation system. It included industry forecasts, plant inventories, natural resource reserve estimates, and surveys of shippers and waterside companies. Short term 25-year forecasts were based on the industries' own forecasts and capped by existing and under-construction plant capacity. Long term forecasts were based on additions to capacity in amounts equal to satisfy future demands as indicated by OBERs-based growth in markets. A detailed summary of the development of the traffic forecasts is provided in the NAVIGATION SYSTEM ANALYSIS APPENDIX.

b. Traffic Demand Forecasts

Table 3-3 summarizes the traffic demand forecasts for the Monongahela River, the lower portion of the river, and L&Ds 2, 3 and 4. The growth rate is 1.4 percent a year for the river and 1.7 to 1.8 percent a year for the projects.

Table 3-3
Traffic Demand Forecasts
1986-2050
(Thousands of Tons)

	L&D 2	L&D 3	L&D 4	Lower Monongahela	Monongahela
1986	15,817	17,460	15,396	22,023	32,444
1990	19,409	20,770	17,589	27,464	38,318
2000	25,943	28,206	24,567	36,773	48,071
2010	29,592	32,495	28,702	41,421	52,993
2020	31,204	34,777	30,858	43,848	55,720
2030	37,112	41,284	37,454	50,929	64,562
2040	40,853	45,765	42,035	55,951	71,055
2050	45,209	50,966	47,375	61,778	78,700
Average Annual Growth Rate	1.7	1.7	1.8	1.6	1.4

c. Reasons for Deviation from Historic Growth Rates

While the growth rates for the Monongahela River appear relatively modest, they are high by the standards of the past four decades. This is particularly true of the short term forecasts, which show a nearly 50 percent increase in Monongahela River traffic demands from 1986 through 2000. The reasons for this apparently large increase are as follows. First, 5 million tons or one-third of the increase actually represents traffic demands not currently moving on the waterway but identified in industry surveys as traffic that would move on the river because of the replacement (now underway) of the small locks at L&Ds 7 and 8 on the upper river with larger locks. Second, a steel strike in 1986 depressed coal receipts at the Clairton coke plant. The normalization of this movement along with an increase in coal receipts because of the reopening of two coke batteries accounts for 3 million or 20 percent of the increase. Third, the reopening of the Phillips plant by Duquesne Light will add 1 million tons or 7 percent of the increase. The other 6 million tons represents normal long term growth in base traffic due to increased electricity generation by coal-fired plants, increased limestone movements for use in desulphurization units, and growth in other markets such as coal exports and coal shipments to eastern utilities.

Traffic demand growth after the year 2000 is much lower than pre-2000: it takes nearly 30 years after 2000 to equal the growth in the 14 years pre-2000 period. However, because the pre-2000 forecasts include adjustments as well as growth in existing waterway traffic, the volumes of traffic growth in the two periods are not strictly comparable. A more appropriate comparison is between the projected growth in traffic after the year 2000 with the unadjusted growth (6 million tons) in traffic from 1986 to 2000. The annual increase in traffic for both periods is about one-half million tons a year, or 5 million tons every decade. This is equivalent to the amount of coal burned in a large power plant.

d. Preliminary Tracking of Forecasts

Any projections of growth after decades of fluctuations around a constant trend line are naturally viewed with skepticism. While three years is insufficient time to determine if skepticism is justified or whether the analysis of coal markets provided "good" traffic forecasts, the data does show that Monongahela River traffic increased 6 million tons between 1986 and 1989 compared to projections of 4.5 million tons. After decades of no growth, indications are that river traffic has the potential to experience real growth for the first time since the establishment of the area's steel industry.

5. LOCK USAGE AND TOWING EQUIPMENT

a. **General**

Upon completion of construction on the upper river to solve the problems with existing Lock and Dam 7 and Point Marion Lock and Dam, the locks at L&Ds 3 and 4 will be the smallest on the Monongahela River. This is expected to exacerbate the difficulty of navigating on the lower river, as shippers adjust to the improved river system by using larger barges and tows. Historic trends in lock usage and towing equipment are discussed in the following paragraphs, as are expectations for the future.

b. **Lock Usage**

Statistics on the towboat fleet at the lower river projects for 1980 and 1988 is provided in Table 3-4. The first point of interest is the significantly higher number of towboats at L&D 3 than the other two projects, despite only minor differences in traffic tonnage. The principal reason for this is a short upstream approach area at L&D 3, which limits the size of tows passing through the project to those that can be processed in a single lockage operation. Because of this restriction, large tows that can pass through L&D 2 in a single lockage operation and through L&D 4 in a double lockage operation must be disassembled into smaller tows to pass through L&D 3. As a result, the number of tows at L&D 3 is higher than at the other projects, as indicated in Table 3-4 by the tons per tow statistics.

Table 3-4
Tons, Barges and Tows
1980 AND 1988

Project/Item	1980	1988	% Change
L&D 2			
Tows	6,138	4,533	-26
Tons/Tow	3,173	3,548	+12
Barges/Tow	5.5	5.2	-5
L&D 3			
Tows	8,756	7,427	-15
Tons/Tow	2,295	2,462	+7
Barges/Tow	4.7	4.5	-4
L&D 4			
Tows	7,002	5,300	-24
Tons/Tow	2,425	3,083	+27
Barges/Tow	5.1	5.5	+8

SOURCE: PMS.

The operation performed by large tows to pass through L&D 3 is commonly referred to as double tripping. It requires that the towboat remove several barges from the tow so that the remainder can lock through in one-cut, moving the stripped-down tow through the lock, tying these barges along shore, returning empty through the locks, retrieving the barges that were stripped-off prior to the first lockage operation, moving these barges through the lock, retrieving the barges locked in the first operation, and reassembling the tow into the original configuration. The total time required for double tripping is not included in statistics on processing and delay times recorded at the project since a major portion of the operation occurs away from the project where the data are recorded. Total processing times, as shown in Table 3-5, recorded at the projects, including delays, range from 47 minutes at L&D 3 to 58 minutes at L&D 4. The total time for double tripping is estimated to take from 3 to 5 hours.

Table 3-5
Processing Times at L&Ds 2, 3, and 4
1986
Minutes per Tow

	L&D 2	L&D 3	L&D 4
Lockage	39	33	42
Delay	16	14	16
Total	55	47	58

c. **Towing Equipment**

The data also indicate that the number of tons per tow has been increasing over time despite a decline in the number of barges per tow. The reason for this is the use of larger barges. For historic reasons linked to the size of the locks on the Monongahela River (56' x 360') and the large volume of shipments that moved only on the Monongahela River, a barge fleet developed that was unlike that used elsewhere on the system. The fleet consisted primarily of regular (standard) barges that measure 26' x 175'. Three of these could fit in the chamber with a towboat as compared to only two stumbo (26' x 195') or one jumbo (35' x 195') barge. Three regular barges can carry 2,700 tons, compared to 2,200 for two stumbos and 1,500 for one jumbo barge. As a result, the barge fleet on the Monongahela River consists primarily of regular barges (Table 3-6). However, with the replacements of Lock and Dam 7 and the Lock at Point Marion Lock and Dam on the upper river, the last vestiges of the 56' x 360' size main lock system are being removed. As a result, it is expected that the use of larger barges will become more prevalent despite the inefficiency of locking them through L&Ds 3 and 4.

Table 3-6
Distribution by Barge Type at Monongahela River Projects
1986

Project	Regular (%)	Stumbo (%)	Jumbo (%)	Other (%)
L&D 2	42	17	29	12
L&D 3	54	28	11	7
L&D 4	55	33	8	4
Maxwell	58	33	7	2
L&D 7	70	25	3	2
L&D 8	67	27	4	2
Hildebrand	27	65	8	-
Morgantown	67	32	1	-
Weighted Average	57	28	11	4

6. CONCLUSIONS

The projects on the Lower Monongahela are generally old projects that have been modified over the years with add-on features designed to accommodate the needs of the time. The locks and dam at L&D 3 were opened in 1907 while the land chamber was lengthened in 1924 to accommodate larger tows and increasing traffic. The locks at L&D 4 were opened in 1932 while the dam was reconstructed in 1967 as part of the improvement plan for the middle river. Finally, the dam at L&D 2 was completed in 1906 while the locks were reconstructed in the early 1950's to accommodate larger tows and higher levels of traffic.

The locks at L&Ds 3 and 4 are also relatively small by present day standards. Small locks mean limited capacity which eventually results in high delays as traffic on the river increases. The problems are exacerbated by the short upstream approach at L&D 3, which requires that tows double trip over this stretch of the river. The short upstream approach is partially due to the fact that the project was originally sited over 80 years ago for the smaller tows and shorter lock chambers (56' x 360') characteristic of the time. Continued increases in tow size consistent with the predominant size of Monongahela River locks (84' wide) indicate that the congestion and safety problems caused by double tripping will worsen in the future.

SECTION 4 - PROBLEM IDENTIFICATION

This section summarizes the major problems with the existing navigation projects and the expected and/or possible consequences if the problems are not corrected.

1. INTRODUCTION

Four major problems were identified for the Lower Monongahela River navigation system: poor foundations, deteriorating concrete, small locks, and inadequate approach areas. Foundations and concrete are components of the structure of the projects, and are described in the following paragraphs under that heading. The possible consequences of poor foundations and/or deteriorating concrete are the failure of major structural components resulting in unscheduled lock chamber closures or loss of pool. Lock size and approach areas are navigational features of the projects. Small lock sizes and short approach areas generally reflect the fact that the projects were constructed in an era when tows were small and traffic levels were low. The consequences of small locks and short approach areas given today's tow sizes and traffic levels are complicated towing operations, high traffic delays, and greater risk of accidents. These problems and their possible consequences are described in the following paragraphs.

2. STRUCTURAL CONDITIONS

a. **General**

The structural conditions of the existing projects were evaluated with the following sources of information - District Periodic Inspection Reports and structural and stability computations, diver observations of the dam apron and foundation conditions, and Waterway Experiment Station (WES) Condition Surveys of the locks conducted during the late 1980s. The WES Condition Surveys primarily involved core sampling and analysis of lock wall concrete and foundation material. The studies for each project are cited below and details on specific findings are described in the STRUCTURAL CONDITION APPENDIX.

The structural deficiencies of each facility can be categorized in the areas of concrete deterioration and foundation condition. The primary causes of concrete deterioration occurring at the three existing structures are freeze/thaw cycles, barge impacts, and poor construction techniques. The visible effects of concrete deterioration include gouging and cracking of surfaces but the defects can also extend throughout the concrete wall sections (monoliths) and threaten their structural integrity. Deteriorated portions of monoliths could fall into a lock chamber and endanger lives. Concerns about the foundation conditions include weak bearing material, excessive pile loadings, and washout of the foundation material. The visible effects of foundation condition problems include movement of entire monoliths. Movement of monolith sections or entire monoliths could lead to safety hazards or render a lock inoperable. These situations would require, at a minimum, more costly maintenance actions or even emergency (unscheduled) repair and a possible corresponding closure of a lock or both locks. Emergency repairs would entail some risk to work crews and unscheduled lock closures would be more costly to navigation interests than scheduled maintenance closures since they have no time to make alternate plans. A movement of one or more dam monoliths or critical lock monoliths during a lockage operation could lead to a loss of pool. This would be particularly devastating since both navigation and water users in the affected pool would incur additional costs. The Maxwell pool has been lost three times in the last ten years. In 1985, barges were swept loose by flood waters and became lodged in several gates at the dam. The pool was lost for about two months and the resulting losses to industry (navigation and other water users) were estimated to be about $1 million per day.

Following is a summary of the findings for the six major structural components of the existing structures - the locks and dam at each location. Also included for each component are potential consequences if the problems are not corrected in a timely manner.

b. **Locks 2**

In general, the lockwalls at Locks 2 are in good condition and only require minor repairs at present. The primary concern is the floodway bulkhead for the auxiliary chamber, which is discussed at length below.

(1) Foundation Condition

The foundation material provided adequate stability and is not a concern over the analysis period.

(2) Concrete Deterioration

All walls are constructed with air-entrained concrete except the upper guard wall extension, which is constructed of circular steel sheet pile cells. Air-entrained concrete is more resistant to deterioration caused by freeze-thaw than non air-entrained concrete used in the other structural components described below. For the lock walls, the only problem areas include minor cracking at the recesses and severe spalling at some of the monolith joints within the chambers. However, the outdated floodway bulkhead for the auxiliary chamber is marked with several significant defects. (The floodway bulkhead serves several purposes. During flooding, it allows river flows to pass through the auxiliary chamber, thereby reducing river levels and flood damages. It serves as an emergency lock closure that could prevent a loss of pool and as a closure for maintenance lock dewaterings.) Both support piers contain large vertical cracks that threaten its structural integrity. Furthermore, misalignment of bulkheads have occurred during placement. Such misalignments must be corrected manually, therefore posing potential safety problems and encroaching on valuable timely placement. The failure of this system to operate in a critical situation is a real possibility. Clearly, this is not a reliable system to provide for the important functions for which it is designed and required.

(3) Potential Consequences

The most likely short term adverse consequence of operating and maintaining the existing Locks 2 is failure of the auxiliary chamber floodway bulkhead during placement. Such failure would cause increased flooding and could result in injury or even loss of life. Also of concern is the continued effect of concrete deterioration due primarily to tow impact damage. If left unchecked, this continued deterioration could lead to monolith damage with repair requiring emergency lock closure(s) during the latter half of the analysis period.

c. **Dam 2**

Dam 2 is the oldest and one of the poorest structures in terms of condition and reliability in the Pittsburgh District. The primary concern is foundation stability even though there are also signs of significant concrete deficiencies.

(1) Foundation Condition

The District has had serious concerns about the stability of Dam 2 since 1973 when a substantial washout of the stone fill foundation material was discovered by soundings. In 1978, uneven flow over the crest of the dam was observed, suggesting concrete damage (addressed below) or settlement of sections of the dam or apron. In 1983, divers noted that numerous timbers under the apron were missing and fill material was washed out all the way to the downstream face of the dam in many areas. They also noted strong currents coming from two holes under the dam, suggesting missing fill material under the entire cross section of the dam. The dam and apron are supported by timber piles and stone-filled timber cribs, respectively. The foundation material under the dam and apron supplies lateral support that is critical to the stability of this structure. Missing foundation material increases the loading on the vertical piles and increases the probability of pile failure, which in turn could lead to dam movement and breaching. Stability analyses show that <u>even if full foundation support is assumed</u>, the piles are overloaded laterally under current design criteria when ice or impact loads are considered. The allowable load is 6,000 pounds per pile (lb/pile), whereas the load experienced by the piles at Dam 2 is 14,000 lb/pile. Furthermore, these analyses show that the piles are overloaded even more in both tension and compression for design loads when loss of supporting fill is assumed. These concerns led the District to complete interim scour protection downstream of the dam in 1987; however, there was no provision for repairing voids in the foundation of the dam. The scour protection was placed within the O&M program and repairing the voids would have been far too costly and relatively ineffective in terms of increasing the reliability of the dam. However, this limited work effort was considered as an acceptable interim solution until comprehensive improvements could be made.

(2) Concrete Deterioration

All concrete is non-air entrained and unreinforced. Based on observations of uneven flow over the dam, the District believes that the concrete is damaged, due either to deterioration or impact damage.

(3) Potential Consequences

If not corrected, the extremely poor foundation conditions could allow for movement of sections of the dam and loss of pool at any time. Emergency repair costs and corresponding navigation impact costs were calculated for a hypothetical dam failure situation. It is theorized that a breach of the dam would affect at least a 100 foot section and would take about two months at a cost of approximately $7 million to repair. A two month loss of pool with restrictions on river traffic would also result in higher transportation costs that would cost about $32 million.

d. **Locks 3**

Of the 24 lock and dam projects in the Pittsburgh District, L&D 3 has the locks considered to be in the worst condition from both foundation and concrete deterioration standpoints. WES completed two Condition Surveys, one in 1976 prior to a major rehabilitation and the other in 1988 as part of this study effort. The 1988 report is summarized in the STRUCTURAL CONDITION APPENDIX.

(1) Foundation Condition

All lock walls, except the upper guard wall and lower river wall extensions, are concrete gravity type founded on rock. There are two major areas of concern with the foundation conditions at Locks 3. The first is the poor quality foundation material over the majority of the lock site. This material is highly weathered and fractured and does not provide a solid base for the lock walls. Furthermore, at least one monolith bears on coal, a very poor and unreliable foundation material. The second concern is a weak foundation material-concrete interface. Approximately 400 feet of the lower middle wall was placed in the wet by dumping concrete into wooden forms during the 1920-1923 modification of the large chamber, resulting in a very poor foundation contact.

The poor stability conditions were improved somewhat in the 1978-1980 rehabilitation. Extensive monolith wall areas were stabilized with rock anchors, including about 550 feet of the retaining wall for the land chamber flume and the following monoliths: L39 thru L45 (land wall); M3 thru M26 (middle wall) and; R12 - R23 (river wall). A total of 212 anchors were installed, of which 167 were installed using polyester resin grout with a single level of corrosion protection. These anchors provided additional resistance to both sliding and overturning movements. However, due to the extremely poor stability conditions, the resulting stability safety factors after the anchor installation are still below those recommended by current criteria. Furthermore, based on information obtained subsequent to this installation, the District believes that these anchors cannot reliably provide adequate resistance to movement throughout the analysis period. A more detailed discussion of the major rehabilitation work accomplished and its temporary nature is provided in the STRUCTURAL CONDITIONS Appendix.

(2) Concrete Deterioration

The concrete at Locks 3 is unreinforced and non-air entrained. The 1976 WES Condition Survey found that concrete deterioration extended from two to six feet into the walls. Additional pockets of concrete, estimated at 10-20% is unsatisfactory due to the poor construction techniques used in the original construction. During the '78-'80 rehabilitation program, broken timbers and other miscellaneous material that had fallen into the concrete during the original construction were discovered. It was not practical to replace all deteriorated concrete during the major rehabilitation as a major reconstruction effort at considerable cost and extended lock and project closures would have been required. The condition was temporarily addressed by refacing or resurfacing most of the lock wall vertical and horizontal faces. Generally a 1 foot thick cover was placed on those surfaces above the lower pool level, mainly to restore the surface to a serviceable condition free of gouges that barges could catch upon impact and to provide protection to the underlying deteriorated concrete. This cover is primarily designed to prevent further deterioration of the interior concrete and can not resist structural loadings. Substantial volumes of interior deterioration remain, as evidenced by severe cracking in the middle wall gallery and subsequent telescoping of internal cracks throughout the new cover. In addition, the rehabilitation did not permanently resolve a critical stability problem in the retaining wall on the land side of the land wall filling flume.

When viewed from the top of the lock walls, the concrete looks reasonably good. However, this is misleading as the overlay merely masked many problems and did not correct them. The fact remains that a significant portion of the wall volume at Locks 3 is deteriorated and thereby limited in load resistance capacity.

(3) Potential Consequences

Due to the generally poor foundation and concrete conditions, long reaches of all walls are susceptible to unacceptable movement at any time. As concluded in the WES 1988 Condition Survey, the major concern "...is that one or several of the concrete defects could connect up with a structural crack propagating through a monolith, as a result of a boat or barge impact, and contribute to a failure of a monolith that could result in closure of a chamber or loss of pool." Thin unreinforced sections around pipe galleries and culverts are particularly vulnerable. Modern projects are designed to withstand larger impact loads associated with the increase in tow sizes over time. In addition, the overloading on the retaining wall in the land wall flume could cause movement and failure of the flume. Emergency repair costs were estimated for hypothetical failures of wall monoliths. It is theorized that such failures would occur in groups of two or three monoliths and cost $5 - $10 million to repair under emergency conditions in addition to closing one or both lock chambers for several months. A three month closure of this project would result in about $50 million in higher transportation costs.

e. **Dam 3**

Dam 3 is very similar in nature and condition as Dam 2. As with Dam 2, the foundation condition is the more serious concern.

(1) Foundation Condition

The stability of Dam 3 is seriously compromised as evidenced by missing timbers from the cribbing and voids under the apron. Scour is also a problem downstream of the dam. No scour protection has been placed since work in connection with this study is envisioned. Although there have not been reports of flow under the dam, fill material may be missing. However, even if no fill is missing, District computations show that the piling are overloaded both axially and laterally when ice/impact loads are considered. For example, the allowable vs. actual maximum pile loadings for this structure are 60,000 lb/pile vs. 68,000 lb/pile compression, 6,000 lb/pile vs. 13,000 lb/pile lateral and 0 lb/pile (no tension pile loads are allowed in this type of structural design) vs. 23,000 lb/pile tension. Furthermore, the abutment piling is extremely overloaded, 60,000 lb/pile allowable vs. 139,000 lb/pile compression, 0 lb/pile vs. 47,000 lb/pile tension and 6,000 lb/pile vs. 13,000 lb/pile lateral load.

(2) Concrete Deterioration

All concrete is non-air entrained and unreinforced. There are large cracks and concrete breakouts in the dam apron. The abutment concrete is also in very poor condition.

(3) Potential Consequences

As with Dam 2, the extremely poor foundation conditions demand extensive repairs by the turn of the century. Without these repairs, movement of sections of the dam and loss of pool could occur at any time. Emergency repair costs and corresponding navigation impact costs were calculated for a hypothetical dam failure situation. It is theorized that a breach of the dam would affect at least a 100 foot section and would take about two months to repair under emergency conditions and cost approximately $7 million. A 2 month loss of pool would also result in higher transportation costs that, along with reduced availability of river water, would cost the regional economy about $33 million.

f. <u>Locks 4</u>

In general, Locks 4 are considered to be in fair to poor condition with primary deficiencies in concrete deterioration and pile loadings.

(1) Foundation Condition

The lock walls are founded on 12" diameter wood piles intended to be end bearing. However, it is not known if the piles were driven to rock. This uncertainty, combined with the age of the piles, reduces their reliability to adequately resist normal loads. Furthermore, District computations indicate that the majority of the lock wall pile loads are very near the allowable for wood piles. These high loadings have been in effect since 1967 when Pool 4 was raised six feet. This increased loading condition was accepted at the time under the assumption that corrective action would be taken within a 25 year period. In addition, the pile cap for these walls is also considered a potential problem area. The cap is a 4 foot thick unreinforced concrete beam at the base of the wall monoliths. With the high pile loads that are transferred to it, this cap is subject to tensile loads that could propagate cracks throughout the monolith. Under normal, current design, the cap would be designed with steel reinforcement to resist such tension.

The upper guard wall is founded on stone filled cribbing and is leaning toward the land chamber. The lower guide wall is also leaning, but riverward, due to the loads imparted by the backfill and land side railroad loading behind the guide wall.

(2) Concrete Deterioration

All lock walls are unreinforced and non-air entrained concrete. They are considerably spalled and eroded with deterioration penetrating several feet. The ceiling and floor of the galleries have longitudinal cracks as well as occasional transverse cracks, which is made more serious by the absence of reinforcing steel in these relatively thin concrete wall sections. There is extensive leakage into the middle and river wall galleries. There has been relative movement between the monoliths in the middle wall, noted both in the pipe gallery and the culvert. Most of the lock wall monoliths contain cracks which threaten the structural integrity of these concrete monoliths.

(3) Potential Consequences

The extensive cracking and extremely high pile loading could result in monolith movements requiring emergency repair at any time. Such movements would probably be started by barge impact. As with Locks 3, thin unreinforced sections around the pipe galleries and culverts are vulnerable. Wall movements would probably occur in groups of two or three monoliths, cost \$5 - \$10 million to repair under emergency conditions and close one or both chambers for about three months. A three month closure of both chambers would result in an additional \$45 million cost.

g. **Dam 4**

Dam 4 was reconstructed in 1967 and is in good condition.

(1) Foundation Condition

The only problem area with the foundation is scouring of the derrick stone protection below the stilling basin to various depths over its entire length.

(2) Concrete Deterioration

There is minimal concrete deterioration at Dam 4. However, many of the concrete baffles below the dam have been damaged and there are several scour holes in the stilling basin floor.

(3) Potential Consequences

Due to its good condition and minor repair of the items discussed above, possibly with Operations and Maintenance funds, no significant consequences are anticipated over the analysis period for Dam 4.

3. NAVIGATION PROBLEMS

a. General

There are two problem areas in terms of navigation with the existing system: small locks and short approach areas. Small locks are a problem at L&Ds 3 and 4 where the width of the locks is only 56' as compared to 84' or larger elsewhere on the river (upon completion of Grays Landing and Point Marion L&Ds in 1995). A short approach area is a problem at L&D 3 where it limits tow size to the length that can pass through the project in one-cut (720'). These problems and their consequences are described further below.

b. Small Locks

The small size of the locks at L&Ds 3 and 4 requires that tows go through a series of complicated operations to pass through both projects. The problem is compounded by the locks being smaller in the critical dimension of width as opposed to length. At L&D 4, the width restriction requires that downbound tows reconfigure to accommodate the smaller width of the lock by stripping off a column of barges to reduce the width of the tow and adding the barges to the front to increase its length. The tow can then double lock through L&D 4 and proceed downstream to above L&D 3, where operations become even move complicated because of the short upstream approach area, as described below. The same series of operations is necessary for upbound tows, in the opposite sequence. The time required to reconfigure is estimated at about 30 minutes. Since reconfiguration occurs away from the project, it is not included in the processing times recorded at the lock.

Locking delays are a second problem related to the small size of the locks. While delays are relatively minor at present, they are expected to increase to significant levels in the future.

c. Short Approach Area

The approach area upstream of L&D 3 is short because of the configuration of the river above the locks. Consequently, it is considered unsafe for long tows to navigate this stretch of river and so they are restricted to a length that can be processed through L&D 3 in a single cut (720'). This requires that larger tows perform a series of time-consuming and costly operations known as double tripping to pass through this stretch of river. Double tripping operations were described in SECTION 3 and basically involve downsizing tows to dimensions that can pass through the main lock in one cut along with the shuttling operations necessary to move all the barges through the project. The operation is both time consuming (3-5 hours) and risky because the high frequency of towboat movements increases the opportunity for accidents.

d. **Summary of Navigation Problems**

The major navigation problems of the study reach are summarized in Table 4-1. The problems are small locks and a short approach area which have the effect of complicating towing operations, adversely impacting on the economic benefits of navigating on the Mon and injecting a significant element of personal risk to the crews transiting the facilities.

Table 4-1
Navigation Problems and Consequences

Project	Problem	Consequence	Timing
L&D 3	Short Approach	Double Tripping	Current
	Small Locks	Delays	Future
L&D 4	Small Locks	Reconfiguring and Double Locking	Current
	" "	Delays	Future

4. SUMMARY OF PROBLEMS

The major problems with the projects are their poor structural conditions and small navigational features. The problems are summarized in Table 4-2 below.

Table 4-2
Summary of Problems
Monongahela River L&Ds 2, 3 AND 4

Facility	Structural Condition		Navigation	
Component	Foundation	Concrete	Lock Size	Approach
Locks 2	Good	Fair	Adequate	Good
Dam 2	Poor	Poor	---	---
Locks 3	Poor	Poor	Inadequate	Very Poor
Dam 3	Poor	Poor	---	---
Locks 4	Poor	Fair/Poor	Inadequate	Good
Dam 4	Good	Good	---	---

SECTION 5. PLAN FORMULATION

1. GENERAL

This section summarizes the process used to arrive at the final array of plans for the Lower Monongahela River navigation study. It begins with a description of the development of the "without" project condition ("without" plan) and ends with an economic analysis of the "best" improvement plans, which along with the "without" plan were carried forward into the next section for evaluation according to other pertinent criteria.

The planning horizon for this study is the 50 year period beginning in 2002 and ending in 2051. All estimates are expressed in October 1991 price levels and all values, as appropriate, were discounted using a rate of 8 3/4 percent.

2. NATIONAL OBJECTIVES

The principal Federal objective of water and related resources planning is to identify the best investment from a Federal perspective while at the same time protecting the nation's environment. Such protection is accomplished pursuant to national environmental statutes, applicable Executive Orders, and other Federal planning regulations. Contributions to national economic development (NED) are increases in the net value of the national output of goods and services, expressed in monetary units. It is, therefore, the goal of all Corps' studies to alleviate problems and realize opportunities related to the output of goods and services or to increase economic efficiency. The Principles and Guidelines for Water and Related Land Resources Planning establishes four accounts to facilitate the orderly evaluation of each plan. These accounts are: National Economic Development (NED); Environmental Quality (EQ); Regional Economic Development (RED); and Other Social Effects (OSE).

3. STUDY OBJECTIVES

The primary objective of this study was to determine the navigational needs on the Lower Monongahela River and to develop and evaluate plans to meet those needs. Such plans must contribute to the NED, while protecting Environmental Quality (EQ). Consideration was also given to Regional Economic Development (RED) and to Other Social Effects (OSE).

This evaluation addressed only those problems and needs related to navigation and its associated water resources within the study area. Other problems or needs that affect or could be affected by solutions to navigation problem, or that reflect an alternative use of the same resource, have and will, continue to receive appropriate consideration.

An examination of the existing problems and concerns of the study area indicate a need for more specific planning objectives. These objectives should reflect not only the overall objectives established for the Locks and Dams 2, 3 and 4 study, but also encompass national, state and local views, where possible, for alleviating problems and realizing opportunities. The specific objectives are as follows:

a. To ensure the safe and reliable operation of the Lower Monongahela River Navigation System into the future.

b. To minimize inefficiencies to towing operations related to the Lower Monongahela River Navigation System.

c. To maintain or improve, where possible, the river's present water quality, fishery and recreational values.

4. THE PLAN FORMULATION PROCESS

The formulation process began with a review of the problems with the existing navigation projects, as identified in the preceding sections. The problems, in conjunction with the study objectives, were the basis for developing the "without" plan. The "without" plan was evaluated in terms of economic feasibility and success in solving the originally defined problems to determine what, if any, unaddressed major problems remain. The findings indicated that while the work efforts of the "without" plan were economically justified, several significant problems remained. The study then focused on the development and evaluation of alternatives that resolve all of the problems and that might be more economically feasible to implement than the "without" plan. The process concluded with an evaluation of the best plans according to all pertinent planning criteria.

5. "WITHOUT" PLAN

a. <u>**General**</u>

The "without" plan is used to quantify and describe solutions to the water resource problems and needs of the study area that are likely to be implemented in the absence of specific federal authorization. The "without" plan also serves as the baseline against which the benefits, costs, and socio-environmental impacts of each alternative plan are measured.

b. <u>**Correction of Structural Condition Problems**</u>

The most critical problem at each facility in the Lower Monongahela River System is poor structural condition. The foundation and concrete deficiencies at each facility identified in Section 4 will require significant work efforts throughout the analysis period as described below.

(1) Locks 2

The concrete in the walls, although not a critical problem at the present time, would require rehabilitation by the year 2022 due to continued abrasion and impact damage. At that time, the concrete will be about 70 years old and the service provided could prove to be unreliable. This rehabilitation is viewed as the only feasible way of assuring reliable service levels at this facility throughout the latter half of the analysis period. Details of the work items in this rehabilitation are described in the PLAN FORMULATION APPENDIX.

(2) Dam 2

Due to the extensive voids in the foundation material, remedial work would be required by the year 2002 to extend the dam's useful life. Two alternatives were considered - filling the voids with grout, and complete replacement. Grouting alone would not provide for a reliable structure because of high pile loadings. The wood piles would require augmenting by pin piles, a costly procedure. Furthermore, the old structure with non-air entrained concrete would be retained. This would reduce the reliability of the overall structure. Thus, total replacement of Dam 2 in kind is required to provide for a reliable structure throughout the analysis period.

As a prelude to the construction of Dam 2, the old and unreliable emergency bulkhead structure in the auxiliary chamber would be replaced. A reliable bulkhead system is required at all times as an emergency or maintenance closure and as a mechanism to utilize the auxiliary chamber as a floodway during high river flows. However, the need to use the floodway will be increased during construction of the dam due to river constrictions caused by the use of cofferdams (see the HYDRAULICS APPENDIX). This accelerated schedule for construction of the bulkhead has two advantages over delaying it until the rehabilitation - a more reliable system will be in place to reduce flood flows during construction and will be available during the 50-year analysis period for use as an emergency and a maintenance closure.

(3) Locks 3

Severe foundation and concrete deterioration problems must be corrected by the year 2002 to ensure reliable navigation. As a minimum, the lock walls require further stabilization with reliable rock anchors, and substantial portions of the old concrete need to be replaced with air-entrained concrete at the beginning of the analysis period. However, the installation of additional anchors is not practical due to poor quality concrete throughout the lock walls. The lock wall concrete would be nearly 100 years old in the year 2002 and susceptible to excessive damage by the drilling and stressing required for anchor installation. The only practical way to attain satisfactory stability is to completely reconstruct the walls.

The walls would be constructed to current design criteria using air entrained concrete. Consideration was given to staging the construction and initially replacing only the most critical sections. However, portions of all walls are in critical need of upfront repair, making total upfront reconstruction of all walls the most practical and cost effective strategy. Several schemes were evaluated as detailed in the PLAN FORMULATION APPENDIX. The most cost effective alternative involves the replacement of all walls riverward of their existing location and making the river chamber the main chamber. This approach would provide a 56'x720' chamber for navigation at all times during construction without the need for a temporary chamber to maintain traffic.

(4) Dam 3

As in the case of Dam 2, the extensive voids in the foundation material must be addressed by the year 2002 to extend the dam's useful life. Again, filling the voids with grout and complete replacement were the two practical and cost effective options considered. The grouting alternative was not chosen since augmentation with pin piles would be required and the old non-air entrained concrete would be retained, which would reduce the reliability of the overall structure. Thus, total replacement of Dam 3 "in kind" is required to provide for a reliable structure throughout the analysis period.

(5) Locks 4

The condition of the non-air entrained concrete throughout the lock walls must be addressed with a major rehabilitation by the year 2002. The primary work item of this rehabilitation would be the removal of deteriorated surface concrete and replacement with air-entrained concrete. Specific items in this rehabilitation are described in the PLAN FORMULATION APPENDIX.

The surface concrete applied in this rehabilitation would be considered reliable for about a 25 year period, normal for this type of work. Thereafter, additional work would be required. Since a second rehabilitation of the concrete surfaces is not practical, reconstruction of the locks would be required by 2027 or about the midpoint of the analysis period.

(6) Dam 4

The scouring of the derrick stone, broken baffles and stilling basin scour would be repaired during the rehabilitation of the locks.

The work items outlined above for the "without" plan are summarized in Table 5-1.

Table 5-1
Timing and Action of Work in the "Without" Plan

Project	Action	Timing
Locks 2	rehab	2022
Dam 2	replace	2002
Locks 3	replace	2002
Dam 3	replace	2002
Locks 4	rehab/replace	2002/2027
Dam 4	minor repairs	2002

c. **Non-Structural Measures to Improve Efficiency**

Even with the major work effort represented by the "without" plan, the small size of the locks at the projects continue to cause navigation problems. As a result, a number of nonstructural measures were considered as means to increase the efficiency of the existing locks to process traffic. These measures included:

i) Use of of various lockage policies to maximize tonnage processed;

ii) Use of helper or switchboats to minimize processing times.

The existing condition includes different lockage policies at L&D 3 and L&D 4. Because of an unusually short upstream approach area, tows at L&D 3 are limited in length to those that can lock through the project in a single lockage operation. In effect, the operation is equivalent to ready-to-serve (RTS) which requires extensive use of towboats. There are no similar restrictions at L&D 4 and tows are allowed to double lock through the project.

With the replacement of L&D 3 in the "without" plan, the upstream approach area will be improved and large tows will be allowed to approach and double lock through the project. Since double locking is more cost effective than reconfiguring tows for one-cut lockages at low levels of delay, it is expected that large tows will opt to double lock until delays become significant, at which time other policies may become more cost effective. Allowing double lockages at L&D 3 represents a non-structural measure that increases the efficiency of the system during the early years in the project life.

However, as traffic and delays increase over time, the cost effectiveness of the double lockage policy diminishes. A number of alternatives were explored to keep traffic moving without major delays. The alternatives included two types of helper boat operations and one type of change in operations. The helper boat operations differed according the extent they would be used to extract and remove barges from the lock: one plan had helper boats extracting barges from the lock and securing them along the lock wall for reassembly; the second plan had the helper boats extracting barges and removing them to reassembly areas away from the project. The change in operations involved a shuttle type of operation, whereby tows would downsize to pass through L&D 3, L&D 3 pool, and L&D 4 as small tows that could lock through the chambers in one-cut, similar to what they are currently doing at L&D 3. Upon completion of the shuttle, the tows would be reconfigured into larger tows for the continuation of their journey. This type of operation was shown to increase the capacity of the system and to be more cost effective than either of the helper boat plans (NAVIGATION SYSTEMS ANALYSIS APPENDIX). Based on a timing analysis, it was included as part of the "without" plan.

The use of helper boats was also analyzed for L&Ds 3 and 4 during times when one of the chambers is closed for ordinary maintenance and repairs. The results indicated that helper boats are justified when the main chambers are closed and all traffic must pass through the auxiliary. Based on the economic analysis, helper boats were incorporated as part of the "without" plan during closures beginning in the year 2002. The analysis and results of the evaluation of nonstructural measures is described in detail in the NAVIGATION SYSTEMS ANALYSIS APPENDIX. The timing and type of non-structural actions that were included as part of the "without" plan are summarized in Table 5-2.

Table 5-2
Non-Structural Measures in "Without" Plan

Project	Measure	Timing
L&D 3	1. Change lockage policy to double lockages	2002
	2. Use helper boats during closure of main	2002
	3. Change to Lower Mon ready-to-serve	2016
L&D 4	1. Use helper boats during closure of main	2002
	2. Change to Lower Mon ready-to-serve	2016

d. **Inland Navigation System**

The "without" plan for the Lower Monongahela River projects are elements in the "without" plan of the inland navigation system. Other features of the "without" plan are:

(1) All existing waterway projects or those under construction are considered to be in place and would be operated and maintained through the period of analysis. New locks include those at Gallipolis and Olmsted on the Ohio River, at Winfield on the Kanawha River and at Gray's Landing and Point Marion on the Monongahela River.

(2) Waterway user taxes would continue in the form of the towboat fuel tax prescribed by Title XIV of Public Law 99-662, the Water Resources Development Act of 1986.

(3) Alternative surface transportation systems would have sufficient capacity to move future traffic at current rates.

(4) Preventive maintenance policy measures for navigation projects would be in place over the period of analysis. This would be accomplished through a regular schedule of inspections and maintenance.

(5) All reasonable nonstructural measures for improving lock efficiency that are within the purview of the Corps would be implemented at the appropriate time. Generally, these would consist of either the use of helper boats or specific lockage policies at those projects where they are needed and justified.

e. **Evaluation of "Without" Plan**

The "without" plan for the Lower Monongahela River is an amalgamation of structural and non-structural measures that allow navigation to continue at about current levels of efficiency for the first half of the period of analysis and at a diminished level of efficiency thereafter. Construction and rehabilitation would solve the structural problems, but not the navigation problems. Non-structural actions such as changes in lockage policies and the use of helper boats would defer the time when delays become significant, but not eliminate delay problems over the project life. Moreover, the use of helper boats would further complicate traffic congestion and safety problems in the area. At a cost of nearly $750 million dollars, the "without" plan would be a costly alternative that only partially solves the problems in the study area. None the less, the "without" plan would be justified by the benefits generated by continued navigation.

As shown in Table 5-3, the benefits in terms of transportation savings would exceed the cost by a ratio of 4.7 to 1.

Table 5-3
Benefits and Costs of "Without" Plan
(Millions of Dollars; October 1991 Price Level; 8 3/4 %)

Benefits	$265.8
Costs	$ 56.1
Net Benefits	$209.7
B/C Ratio	4.7

Note: Average Annual Values.

f. **Mon-Upper Ohio System Analysis**

The benefits provided by the Lower Monongahela River projects depend on the continued future operation of a large number of navigation projects. Most important among these are those up-river on the Monongahela River and down-river on the upper portion of the Ohio River. Over the coming decades, many of these projects will need to be rehabilitated and, in some cases, completely rebuilt, in order to ensure the continued navigability of the system. A schedule of work items and costs were developed for these projects to determine if the "system" benefits warranted the "system" costs of ensuring its continued operation. The findings indicated that the average annual benefits totalled $777.5 million and the costs totalled $110.7 million for a benefit to cost ratio of 7 to 1.

6. DEVELOPMENT OF ALTERNATIVE PLANS

a. **General**

Because of the high cost of maintaining the existing system and forecasts that navigation problems would become increasingly severe over time, alternative plans were developed and evaluated for the lower river. These plans not only considered the construction of larger locks, but also a reduction in the number of structures. Alternative plans were developed with 3 projects to replace the 3 existing projects ("3 for 3" plans), and 2 projects to replace the 3 existing projects ("2 for 3" plans).

The process began with a review of all potential project sites on the lower river. Individual projects were developed for each site using different types of dams and project components consistent with varying pool levels. The individual projects were screened by cost and navigability, and configured into preliminary navigation plans for the Lower Monongahela River. The plans were screened using average annual benefits and costs and reduced to the best "2 for 3" and best "3 for 3" plans. These plans were finalized by optimizing lock sizes and construction time-tables and, along with the "without" plan were carried forward into the next phase of analysis.

b. **Screening of Sites and Development of Preliminary Projects**

Thirteen sites were considered as potential project location sites in the 41.5 miles of river from the "Point" in Pittsburgh to Locks and Dam 4. The criteria used to identify potential sites included approach conditions; potential of interference in the lock approaches caused by docks, launching ramps, bridges, etc.; vehicular access to the locks; and affects on shoreside facilities and communities where a selected site would require a pool level change. The sites are described in detail in the PLAN FORMULATION APPENDIX.

The procedure for the iterative reduction of potential projects is illustrated in Figure 1 and described below.

A total of 39 potential projects that varied by location, type of dam and other design features were developed for the 13 sites. Preliminary construction costs were estimated and used to screen out the clearly infeasible projects (from a cost order of magnitude viewpoint) and thereby reduce the number from 39 to 25.

The remaining potential projects were then modeled by the Waterways Experiment Station (WES) to estimate navigation entrance conditions for each project. As a result, the number of projects was reduced from 25 to 14 by the elimination of those projects that would most probably have unsafe entrance conditions.

Figure 1
Screening of Potential Projects

Sites	Potential Projects	Basis for Screening
13	39	
		Preliminary locks and dam construction costs.
13	25	
		WES modeling of navigation entrance conditions
8	14	
		More detailed structure cost estimates with preliminary estimates of real estate costs and shoreside facilities adjustment costs
6	9	

The final project screening involved the use of more detailed project feature cost estimates with preliminary estimates of real estate costs and the cost of shoreside facilities adjustments. The most costly were discarded, thereby reducing the number of potential projects from 14 to 9.

c. **Development of Preliminary Alternative Plans**

The final 9 alternative projects were configured into 7 alternative plans for providing navigation in the study area. An illustration of this process is provided in Figure 2. Important features of the plans are displayed in Table 5-4, which includes the "without" project plan for comparison purposes. Features of the plans are summarized in the following paragraphs and described in detail in the PLAN FORMULATION APPENDIX.

Figure 2
Combination of Sites into Plans

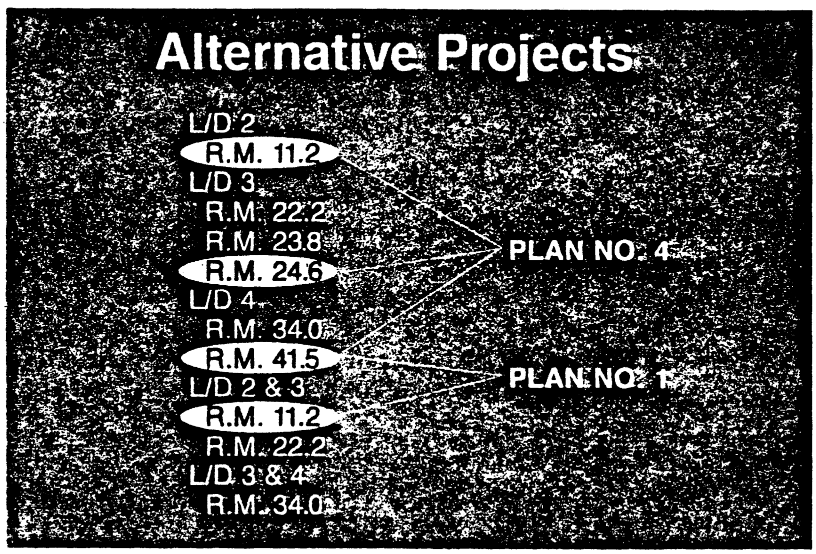

Table 5-4
Preliminary Plans
Location of Projects, Type of Dam, and Pool Changes

	Structure			Pool Change (ft) (r.m.-r.m.)				
	Location - River Mile			11.2	22.2	23.8	24.6	34.0
	(Type of Dam)			to	to	to	to	to
Plan	L&D 2	L&D 3	L&D 4	22.2	23.8	24.6	34.0	41.5
W/O	11.2(FC)	23.8(FC)	41.5(G)	None	None	None	None	None
1	11.2(G)	----	41.5(G)	+5.0	+5.0	-3.2	-3.2	-3.2
2	11.2(FC)	22.2(FC)	41.5(G)	None	+8.2	None	None	None
3	11.2(FC)	23.8(FC)	41.5(G)	None	None	None	None	None
4	11.2(FC)	24.6(FC)	41.5(G)	None	None	-8.2	None	None
5	----	22.2(FC)	41.5(G)	-8.7	+8.2	None	None	None
6	11.2(FC)	----	34.0(G)	None	None	-8.2	-8.2	+16.6
7	11.2(G)	----	34.0(G)	+5.0	+5.0	-3.2	-3.2	+16.6

Notes: W/O - Without Project: No change in the existing system.
Dam types: FC - Fixed Crest; G - Gated.

Plan 1

L&D 2 - replace fixed crest dam with gated dam by 2002 and rehabilitate locks by 2022.
L&D 3 - remove existing locks and dam by 2002.
L&D 4 - construct twin 84' x 720' locks by 2002.
Pool Changes - Raise Pool 2 (5 feet) from existing Locks and Dam 2 (r.m. 11.2) to existing Locks and Dam 3 (r.m. 23.8). Lower Pool 3 (3.2 feet) from existing Locks and Dam 3 to existing Locks and Dam 4 (r.m. 41.5).

Plan 2

L&D 2 - reconstruct fixed crest dam by 2002 and rehabilitate locks by 2022.
L&D 3 - remove existing locks and dam by 2002 and construct twin 84' x 720' locks with fixed crest dam 1.6 miles downstream of existing location at r.m. 22.2.
L&D 4 - construct twin 84' x 720' locks by 2002.
Pool Changes - Raise Pool 2 (8.2 feet) from r.m. 22.2 to existing Locks and Dam 3 (r.m. 23.8).

Plan 3

L&D 2 - reconstruct fixed crest dam by 2002 and rehabilitate locks by 2022.
L&D 3 - construct twin 84' x 720' locks and fixed crest dam at existing location.
L&D 4 - construct twin 84'x 720' locks by 2002.
Pool Changes - None

Plan 4

L&D 2 - reconstruct fixed crest dam by 2002 and rehabilitate locks by 2022.
L&D 3 - remove existing locks and dam by 2002 and construct twin 84' x 720' locks with fixed crest dam 0.8 miles upstream of existing location at r.m. 24.6.
L&D 4 - construct twin 84' x 720' locks by 2002.
Pool Changes - Lower Pool 3 (8.2 feet) from existing Locks and Dam 3 (r.m. 23.8) to r.m. 24.6.

Plan 5

L&D 2 - remove existing locks and dam by 2002.
L&D 3 - remove existing locks and dam by 2002 and construct twin 84'x 720' locks and fixed crest dam 1.6 miles downstream of existing location at r.m. 22.2.
L&D 4 - construct twin 84' x 720' locks by 2002.
Pool Changes - Lower Pool 2 (8.7 feet) from existing Locks and Dam 2 (r.m. 11.2) to r.m. 22.2. Raise Pool 2 (8.2 feet) from r.m. 22.2 to existing Locks and Dam 3 (r.m. 23.8).

Plan 6

L&D 2 - reconstruct fixed crest dam by 2002 and rehabilitate locks by 2022.
L&D 3 - remove existing locks and dam by 2002.
L&D 4 - remove existing locks and dam by 2002 and construct twin 84'x 720' locks and a gated dam 7.5 miles downstream of existing location at r.m. 34.0.
Pool Changes - Lower Pool 3 (8.2 feet) from existing Locks and Dam 3 (r.m. 23.8) to r.m. 34.0. Raise Pool 3 (16.6 feet) from r.m. 34.0 to existing Locks and Dam 4 (r.m. 41.5).

Plan 7

L&D 2 - replace fixed crest dam with gated dam by 2002 and rehabilitate locks by 2022.
L&D 3 - remove existing locks and dam by 2002.
L&D 4 - remove existing locks and dam by 2002 and construct twin 84'x 720' locks and a gated dam 7.5 miles downstream of existing location at r.m. 34.0.
Pool Changes - Raise Pool 2 (5 feet) from existing Locks and Dam 2 (r.m. 11.2) to existing Locks and Dam 3 (r.m. 23.8). Lower Pool 3 (3.2 feet) from existing Locks and Dam 3 (r.m. 23.8) to r.m. 34.0. Raise Pool 3 (16.6 feet) from r.m. 34.0 to existing Locks and Dam 4 (r.m. 41.5).

7. EVALUATION OF PRELIMINARY PLANS

a. General

The preliminary plans were evaluated on the basis of net benefits (benefits minus costs). Costs are detailed in the COST ANALYSIS APPENDIX and the ENGINEERING TECHNICAL APPENDIX and include all projected project (federal) and private (non-federal) expenditures. The project expenses are to be cost shared jointly by the General Fund (50%) and the Inland Waterways Trust Fund (50%). Benefits include the reduction in transportation costs due to improvements in the inland waterway navigation system (NAVIGATION SYSTEMS ANALYSIS APPENDIX) and savings in future investments due to the early replacement of shoreside facilities to accommodate changes in pool elevations (PLAN FORMULATION APPENDIX). Both benefits and costs are expressed in October 1991 dollars and were annualized using a 50-year economic life, an interest rate of 8 3/4 percent, and a base year of 2002. The "without" plan is included in the following tables for comparison purposes.

b. Costs

(1) Construction Costs

A line item listing of the construction costs for the alternative plans is provided in Table 5-5. Private (Non-federal) and project (federal) costs for adjusting shoreside facilities to new pool elevations are included in the table. The 50 percent share of construction costs that is cost-shared and funded out of the Inland Waterway Trust Fund is included as a project cost.

The costs range from $740 million to $1.5 billion. The major cost items are construction of locks and dam structures and relocations. Although the locks and dam replacement costs of a "2 for 3" plan would be lower than a "3 for 3" plan because of the elimination of one structure, the savings are at least partially offset by higher dredging and relocation costs.

(2) Project Costs

Project costs are all costs either directly or indirectly incurred as a result of implementation of a plan and include not only the construction and shoreside adjustment costs described above, but also operation and maintenance costs (O&M), potential flood damage costs, and the cost of non-structural measures. O&M costs are the ordinary costs of keeping the projects operational. Potential flood damage costs are the cost of potential flood damages that are a byproduct of construction activity. The cost of non-structural measures include the cost of towboats for speeding lockage operations.

Table 5-5

LOWER MONONGAHELA RIVER NAVIGATION STUDY
(October 1991 Cost Level)
INTERMEDIATE SCREENING LEVEL ESTIMATES

(All costs shown are in $1,000's of dollars.)

CODE OF ACCOUNT	DESCRIPTION	W/O PLAN	PLAN 1*	PLAN 2	PLAN 3	PLAN 4	PLAN 5	PLAN 6	PLAN 7
01	LANDS AND DAMAGES **	$7,900	$3,100	$83,900	$7,900	$4,300	$83,900	$5,300	$5,700
02	RELOCATIONS								
	Utilities	$0	$10,915	$0	$0	$0	$0	$0	$0
	Structures	$0	$460	$2,250	$0	$0	$5,225	$39,902	$43,567
	Railroad	$0	$19,260	$0	$0	$0	$507	$670	$19,830
	Highway	$0	$0	$400	$0	$0	$400	$28,874	$28,874
	Major Storm Sewers	$0	$1,230	$850	$0	$0	$850	$140,770	$165,245
03	RESERVOIRS								
	Remove L/D #2	$0	$0	$0	$0	$0	$9,660	$0	$0
	Remove L/D #3	$0	$7,000	$7,000	$0	$7,000	$7,000	$7,000	$7,000
	Remove L/D #4	$0	$0	$0	$0	$0	$0	$10,432	$10,432
04	DAMS								
	Gated Dam at L/D #2	$0	$98,000	$0	$0	$0	$0	$0	$98,000
	Fixed Crest Dam at L/D #2	$28,583	$0	$28,583	$28,583	$28,583	$0	$28,583	$0
	Fixed Crest Dam at L/D #3	$36,876	$0	$0	$33,910	$0	$0	$0	$0
	Modify Dam(W/ Lock 4 Contract)	$0	$2,200	$2,200	$2,200	$2,200	$2,200	$0	$0
	Gated Dam at alternate site	$0	$0	$0	$0	$0	$0	$52,541	$52,541
	Fixed Crest Dam at alt. site	$0	$0	$26,024	$0	$49,138	$26,146	$0	$0
05	LOCKS								
	Rehab Locks at L/D #2	$40,000	$40,000	$40,000	$40,000	$40,000	$0	$40,000	$40,000
	Floodway Bulkhead at L/D #2	$3,600	$3,600	$3,600	$3,600	$3,600	$0	$3,600	$3,600
	Modify Locks(With Dam Contract)	$0	$11,300	$0	$0	$0	$0	$0	$11,300
	Twin 84x720 at L/D #3	$0	$0	$0	$168,028	$0	$0	$0	$0
	Replace L/D #3 in kind	$119,980	$0	$0	$0	$0	$0	$0	$0
	Twin 84x720 at L/D #4	$0	$184,000	$184,000	$184,000	$184,000	$184,000	$0	$0
	Rehab Locks at L/D #4	$30,736	$0	$0	$0	$0	$0	$0	$0
	Replace L/D #4 in kind	$134,488	$0	$0	$0	$0	$0	$0	$0
	Twin 84x720 at alternate site	$0	$0	$96,024	$0	$126,267	$94,629	$102,930	$102,930
06	FISH AND WILDLIFE FACILITIES	$800	$1,200	$650	$800	$1,400	$1,200	$1,200	$1,200
09	CHANNELS AND CANALS	$0	$27,000	$0	$0	$0	$39,200	$45,600	$2,850
16	BANK STABILIZATION	$0	$4,315	$453	$0	$0	$453	$647	$4,436
18	CULTURAL RESOURCES	$1,280	$780	$930	$1,280	$1,280	$930	$1,380	$1,380
20	PERMANENT OPERATING EQUIPMENT	$486	$325	$486	$486	$486	$325	$325	$325
30	PLANNING, ENGINEERING AND DESIGN	$40,150	$32,220	$36,640	$42,450	$40,995	$37,937	$86,868	$93,725
31	CONSTRUCTION MANAGEMENT	$30,060	$42,085	$27,467	$31,800	$30,710	$28,431	$65,125	$71,267
	CONTINGENCIES	$264,342	$134,468	$214,213	$245,951	$211,995	$246,110	$600,884	$623,920
	SUBTOTAL, PROJECT COSTS ***	$739,281	$623,458	$755,670	$790,988	$731,954	$769,103	$1,262,631	$1,388,222
	SUBTOTAL, PRIVATE COSTS	$0	$111,217	$1,570	$0	$10,274	$83,944	$100,275	$114,452
	TOTAL, PROJECT AND PRIVATE COSTS	$739,281	$734,675	$757,240	$790,988	$742,228	$853,047	$1,362,906	$1,502,674

* Refer to Engineering Technical Appendix for detailed estimates.

** Refer to Real Estate Appendix for detailed estimates.

*** Cost Shared Jointly by the General Fund (50%) and the Inland Waterways Trust Fund (50%).

Construction costs and shoreside adjustment costs are provided in the COST ANALYSIS APPENDIX and ENGINEERING TECHNICAL APPENDIX. O&M costs and potential flood damage costs are included as attachments to the PLAN FORMULATION APPENDIX. The cost of non-structural measures are described in the NAVIGATION SYSTEMS ANALYSIS APPENDIX.

Project costs were converted into economic costs to provide a basis for comparing dollar values that may be expended at different points in time, depending on the plan. Economic costs were then annualized to facilitate comparison with benefits, which are calculated on an annual basis. The calculations used to convert project costs into economic and annualized costs are detailed in the PLAN FORMULATION APPENDIX.

The three least costly plans in terms of average annual costs are the "without" Plan, Plan 1 ("2 for 3"), and Plan 4 ("3 for 3"). A listing of average annual costs is provided in Table 5-6.

Table 5-6
Average Annual Costs of Preliminary Plans
(Millions of October 1991 Dollars; 8 3/4%)

	Construction Costs		Average Annual Costs				Total
Plan	Total	Present Worth	Investment Cost	O&M	Flood Damages	Helper Boats	Total Annual Cost
W/O	$739.3	$474.2	$ 51.7	$3.3	$1.0	$0.1	$ 56.1
1	734.7	681.1	71.4	2.3	0.5	0.0	74.2
2	757.2	709.8	80.6	3.3	1.0	0.0	84.9
3	791.0	743.7	81.2	3.3	1.0	0.0	85.5
4	742.2	694.5	74.7	3.3	1.0	0.0	79.0
5	853.0	844.3	93.2	2.2	0.9	0.0	96.3
6	1,362.9	1,311.8	151.4	2.2	0.5	0.0	154.1
7	1,502.7	1,450.7	168.9	2.3	0.9	0.0	172.1

NOTE: O&M for plans 1 & 7 include $ 0.1 M for maintenance of Turtle Creek. Details can be found in Section 7-3.

c. **Benefits**

The benefits of the alternative plans are listed in Table 5-7. The majority of the benefits are due to navigation with the remainder due to a savings in future investments in shoreside facilities. The benefits of the navigation system are measured as the difference between waterborne transportation costs and overland transportation costs. The system navigation benefits are higher for the improvement plans than the "without" plan because they reduce delays and correct other inefficiencies in the navigation system and thereby reduce waterborne transportation costs and increase the transportation savings of the navigation system. The increment, or benefit attributable to the improvement, is calculated as the increase in transportation savings "with" improvement over "without" improvement. The increment, or benefit, of advanced replacement of shoreside facilities was calculated as the savings in future investments in shoreside facilities because of their early replacement to accommodate changes in pool elevations. Total incremental benefits attributable to the proposed Lower Monongahela improvements are the sum of the increment in system navigation benefits and the increment in advanced replacement benefits. The improvement plans provide incremental annualized benefits of $32 to $40 million.

The total benefits attributable to the improvement plans are the incremental benefits plus the base amount of benefits provided by the Lower Monongahela projects in the "without" plan. The navigation benefits provided by the projects in the "without" plan amount to $265.8 million average annual. The "without" plan does not provide any advanced replacement benefits since it does not affect pool elevations so that the total base benefits are $265.8 million. The total benefits of the improvement plans are the incremental benefits added to the base benefits.

Table 5-7
Average Annual Benefits of Preliminary Plans
(Millions of October 1991 Dollars; 8 3/4%)

Plan	System Navigation Benefits	Advanced Replacement Benefits	Increment over W/O	Lower Mon Benefits
W/O	$3,544.9	$ 0	$ ---	$265.8
1	3,581.6	2.0	38.7	304.5
2	3,579.9	*	35.0	300.8
3	3,577.6	0	32.7	298.5
4	3,579.9	*	35.0	300.8
5	3,584.1	1.0	40.2	306.0
6	3,581.7	3.5	40.3	306.1
7	3,581.7	3.1	39.9	305.7

Note: * denotes less than $50 thousand.

d. **Net Benefits**

Net benefits (benefits minus costs) are an indication of the overall economic efficiency of a plan. Positive net benefits indicate that the a plan is economically feasible whereas negative net benefits indicate the opposite. All of the plans provide positive net benefits (Table 5-8). Plan 1, a "2 for 3" plan, provides the highest net benefits followed by Plan 4, a "3 for 3" plan.

Table 5-8
Average Annual Benefits, Costs, and Net Benefits
(Millions of October 1991 Dollars; 8 3/4 %)

Plan	Lower Mon Annual Benefits	Annual Costs	Net Benefits	
W/O	$265.8	$ 56.1	$209.7	
1	304.5	74.2	230.3	(1)
2	300.8	84.9	215.9	
3	298.5	85.5	213.0	
4	300.8	79.0	221.8	(2)
5	306.0	96.3	209.7	
6	306.1	154.1	152.0	
7	305.7	172.1	133.6	

(1) - Highest net benefits; also best "2 for 3" Plan.
(2) - Second highest net benefits; also best "3 for 3" Plan.

8. DEVELOPMENT OF FINAL PLANS

Upon completion of this screening iteration, the best 2 preliminary replacement alternatives (Plans 1 and 4) and the W/O Plan were carried forward for additional analysis. These 2 best replacement plans not only provide the highest net benefits, but also represent the two basic types of plans for improvement: 1) two projects to replace three projects; and 2) three projects to replace three projects. This was important given the uncertainty of how any one type of plan would measure against environmental acceptability, and other decision-making criteria. The additional work involved a more in-depth investigation to assure consistency in the details of the cost estimates and to gain more knowledge about specific elements of each plan to reduce the uncertainities that resulted in the higher contingency figures of the screening estimates. The results of this iteration is shown in Table 5-9 below.

Table 5-9

LOWER MONONGAHELA RIVER NAVIGATION STUDY

(October 1991 Cost Level)

FINAL SCREENING LEVEL ESTIMATES

(All costs shown are in $1,000's of dollars.)

CODE OF ACCOUNT	DESCRIPTION	W/O PLAN COST	W/O PLAN CONTINGENCY		PLAN 1 COST	PLAN 1 CONTINGENCY		PLAN 4 COST	PLAN 4 CONTINGENCY	
01	LANDS AND DAMAGES	$7,900	$2,100	27%	$3,100	$800	26%	$4,300	$1,100	25%
02	RELOCATIONS									
	Utilities	$0	$0		$10,915	$10,350	95%	$0	$0	
	Structures	$0	$0		$460	$225	49%	$0	$0	
	Railroad	$0	$0		$19,260	$5,740	30%	$0	$0	
	Major Storm Sewers	$0	$0		$1,230	$620	50%	$0	$0	
03	RESERVOIRS									
	Remove L/D #3	$0	$0		$7,000	$2,000	29%	$7,000	$2,000	29%
04	DAMS									
	Gated Dam at L/D #2	$0	$0		$98,000	$28,000	29%	$0	$0	
	Fixed Crest Dam at L/D #2	$49,300	$15,400	31%	$0	$0		$49,300	$15,400	31%
	Fixed Crest Dam at L/D #3	$44,500	$13,700	31%	$0	$0		$0	$0	
	Modify Dam(W/ Lock 4 Contract)	$2,200	$500	23%	$2,200	$500	23%	$2,200	$500	23%
	Fixed Crest Dam at River Mile 24.6	$0	$0		$0	$0		$52,100	$16,100	31%
05	LOCKS									
	Rehab Locks at L/D #2	$40,000	$15,000	38%	$40,000	$15,000	38%	$40,000	$15,000	38%
	Floodway Bulkhead at L/D #2	$3,600	$1,500	42%	$3,600	$1,500	42%	$3,600	$1,500	42%
	Modify Locks(With Dam Contract)	$0	$0		$11,300	$2,900	26%	$0	$0	
	Replace L/D #3 in kind	$193,000	$62,000	32%	$0	$0		$0	$0	
	Twin 84x720 at L/D #4	$0	$0		$184,000	$46,000	25%	$184,000	$46,000	25%
	Rehab Locks at L/D #4	$38,800	$17,400	45%	$0	$0		$0	$0	
	Replace L/D #4 in kind	$178,000	$56,000	31%	$0	$0		$0	$0	
	Twin 84x720 at River Mile 24.6	$0	$0		$0	$0		$187,000	$58,000	31%
06	FISH AND WILDLIFE FACILITIES	$800	$120	15%	$1,200	$200	17%	$1,400	$350	25%
09	CHANNELS AND CANALS	$0	$0		$27,000	$6,000	22%	$0	$0	
16	BANK STABILIZATION	$0	$0		$4,315	$1,185	27%	$0	$0	
18	CULTURAL RESOURCES	$1,280	$640	50%	$780	$390	50%	$1,280	$640	50%
20	PERMANENT OPERATING EQUIPMENT	$486	$121	25%	$325	$80	25%	$486	$121	25%
30	PLANNING, ENGINEERING & DESIGN	$55,195	$16,439	30%	$32,220	$10,680	33%	$50,240	$14,078	28%
31	CONSTRUCTION MANAGEMENT	$39,520	$9,878	25%	$42,135	$2,248	5%	$36,600	$9,151	25%
	SUBTOTAL, PROJECT COSTS	$654,581	$210,798	32%	$489,040	$134,418	27%	$819,506	$179,948	29%
	SUBTOTAL, PRIVATE COSTS	$0			$111,217			$10,274		
	TOTAL, PROJECT AND PRIVATE COSTS	$865,379		32%	$734,675		22%	$809,728		29%

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Average annual costs, benefits and net benefits were then recomputed for each final plan. The costs and benefits were computed based on an interest rate of 8 3/4% and a base year of 2002. Table 5-10 shows this recomputation of costs and benefits.

Table 5-10
Final Plans
Average Annual Costs, Benefits, and Net Benefits
(Millions of October 1991 Dollars: 8 3/4 %)

Plan	Construction Costs	Average Annual Costs	Average Annual Benefits	Net Benefits
"Without"	$865.4	$68.3	$265.8	$197.5
1	734.7	77.3	304.5	227.2
4	809.7	88.7	300.8	212.1

This reaffirmation confirms that the 2 for 3 plan continues to optimize the net benefits.

The development of the final plans continued by optimizing lock sizes and construction timetables for these two plans, as described in the following paragraphs.

a. **Lock Size**

Alternative lock sizes were examined for L&Ds 3 and 4 that were consistent with the size of the main locks at upstream and downstream projects: 84' x 720' and 110' x 720'. All of the alternatives include main chambers with dimensions of one of these sizes. Most of the variation in lock size alternatives are in the size of the auxiliary lock which range from none at all to one equal in size to the main lock.

The benefits and costs of the lock size alternatives for the "2 for 3" (Plan 1) and "3 for 3" (Plan 4) plans are summarized in Table 5-11. While benefits increase as the locks become larger, costs do likewise. The lock size combination that provides the highest net benefits is the twin 84' x 720' alternative. Therefore, this is the optimum size to be included as a feature of the improvement plans. A detailed analysis of the benefits of different lock sizes is provided in the NAVIGATION SYSTEM ANALYSIS APPENDIX.

Table 5-11
Benefits, Costs, and Net Benefits of Alternative Lock Sizes
(Millions of October 1991 Dollars; 8 3/4%)

	Plan 1			Plan 4		
Lock Size	Annual Benefits	Annual Costs	Net Benfts	Annual Benefits	Annual Costs	Net Benfts
Single 84x720	$301.4	$74.9	$226.5	$293.6	$83.3	$210.3
84x720 & 56x360	302.3	76.4	225.9	296.1	86.5	209.6
84x720 & 84x410	303.3	76.8	226.5	297.7	87.6	210.1
84x720 & 110x410	304.0	79.8	224.2	298.6	93.4	205.2
Twin 84x720 *	304.5	77.3	227.2	300.8	88.7	212.1
Single 110x720	303.4	76.8	226.6	296.9	87.6	209.3
110x720 & 56x360	303.8	78.8	225.0	298.1	91.3	206.8
110x720 & 84x410	304.5	79.8	224.7	299.5	93.4	206.1
110x720 & 110x410	305.3	81.8	223.5	301.4	97.7	203.7
Twin 110x720	305.8	83.3	222.5	302.3	100.4	201.9

*** optimum lock size.**

b. **Timing for Construction of Second Lock**

The lock size analysis indicated that twin 84' x 720' locks are the optimum size locks. However, it did not consider the optimum time for construction of the locks. While one large lock may be needed at the beginning of the project life to provide the benefits of a modernized system, construction of the second lock may not be initially justified. The optimum time for construction of the second lock was estimated based on a comparison of the incremental benefits and costs of providing a second lock at different years in the future. The optimum year was designated as the year when net benefits were maximized. The analysis was performed using data for Plan 1; however, the findings are considered valid for Plan 4 as well.

The two major factors affecting the optimum time for constructing the second lock are the additional costs of constructing the second lock as a stand-alone item in the future and the first closure of a lock for maintenance. The higher the additional costs of stand-alone work, the lower is the initial economic advantage of deferral. Also, the sooner a maintenance closure is scheduled, the higher are the benefits for construction of the second lock early in the project life.

The estimated cost of constructing the second lock is an additional $25 million if it is part of the initial work effort and $105 million if it is deferred work. This is because the majority of the costs of constructing a double lock at the site will still be incurred initially in order to construct one fully functional riverward chamber with complete mechanical systems, buildings, and site work. Since there is no standard design for a single chamber riverward lock, we assumed that to provide access and to pass flow the landward location of the future chamber would have a concrete weir and service bridge across it.

Additional costs to be considered if construction of the second lock landward is delayed are the second mobilization and demobilization, removal of the weir and service bridge, no reuse of portions of the cofferdam in-place or cofferdam materials, construction of the landwall building, new lock gates and machinery, new hydraulic system and valves. The overall smaller quantities would mean higher unit prices for all features of work and the limited availability of disposal areas in the future would impact on all excavation and removal costs. This does not include any additional real estate costs in the future.

The first maintenance closure of a lock is scheduled for the year 2007. Without a second lock, lock closure would prevent traffic from moving in the area, thus reducing the benefits of the system.

As summarized in Table 5-12, the analysis indicated that the optimum time for completion of the second lock is during the initial construction work. Early completion avoids the high cost penalties of deferred construction and river closure. Details of this analysis are found in the PLAN FORMULATION APPENDIX.

Table 5-12
Timing Analysis for Construction of Second Lock
(Millions of October 1991 Dollars; 8 3/4%)

Year Second lock is Operational	Increases over Single Lock Costs and Benefits			
	Cost of Construction	Annual Ave Cost	Annual Ave Benefit	Net Benefit
2002	$ 25.0	$ 2.5	$ 3.1	$ 0.6
2007	105.0	7.0	2.8	-4.2
2012	105.0	4.6	2.0	-2.6

c. **Timing of New Locks at L&D 4**

The locks at L&D 4 are proposed for replacement in the year 2027 in the "without" plan and in 2002 in the "2 for 3" (Plan 1) and "3 for 3" plan (Plan 4). The timing of the replacement in the "without" plan was driven by the condition of the locks, in the "2 for 3" plan by the need to adjust the sill depth of the locks to accommodate the change in pool, while in the "3 for 3" plan it was to provide a completely modernized system comparable to the other improvement plans. Since the net benefits of the "3 for 3" plan (Plan 4) and the "2 for 3" plan (Plan 1) are relatively close, the sensitivity of Plan 4 to deferred construction of the locks at L&D 4 was examined. The sensitivity analysis consisted of deferring construction of the locks at L&D 4 until the year 2027, the same year they would be replaced in the "without" plan.

Deferring construction reduces the economic costs of the project because a dollar in the future is worth less than a dollar at present. However, deferral also reduces the benefits of the project because small locks continue to constrain traffic for an additional 25 years. The benefits and costs of the "3 for 3" improvement plan (Plan 4) with and without deferral are shown in Table 5-13. The results suggest that deferral of the construction of the locks at L&D 4 is a more economical plan than up-front replacement. Details of this analysis are contained in the PLAN FORMULATION APPENDIX.

Table 5-13
Timing Analysis for Construction of Locks at L&D 4
(Millions of October 1991 Dollars; 8 3/4%)

Plan	Benefits	Costs	Net Benefits
4	$300.8	$88.7	$212.1
4 Deferred	289.0	72.2	216.8

Note: Construction in 2027 requires rehabilitation in 2002 - same as in the "without" plan.

d. **Congestion Fees**

A non-structural "with" project condition is the management of demand by the use of congestion or lockage fees. Congestion fees are lockage charges designed to discourage marginal traffic off the river and thereby reduce traffic delays. Since they are only marginally effective in economic terms, they were not included in the final array of plans (Table 5-14).

Table 5-14
Congestion Fee Benefits
Millions of October 1991 Dollars

Alternative	Benefits	Costs	Net Benefits	Increment over W/O
"Without"	$265.8	$68.3	$197.5	--
User Charges	277.0	68.3	208.7	11.2
Plan 1	304.5	77.3	227.2	29.7
Plan 4	300.8	88.7	212.1	14.6
Plan 4 Deferred	289.0	72.2	216.8	19.3

e. **Sensitivity Analysis**

Because the plans are fairly close in economic terms, a series of alternative scenarios were analyzed to determine how sensitive the ranking of the plans were to alternative assumptions concerning traffic growth and other items. The findings indicated the following:

i) fleet improvements favor up-front lock size enlargement; and

ii) traffic growth favor up-front lock size enlargement.

Plan 1 continued to be the economically preferred plan under all alternative scenarios except one - no traffic growth at all in the future - where it ranked a close second. The sensitivity analyses are described in detail in the PLAN FORMULATION APPENDIX.

9. SUMMARY DESCRIPTION OF FINAL ALTERNATIVES

The final plans carried forward for further evaluation are the "without" Plan, Plan 1 ("2 for 3"), Plan 4 ("3 for 3"), and Plan 4 Deferred (L&D 3 replaced up-front and L&D 4 replaced in 2027). The "without" Plan provides a baseline for comparison purpose and also can be implemented in the absence of new congressional authorizations. Plan 1 is the best "2 for 3" plan and also provides the highest net benefits. Plan 4 Deferred is the best "3 for 3" plan and is nearly identical to the "without" Plan except for the size of the locks. While Plan 4 provides lower net benefits than Plan 4 Deferred, it would provide an immediate improvement to the projects, while minimizing disruptions to shoreside interests. All of the alternatives have features that could weigh in their favor when criteria other than economics are considered.

A summary description of the important features of the final alternatives is provided in Table 5-15 with the major differences between the"without" plan and the other three alternatives highlighted in bold type. The single most important difference is in the number of navigation projects on the river segment under study. The current number of projects is three; of the final alternatives, the"without" plan, Plan 4, and Plan 4 Deferred are "3 for 3" plans and Plan 1 is a "2 for 3" plan. The "2 for 3" plan (Plan 1) provides for the construction of a gated dam at L&D 2, the elimination of L&D 3, and the construction of twin 84' x 720' locks at L&D 4 with all construction completed by 2002. The "without" Plan and Plan 4 Deferred are identical except for the size of the replacement locks at L&Ds 3 and 4 and in the location of L&D 3. The "without" Plan and Plan 4 differ in these two areas as well as in the timing of replacement of L&D 4.

Table 5-15
Description of Final Alternatives

	"Without" ("3 for 3")	Plan 1 **("2 for 3")**	Plan 4 ("3 for 3")	Plan 4 Deferred
L&D **2**				
Locks				
Size	110x720 56x360	same	same	same
Action	rehab	same	same	same
Year	2022	same	same	same
Dam				
Type	Fixed Crest	**Gated**	same	same
Action	replace	same	same	same
Year	2002	same	same	same
Pool				
Change	none	**+5'**	none	none
L&D **3**				
Locks				
Size	56x720 56x360	**none**	**Twin 84x720**	**Twin 84x720**
Action	replace	**eliminate**	same	same
Year	2002	same	same	same
Dam				
Type	Fixed Crest	**none**	same	same
Action	replace	**eliminate**	same	same
Year	2002	same	same	same
Pool				
Change	none	**-3.2'**	**(-8.2' for 0.8 miles)**	
L&D **4**				
Locks				
Size	56x720 56x360	**Twin 84x720**	**Twin 84x720**	same
Action	rehab	**replace**	**replace**	same
Year	2002	same	same	same
Size	56x720 56x360	**n.a.**	**n.a.**	**Twin 720x84**
Action	replace	**n.a.**	**n.a.**	same
Year	2027	**n.a.**	**n.a.**	same
Dam				
Type	Gated	same	same	same
Action	none	same	same	same
Year	none	same	same	same
Pool				
Change	none	same	same	same

Note: n.a. denotes not applicable.

SECTION 6. ASSESSMENT OF DETAILED PLANS

The alternative plans were screened to the final four plans on the basis of benefits and costs, as described in the preceding section. While benefits and costs are important considerations in the decision making process, other factors may be of equal or greater importance depending on the factor and the magnitude of the effect of a plan on that factor. These other factors include satisfaction of the planning objectives, impacts on the environment, as well as the completeness, effectiveness, efficiency, and acceptability of the plans. The findings of the evaluations in all of these areas are weighed and balanced in selecting the recommended plan. The results are summarized below and in Table 6-3 attached to the end of this section.

1. PLAN DESCRIPTIONS

Presented below is a brief description of the final four alternative plans.

a. **"Without" Plan**

(1) L&D 2 - reconstruct fixed crest dam by 2002 and rehabilitate locks by 2022.
(2) L&D 3 - reconstruct locks and dam by 2002.
(3) L&D 4 - rehabilitate locks by 2002, reconstruct locks by 2027, and minor repairs to dam.

b. **Plan 1**

(1) L&D 2 - construct gated dam by 2002 and rehabilitate locks by 2022.
(2) L&D 3 - remove locks and dam by 2002.
(3) L&D 4 - construct twin 84' x 720' locks by 2002 and minor repairs to dam.

c. **Plan 4**

(1) L&D 2 - reconstruct fixed crest dam by 2002 and rehabilitate locks by 2022.
(2) L&D 3 - construct twin 84' x 720' locks by 2002 and reconstruct dam by 2002.
(3) L&D 4 - construct twin 840' x 720' locks by 2002 and minor repairs to dam.

d. **Plan 4 Deferred**

(1) L&D 2 - reconstruct fixed crest dam by 2002 and rehabilitate locks by 2022.
(2) L&D 3 - construct twin 84' x 720' locks by 2002 and reconstruct dam by 2002.
(3) L&D 4 - rehabilitate locks by 2002, construct twin 84' x 720' locks by 2027, and minor repairs to dam.

2. ASSESSMENT OF DETAILED PLANS

a. National Economic Development (NED) Account

Net benefits are the amount that the benefits of a plan exceed its costs. Positive net benefits indicate that a plan is economically feasible to implement; negative net benefits indicate that it is not economically feasible. The plan that provides the highest positive net benefits is the National Economic Development (NED) plan.

The final plans all make significant contributions to the NED account. The net benefits range from an average annual amount of $209.7 million for the "without" plan to $230.3 million for the "2 for 3" plan (Plan 1) with the "3 for 3" improvement plans (Plan 4 and Plan 4 Deferred) falling in-between. Since Plan 1 provides the highest positive net benefits, it is the NED plan.

A second way of displaying net benefits is as increments over the "without" plan. Plans that provide positive incremental net benefits are economically superior to the "without" plan whereas those that provide negative incremental net benefits are not. The incremental net benefits of all three of the improvement plans over the "without" plan are positive, again with Plan 1 the highest (Table 6-1).

Table 6-1
Net Benefits of Final Alternatives
(Millions of October 1991 Dollars, 8 3/4%)

Plan	Net Benefits	Increment over W/O	Rank
W/O	$197.5	$ 0	4
1	227.2	29.7	1 **NED PLAN**
4	212.1	14.6	3
4 Deferred	216.8	19.3	2

b. **Environmental Quality (EQ) Account**

All of the replacement plans would result in some unavoidable adverse environmental impacts. Those impacts common to all final replacement plans include construction and disposal activities. Impacts not common to all plans include pool changes (both major and minor), removal of L&D 3 and the loss of a tailwater, replacement of L&D 3 at a new location, bank excavation to improve Locks 3 approach conditions, and bank stabilization in Pool 2.

Comparisons of alternative impacts in general and specifically on significant environmental quality resources are presented in Tables 6-2 and 6-3, respectively. Because these individual impacts vary between alternatives and affect different resources, an overall comparison can be misleading. In general, however, the "without" plan (the No Action Alternative in the environmental impact statement) is less disruptive to the status quo than the other alternatives and on this basis is designated the environmentally preferred alternative. Plans 4 and 4 Deferred resemble the "without" plan as "3 for 3" plans, but involve additional impacts with dredging, disposal, relocation of L&D 3, and 0.8 miles of pool change. Plan 1 is the most disruptive plan involving elimination of L&D 3, 30.3 miles of pool elevation changes, loss of a tailwater, and 9.5 miles (about 2.4 million cubic yards) of dredging.

Table 6-2
Environmental Impacts

LEAST >----------------------	---------------------->----------------------	---------------------->MOST
Replacement at existing site (3 for 3)	Replacement of L&D 3 at new site (3 for 3)	Removal of L&D 3 (2 for 3)
"Without" Plan	Plan 4 Plan 4 Deferred	Plan 1

Despite the variation in extent of environmental impacts between alternatives, they all meet the planning objectives of maintaining or improving water quality, fishery, and recreation. A number of environmental features are included with Plan 1 to compensate for the tailwater loss and other project impacts so that there would be negligible impacts on fish and wildlife resources. These environmental features will be addressed through a combination of sound engineering practices and separable mitigation. Plans 4 and 4 Deferred, and the "without" plan would require separable mitigation to replace the terrestrial habitat values lost with flood plain terrace excavation to relocate L&D 3 or improve Locks 3 approach conditions. The most likely mitigation would be fee purchase and management of similar flood plain terrace lands not otherwise required for project purposes.

Plan 1's primary environmental quality advantages over the other alternatives lie in potential benefits to water quality and in lesser cultural resources impacts. Its disadvantages are associated with the extensive pool changes and dredging impacts, and permanent loss of a tailwater. Plans 4 and 4 Deferred and the "without" plan would essentially maintain the status quo conditions with the exception that future growth in traffic would lead to greater lockage delays and congestion with the "without" plan.

c. **Regional Economic Development (RED) Account**

All of the lock enlargement plans would make positive contributions to the Regional Economic Development (RED) account in the form of increased regional employment and income. The "2 for 3" plan (Plan 1) has the highest positive impacts followed closely by Plan 4 and more distantly by Plan 4 Deferred. The improvements would lower transportation costs, which, in turn, would result in increased income to shippers and ultimate savings to consumers. An improved navigation system would also improve the competitiveness of coal mining and manufacturing activity in the area. The "without" plan would have a minimal affect on the economy of the region.

d. **Other Social Effects (OSE) Account**

While the projects themselves would not require the relocation of residences, access to the disposal area could require the relocation and/or compensation of up to fourteen residences. This is equally true of all of the plans.

The improvement plans would require relocations of non-residential shoreside facilities in numbers that are extensive in the "2 for 3" plan (Plan 1) and minor in the "3 for 3" plans (Plan 4 and Plan 4 Deferred). Plan 1 would require the modification of one railroad bridge, numerous commercial and recreational dock and related facilities, numerous submarine pipelines, and numerous municipal and industrial water intakes and outflows. Plan 4 (and Deferred) would require the relocation of one commercial dock while no relocations are required under the "without" plan. The cost of making adjustments is the responsibility of the owner if it is a privately owned facility and on the river by permit, and a federal responsibility if it is a municipally owned or operated facility. Railroad bridge adjustments are a joint responsibility but with most of the cost borne by the federal government. In terms of the cost and number of relocations, the "2 for 3" plan (Plan 1) is the highest, followed by the "3 for 3" improvement plans (Plan 4 and Plan 4 Deferred) and the "without" plan.

The alternatives, including the "without" plan, require the replacement of the dam at L&D 2. A cofferdam would be required during construction of the new permanent dam. While the cofferdam is in place, the potential damages from high water are increased. The potential damages are lowest for the "2 for 3" plan (Plan 1) because it involves the replacement of the dam at L&D 2 with a gated dam which provides greater control over the river during construction. The "without" plan, Plan 4, and Plan 4 Deferred provide for the replacement of the existing fixed crest dam at L&D 2 with a new fixed crest dam.

3. SATISFACTION OF PLANNING OBJECTIVES

The planning objectives for the Lower Monongahela River Navigation System are:

a. To ensure the safe and reliable operation of the Lower Monongahela River Navigation System into the future.

b. To minimize inefficiencies to towing operations related to the Lower Monongahela River Navigation System.

c. To maintain or improve, where possible, the river's present water quality, fishery and recreational values.

Objective "a" represents the minimum in terms of navigation service at the projects and on the lower river. The "without" plan would meet this objective as would the improvement plans. Objective "b" represents the goal of not merely maintaining the system, but improving it. Plans 1 and 4 meet this objective, Plan 4 Deferred partially meets it, and the "without" plan does not meet it. Objective "c" addresses the overall environment of the study area and the need to be sensitive to non-navigation interests in the development of future plans of action. While all of the alternatives meet this objective, they do not address it equally. In general, the "2 for 3" plan (Plan 1) has greater short term disruption but greater long term benefits, while the "without" plan and the "3 for 3" improvement plans (Plans 4 and 4 Deferred) have less short term disruption but fewer long term benefits.

4. RESPONSIVENESS TO EVALUATION CRITERIA

Principles and Guidelines stipulate that alternative plans should be formulated and evaluated in consideration of four criteria: completeness, effectiveness, efficiency, and acceptability. The following is a summary of these evaluations.

a. <u>Completeness</u>

The term "completeness" refers to the extent to which an alternative plan accounts for all necessary investments. All of the alternative plans are equally complete in that all investments and actions required as part of the plan or as a byproduct of the plan, whether by Federal or Non-Federal interests, were considered in the evaluation.

b. <u>Effectiveness</u>

"Effectiveness" refers to the extent to which an alternative plan alleviates the specified problems and achieves the desired outputs. The plans are all equally effective in alleviating the condition problems and are of varying effectiveness in alleviating the navigation problems. Ranked in order of effectiveness from most to least are the "2 for 3" plan (Plan 1), the "3 for 3" improvement plan (Plan 4), Plan 4 Deferred, and the "without" plan.

c. <u>Efficiency</u>

"Efficiency" refers to the extent which an alternative is the most cost-effective means of alleviating the specified problems and achieving desired output. Maximum net benefits and benefit-cost analysis are the two common means of measuring efficiency. The "2 for 3" plan (Plan 1) is the most efficient of all plans, followed by Plan 4 Deferred, Plan 4, and the "without" plan.

d. <u>Acceptability</u>

"Acceptability" refers to the viability of an alternative plan as viewed by local and state entities and the general public, and its compatibility with existing laws, regulations and public policy. The acceptability of the plans to different groups is generally in proportion to how much, if any, it costs them and how much they benefit from the project. Generally, the higher the number of residential relocations, the greater is the local opposition to the projects since individuals are reluctant to move even with compensation. The towing industry and most other local industry generally support the improvement plans because they are the direct beneficiaries of the project, even though they often incur substantial costs to adjust docks and other facilities. Local governments generally find the plans to be acceptable, with the exception of those considered as disposal sites. The pipeline companies are generally acquiescent, viewing the adjustments as a cost of doing business in the area. Overall, Plan 1 is strongly supported by the towing industry and generally acceptable to other affected parties. In order of acceptability, Plans 1 and 4 are nearly the same followed by Plan 4 Deferred and the "without" plan.

5. RECOMMENDED PLAN

The "2 for 3" plan (Plan 1) with twin 84' x 720' locks maximizes net benefits and is therefore the National Economic Development (NED) plan. Plan 1 also ranks favorably in most other accounts and in those where it does not, the plan is not generally considered to have significant adverse affects. Overall, the positive effects of the plan outweigh the negative effects and the plan is therefore designated as the recommended plan. Ranked in descending order, the other plans are Plan 4 Deferred, Plan 4 and the "without" plan.

Table 6-3

Summary Comparison of Detailed Plans

	"Without" Plan	Plan 1	Plan 4	Plan 4 Deferred
1. Plan Description	L&D 2 - reconstruct fixed crest dam by 2002 and rehabilitate locks by 2022. L&D 3 - reconstruct locks and dam by 2002. L&D 4 - rehabilitate locks by 2002, reconstruct locks by 2027; minor repairs to dam.	L&D 2 - construct gated dam by 2002 and rehabilitate locks by 2022. L&D 3 - remove locks and dam by 2002. L&D 4 - construct twin 84' x 720' locks by 2002; minor repairs to dam.	L&D 2 - same as "Without" Plan L&D 3 - construct twin 84' x 720' locks by 2002 and reconstruct dam by 2002. L&D 4 - construct twin 84' x 720' locks by 2002 and minor repairs to dam.	L&D 2 - same as "Without" Plan L&D 3 - same as Plan 4 L&D 4 - rehabilitate locks by 2002, construct twin 84' x 720' locks by 2027, and minor repairs to dam.
a. NED - National Economic Development ($ Millions; Oct 91; 8 3/4%)				
(1) Annual Benefits and Costs:				
Benefits	$265.8	$304.5	$300.8	$289.0
Costs	68.3	77.3	88.7	72.2
Net Benefits	$197.5	$227.2	$212.1	$216.8
B/C Ratio	3.9	3.9	3.4	4.0
(2) Increment over "Without":				
Benefits	$0.0	$38.7	$35.0	$23.2
Costs	0.0	9.0	20.4	3.9
Net Benefits	$0.0	$29.7	$14.6	$19.3
B/C Ratio	---	4.3	1.7	5.9
(3) Project Costs:				
Federal Costs*	$865.4	$623.5	$799.4	$864.5
Non-Federal Costs	0.0	111.2	10.3	10.3
Total Costs	$865.4	$734.7	$809.7	$874.8
* includes 50% from Inland Waterways Trust Fund				
(4) Economic Costs:				
Present Worth of Costs	$719.1	$839.1	$949.6	$733.0
Interest during Construction	133.9	149.6	185.0	133.5
Total	$853.0	$988.7	$1,134.0	$866.5

Table 6-3 (cont'd). Summary Comparison of Detailed Plans

	"Without" Plan	Plan 1	Plan 4	Plan 4 Deferred
(5) Annualized Costs:				
Investment	$63.9	$74.5	$84.4	$65.1
O&M	3.3	2.3	3.3	3.3
Flood Damages	1.0	0.5	1.0	1.0
Helper Boats	0.1	0.0	0.0	2.8
Total	$68.3	$77.3	$88.7	$72.2
(6) Annual Benefits:				
Navigation	$265.8	$302.5	$300.8	$289.0
Advanced Replacement	0.0	2.0	0.0	0.0
Total	$265.8	$304.5	$300.8	$289.0
b. Environmental Impacts				
(1) Water Quality	Status quo in near term, localized impacts during future reconstruction and lockage congestion.	Localized impacts during construction periods and extensive channel dredging, loss of Dam 3 tailwater benefits replaced by design and operation of new Dam 2 and Locks 4.	Status quo, except for temporary construction impacts at each structure.	Same as Plan 4
(2) Ground Water	No change	No significant impact, minor raise in Pool 2 and drop in Pool 3 near river banks.	Minor impacts between r.m. 23.8-24.6 where pool drops 8.2 feet, no impact beyond 1,500 feet landward of riverbank	Same as Plan 4
(3) Wetlands	No net loss. Monongahela River - no change; Bunola disposal site - temporary fill in less than one acre	No net loss. Pool change adjustment (30.3 miles); Bunola disposal site - temporary fill in less than once acre	No net loss. Pool change adjustment (0.8 mile); Bunola disposal site - temporary fill in less than one acre	Same as Plan 4
(4) Aquatic Habitat	Status quo in near term, localized impacts during construction, approach dredging (410,000 yd^3), and future lockage congestion.	Loss of one tailwater replaced by construction of fish reefs, rubble beds, and net gain 76.5 acres shallow water habitat; extensive dredging impacts (2,431,650 yd^3); localized construction impacts.	Localized construction impacts, net gain 1.4 acres shallow water habitat, minor dredging impacts (344,450 yd^3).	Same as Plan 4. Localized impacts from congestion at Locks 4 until 2027.
(5) Terrestrial Habitat	Disposal site impacts: 125+ acres (2,604,900 yd^3 material), loss of about 23.5 acres.	Same as "Without" Plan, (3,272,760 yd^3 material).	Same as "Without" Plan, (3,868,130 yd^3 material), loss of about 41 acres.	Same as Plan 4
(6) Fish and Wildlife	Temporary construction impacts at locks and dams, dredging sites, and disposal areas.	Same as "Without" Plan, loss of one tailwater fishery.	Same as "Without" Plan.	Same as "Without" Plan.

	"Without" Plan	Plan 1	Plan 4	Plan 4 Deferred
b. Environmental Impacts (cont'd)				
(7) Endangered Species	No impact	No impact	No impact	No impact
(8) Prime Farmland	No impact	No impact	No impact	No impact
(9) HTW Sites	Dam 3: At same location, known soil contamination at abutment; At new location, potentially significant impact from ground water drop at one HTW site	Pool changes: Minor ground water impact at three HTW sites	Removal of Dam 3: Potentially significant impact at one HTW site from ground water drop; New Dam 3: Potential for contaminated soils at abutment (r.m. 24.6)	Same as Plan 4
(10) Flood Plains	Status quo over long term, potential for increased flooding during cofferdam phases of construction.	Same as "Without" Plan	Same as "Without" Plan	Same as "Without" Plan
(11) Recreation	Status quo to 2020, followed by significant lockage delays.	Benefits from elongated pool and avoidance of future lockage delays, loss of tailwater fishery (3,300 recreation days).	Status quo, avoidance of future lockage delays.	Status quo, avoidance of future lockage delays, except at Locks 4 until after 2027.
(12) Scenic Rivers	No impact	No impact	No impact	No impact
c. Cultural Resources Impacts	Three locks and dams, remains of Old Lock 3 (ca. 1840), potential for archeological sites in disposal sites and flood plain terrace (r.m. 24-25).	Three locks and dams, one railroad bridge, potential for archeological sites in disposal sites.	Same as "Without" Plan	Same as "Without" Plan
d. Other Social Effects				
(1) Life, Health and Safety	None.	None.	None.	None.
(2) Community Cohesion	Possible future relocation of 14 residences and one business at disposal sites.	Same as "Without" Plan	Same as "Without" Plan	Same as "Without" Plan
(3) Flooding	Potential during replacement of Dams 2 and 3.	Potential during replacement of Dam 2.	Same as "Without" Plan	Same as "Without" Plan

Table 6-3 (cont'd). Summary Comparison of Detailed Plans

	"Without" Plan	Plan 1	Plan 4	Plan 4 Deferred
e. Regional Development (1) Industrial Output	No significant change.	Probable increase in industrial output.	Same as Plan 1.	Same as Plan 1.
(2) Personal Income	No significant change.	Possible increase in high paying coal mining and manufacturing jobs.	Same as Plan 1.	Same as Plan 1.
f. Summary Description of Pool Change Impacts (1) Numbers and Type of Facility	None	35 Commercial Docks and Barge Facilities 1 Railroad Bridge 36 Major Storm Sewers 25 Recreational Docks & Ramps 24 Submarine Crossings 5 Water Supply Facilities 2 Shoreside Park Facilities 5 Sanitary Sewers	4 Commercial Docks 2 Submarine Crossings	4 Commercial Docks 2 Submarine Crossings
(2) Cost of Adjusting to Pool Changes (Millions)	$ 0.0	$ 174.3	$10.3	$10.3
(3) Navigation Channel Dredging Requirements (Cubic Yards)	None	1.67 Million	None	None
(4) Cost of Dredging (Millions of Dollars)	None	$ 33.0	None	None
2. Plan Evaluation **a. Contribution to Planning Objectives** (1) Ensure Future Navigability of Project	Met	Met	Met	Met
(2) Minimize Towing Inefficiencies	Not met	Met	Met	Partially met
(3) Maintain or Enhance Water Quality, Fishery & Recreation Values	No change	Adverse due to increased dredging loss of tailwater and pool changes.	No change.	No change.
b. Response to Evaluation Criteria (1) Completeness (2) Effectiveness (3) Efficiency (4) Acceptability	Yes Partial Fourth Medium	Yes Total First (NED) High	Yes Total Third High	Yes Partial Second Medium

Table 6-3 (cont'd). Summary Comparison of Detailed Plans

c. Navigation	"Without" Plan		Plan 1		Plan 4		Plan 4 Deferred	
(1) Lock Capacity (Million Tons)	L&D 3	L&D 4	L&D 3	L&D 4	L&D 3	L&D 4	L&D 3	L&D 4
	43.4	42.6	107.3	104.4	107.3	104.4	107.3	42.6/104.4
(2) Traffic (Million Tons) Year	L&D 3	L&D 4	L&D 3	L&D 4	L&D 3	L&D 4	L&D 3	L&D 4
2000	28.2	24.6	--	24.6	28.2	24.6	28.2	24.6
2010	32.5	28.7	--	28.7	32.5	28.7	32.5	28.7
2020	34.8	30.9	--	30.9	34.5	30.9	34.5	30.9
2030	41.3	37.5	--	37.5	41.3	37.5	41.3	37.5
2040	41.0	37.3	--	42.1	45.6	42.0	45.6	42.0
2050	40.3	37.4	--	47.4	51.0	47.4	51.0	47.4
(3) Tows (Thousands) Year	L&D 3	L&D 4	L&D 3	L&D 4	L&D 3	L&D 4	L&D 3	L&D 4
2000	8.4	8.7	--	6.8	7.7	6.8	7.6	6.7
2010	11.0	10.4	--	7.9	8.8	7.9	8.8	7.9
2020	15.0	13.3	--	8.6	9.5	8.6	9.5	8.6
2030	17.6	16.0	--	10.2	11.1	10.2	11.1	10.2
2040	17.0	15.7	--	11.4	12.2	11.4	12.2	11.4
2050	17.1	15.8	--	12.8	13.5	12.8	13.5	12.8
(4) Delays (Hours per Tow) Year	L&D 3	L&D 4	L&D 3	L&D 4	L&D 3	L&D 4	L&D 3	L&D 4
2000	1.3	1.6	--	0.4	0.3	0.4	0.3	1.4
2010	2.4	1.8	--	0.4	0.4	0.4	0.3	1.7
2020	2.5	1.9	--	0.5	0.4	0.5	0.4	1.8
2030	35.9	10.4	--	0.8	0.5	0.8	0.5	0.8
2040	32.6	9.5	--	0.8	0.6	0.8	0.6	0.8
2050	16.1	10.2	--	1.0	0.7	1.0	0.7	1.0

SECTION 7 - THE PROJECT RECOMMENDED FOR AUTHORIZATION

1. PROJECT DESCRIPTION

a. Summary

The project recommended for authorization is a "2 for 3" replacement alternative consisting of the replacement of the fixed-crest dam at Locks and Dam (L&D) 2 with a gated dam having 5-110' tainter gates; the replacement of the floodway bulkhead structure for the small lock chamber at Locks 2; raising existing Pool 2 by 5 feet; adjustments of the Conrail Railroad Bridge at Monongahela River mile 11.7; the construction of new twin 84' x 720' locks at L&D 4; the removal of L&D 3; lowering existing Pool 3 by 3.2 feet; and associated miscellaneous relocations and channel dredging. Environmental features to mitigate for adverse impacts to fish and wildlife resources are included as separable mitigation measures and sound engineering practice. Cultural resources mitigation is anticipated for impacts to the existing locks and dams, and to presently unknown archeological sites in the disposal areas.

b. Project Components at L&D 2

The existing 748 foot long fixed-crest Dam 2 would be removed, including the timber cribbing foundation and the concrete weir. A new gated dam would be constructed along an alignment 485 foot upstream of the existing Dam 2 to align with the existing emergency bulkhead closure system for the large lock chamber. To compensate for the dam being moved upstream, an extension of the guard wall is included as an aid to navigation. As currently envisioned, the new non-navigable dam would be a tainter gated structure consisting of five, 110 foot gate bays with 12 foot wide piers on 122 foot centers and a fixed crest weir of 87.5 feet. The overall dam length would be 729.5 feet extending from the river face of the lock river wall to the river face of the abutment. The piers would be concrete gravity structures founded on rock and the gate bay sill monoliths and fixed crest weir monoliths would be supported by steel H piles driven to rock. The sill crest for gate bays 2 through 5 would be set at elevation 696.7 NGVD while that of gate bay 1 would be considerably higher at elevation 714 NGVD +/- to provide for additional downstream reaeration. The crest elevation of the weir would be 723.7 NGVD and the top of the abutment wall would be elevation 739.0 NGVD. The gates would be the non-overflow type with the centerline of trunnion at elevation 727.7 NGVD. Many of the features of the dam are being modeled after that of the Hannibal Locks and Dam, built in the early 1970's.

The existing floodway bulkhead structure for the small lock chamber would be removed. The existing bulkhead sill would be repaired and a new bulkhead, hoist and hoist structure would be constructed in the existing location, consisting of a steel hoist structure to raise the steel bulkhead sections vertically to their stored position. The bulkhead would be fabricated with welded steel trusses and a skin plate. This system would be modeled after that of the Point Marion Lock. The new floodway bulkhead structure must be completed prior to the start of construction for the new gated dam in order to ensure reliable operation of the small chamber as a floodway during construction of the dam and thereby reduce the surcharge to flood flows caused by cofferdams and the constricted river cross section. This would result in potential flood damage savings of $0.1 million annually for a 1 year frequency flood to $0.6 million annually for a 100 year frequency flood.

Pool 2 would be raised 5.0 feet above the crest of the existing fixed-crest dam, to elevation 723.7 NGVD. On average, this new pool level would be approximately 2 foot above normal river levels currently experienced. The permanent pool raise could require embankment protection at an estimated 11 locations in Pool 2 where the loss of soil stability would adversely affect a shoreside facility. It would also require a variety of relocations and the acquisition of flowage easements on tributaries to the Monongahela River in Pool 2. These relocations and acquisitions are discussed more fully in paragraphs 2 and 4 of this section.

WES suggested that submerged dikes may be desirable to reduce the upper approach velocities to improve navigation entrance conditions. Therefore, a group of five dikes is included in the recommended project to divert flow riverward resulting in lower velocities. The configuration, effectiveness, and even the need for any dikes are somewhat speculative at this time. Such questions would be answered in subsequent study.

c. **Project Components at L&D 3**

Locks and Dam 3 would be removed and Pool 3 would be lowered 3.2 feet below the crest of the existing fixed-crest dam, to elevation 723.7 NGVD. On average, this new pool level would be approximately 5.0 feet below normal river levels currently experienced. The permanent pool lowering would require a variety of relocations. These relocations are discussed more fully in paragraph 2 of this section. The removal work would consist of the existing 670 foot long concrete fixed-crest dam and 18 foot wide pier in midstream, the 56 foot X 720 foot land chamber, the 56 foot X 360 foot river chamber, the 391 foot river chamber extension, and all related operating machinery and equipment. All removal would be to the level of the streambed. During removal of the dam, traffic would be maintained through the open locks. This will require the upper guard sills to be removed first so that tows will have sufficient draft after Pool 3 is lowered 3.2 feet. Pool 3 would be dredged to a design template 11 foot below elevation 723.7 NGVD, or the normal pool to be maintained by the new gated dam at L&D 2. The dredging would be completed prior to the lowering of Pool 3.

d. **Project Components at L&D 4**

All facilities related to the existing 56 foot X 360 foot river and 56 foot X 720 foot land chambers would be removed and replaced with twin 84 foot X 720 foot lock chambers. The existing land chamber would be used to maintain traffic while the new river chamber is being constructed. The new river chamber would then be used while the land chamber and esplanade are being constructed. At the time of the construction of the gated dam in the mid-1960's a new river wall section, founded on rock, consisting of 6 monoliths for a total length of 243.5 feet was constructed in anticipation of new locks in the future. This existing stub river wall would be extended to form the river wall for the new 84 foot river chamber.

The new lock walls would be concrete gravity structures with a top at elevation 751.0 NGVD, 2 foot higher than the existing lock walls. The upstream and downstream miter sills would be set to provide 18 feet of navigational clearance at minimum headwater and tailwater. Both the upstream and downstream chamber gates would be of the steel miter type. Each chamber would have an emergency closure. The emergency bulkhead units would be placed by a hoist traveling on parallel steel girder spans over the lock chambers. Access to the existing service bridge would be provided by a steel plate girder footbridge spanning the new locks.

The river and land walls would be founded on firm rock and the middle wall would be founded on caissons. Both the upper and lower guard walls would be concrete gravity walls constructed on steel bearing piles enclosed in circular sheet pile cells filled with gravel. The top elevation of the cells would be below minimum headwater and tailwater. The upper guide wall would be constructed on steel H-Piles. The lower guide wall would be founded on diaphragm type continuous sheet piling cells.

The land chamber would use a side port filling and emptying system with 10 foot by 12 foot culverts in both the land and middle walls. The river chamber would use a lateral filling and emptying system with a 15.5 foot by 15.5 foot culvert in the river wall.

The new chambers would be constructed using a two stage cofferdam. Stage one would use the existing middle wall as the landward cofferdam section. Circular sheet pile cells would extend upstream and downstream and tie into gate bay one of the existing dam. During stage one, river traffic would use the existing land chamber. The new middle wall would be constructed in the existing river chamber. The new river wall would then be constructed in alignment with the stub wall previously placed during the construction of the gated dam. Stage two would use the newly constructed middle wall as the riverward section of the cofferdam. Circular sheet pile cells would extend upstream and downstream and tie into the right bank. During stage two, river traffic would use the new river chamber while the land wall was being constructed.

To construct the new middle wall, the existing concrete struts in the river chamber would have to be removed. The existing middle wall would then have to be stabilized by installing steel struts near the top of the walls, between the existing middle and river walls. The new middle wall would be constructed to below these stabilizing struts. Struts would then be placed between the new middle wall and the existing middle wall while the remaining portion of the new middle wall and the new river wall are constructed.

Two new buildings would be constructed at the new locks. A two story operations building with associated operating machinery and equipment would be located on the middle wall. In addition a service building would be located on the esplanade.

e. **Environmental Features**

The following environmental features are included to address specific environmental planning objectives developed to minimize or compensate for the impacts Plan 1 would have on water quality, fish and wildlife resources, and wetlands. Some of the environmental planning objectives can be achieved through sound engineering practice while others addressing the loss of a tailwater and restoration of upland disposal sites require separable fish and wildlife mitigation measures. The quoted costs for mitigation features are from M-CACES Code of Accounts 06 and 30.

(1) Separable Fish and Wildlife Mitigation Features

(a) A raised sill, low flow gate at new Dam 2.

To maintain existing dissolved oxygen levels in the river, one of the five submerged sill gate bays of new Dam 2 will be redesigned as a raised sill gate. This gate will be operated as a low flow gate and be designed to maximize the dam's reaeration capability during low flow periods. The estimated cost of this mitigation feature is $270,000. Operation and maintenance will be part of normal project operation costs.

(b) Air entrainment ducts in new Locks 4.

The new Locks 4 will be designed to incorporate passive air entrainment ducts to aerate lock discharge. The estimated cost of this mitigation feature is $145,000. Operation and maintenance will be part of normal project operation costs.

(c) Fish reefs.

Fish reefs, i.e. modified spur dikes, will be constructed in the project area's shoreline zone from concrete rubble generated during removal of old Locks and Dam 3. These structures will compensate, in part, for the loss of the Dam 3 tailwater fishery habitat. The estimated cost of this mitigation feature is $710,000. No operation and maintenance costs are anticipated.

(d) Upland disposal site habitat restoration.

Specially designed surface grading, dressing and seeding, and use of on-site materials will replace existing habitat values. The estimated cost of this mitigation feature is $300,000. There will be no continuing operation and maintenance costs.

(e) Wetland restoration.

Wetland restoration will be required for less than one acre of temporary fill at one disposal site, and potentially for riverine wetland impacts resulting from pool level adjustments when Locks and Dam 3 are removed. The need for riverine wetland mitigation will be determined after project construction through a monitoring program. If the monitoring program detects wetland changes caused by project construction warranting mitigation, a contingency wetland mitigation plan will be implemented. Wetland restoration is estimated to cost $285,000.

(2) Environmental Features Through Sound Engineering Practice

(a) Dredging restrictions during fish spawning.

Channel and approach dredging will be prohibited from mid-April through June 30th. No added project cost.

(b) Modified clearing plan in Pool 2.

Some woody vegetation will be retained in the Pool 2 inundation zone through specifications reducing the amount of clearing normally practiced. Project cost reduction.

(c) Modified operating schedule for Dam 4.

The District will investigate modifications to the Dam 4 operating schedule for benefitting a shoreline tailwater fishery. No added project cost.

(d) Rubble beds creation in Dam 2 tailwater.

The District will investigate the opportunity to dispose of unreinforced concrete rubble from old Dam 2 into its tailwater zone to create tailwater spawning shallows. Project disposal cost reduction.

(e) Modified placement of bank stabilization in Pool 2.

The height of riprap bank stabilization in Pool 2 will be reduced from an estimated five feet to two feet above normal pool elevation to minimize impacts to the narrow riparian wetland zone. Project cost reduction.

f. **Cultural Resources Mitigation.**

Specific cultural resources mitigation requirements for the recommended project will not be known until the prerequisite studies and evaluations are conducted following project authorization. These studies will be conducted as stipulated in a programmatic agreement between the District, Advisory Council on Historic Preservation, and the Pennsylvania State Historic Preservation Officer. Preliminary estimates of mitigation include structural documentation of Locks and Dams 2, 3 and 4 and the Conrail Railroad bridge (estimated at $164,000), and data recovery at presently unknown archeological sites (estimated at $270,000).

2. RELOCATIONS

a. **Summary**

The permanent raise of existing Pool 2 to elevation 723.7 NGVD will require the adjustment of a railroad bridge, and potential work at 19 municipal facilities, 24 major storm sewers, 15 commercial shoreside facilities, 1 privately-owned water intake and 5 private recreational facilities. The permanent lowering of existing Pool 3 to elevation 723.7 NGVD may require work at 12 municipal facilities, 20 commercial shoreside facilities, 3 privately-owned water intakes, 13 private recreational facilities and 20 submarine crossings. Tables 7-1 through 7-4 list the name, owner, location and adjustment cost of these facilities.

To develop a conservative project cost estimate, relocation estimates were developed for all identified facilities, even though it is anticipated that many of these facilities can accommodate the relatively small proposed changes in water surface levels. A more detailed analysis of relocation requirements would be conducted during preconstruction engineering and design.

Many of these facilities were constructed in accordance with the regulatory program pertaining to navigation servitude under Section 10 of the River and Harbor Act of 1899. Under provision of the issued permits, owners are generally not entitled to compensation at project expense for adjustments to facilities required as a result of federal projects. However, in 1958 and as modified in 1965, Congress granted the Chief of Engineers discretionary authority to make compensation at project expense for such adjustments, not withstanding the navigation servitude vested in the federal government, where the facility is owned by an agency of government and used in a governmental function. This authority is granted by Section 111 of 72 Stat. 303, as amended by Section 309, 79 Stat. 1094 (33 U.S.C. 633). It is considered appropriate in this instance however, to obtain project-specific authority for the adjustment of such publicly owned facilities as a project cost. This approach would minimize the financial impacts to the local communities who would normally be required to pay for such adjustments as stipulated in the permit. If any of the non-Federal governmentally owned facilities subject to Section 10 regulations and with adjustment included as a project cost as described herein are found, under more detailed evaluation, to not qualify for project cost (e.g. are privately owned, are outside of the limits of navigation servitude, are not adversely affected, or fail to meet state and federal water quality and other environmental regulations) then adjustment under the project specific authority would not be undertaken. It will be incumbent upon the facility owner to demonstrate compliance with any and all applicable regulations prior to the execution of a contract for adjustment of the facility with project funds. Thirty governmentally owned facilities have been identified for adjustment under project specific authority and are listed in Table 7-6. The adjustments of identified facilities will be limited to in-kind relocations or alterations and will not include betterments. Construction of the altered or new facility or utility will meet current engineering design standards that are required by law or regulation. However, facilities or utilities will not be altered or constructed at project cost to serve the owner in other than the same manner nor to a higher degree of serviceability than the existing facility or utility. If additional facilities are identified subsequent to authorization that may be suitable to be considered as project costs, separate decisions will be pursued under Section 111 authority. More detailed discussion of these adjustments are contained in Attachment I to this Main Report.

TABLE 7-1
MAJOR STORM SEWERS
POTENTIALLY IMPACTED BY
PROJECT RECOMMENDED
FOR AUTHORIZATION

Owner 1/	Location	Estimated Cost ($1,000)
	ADJOINING MONONGAHELA RIVER	
P&LE Railroad	R. M. 11.6 Right Bank	$ 9.5
Union Railroad	R. M. 12.1 Left Bank	1,030.4
USX	R. M. 13.3 Left Bank	595.4
Unknown	R. M. 14.2 Right Bank	888.0
National Tube	R. M. 14.4 Right Bank	275.0
Unknown	R. M. 16.2 Right Bank	112.6
USX	R. M. 19.1 Left Bank	915.0
Unknown	R. M. 19.7 Left Bank	9,371.0
USX	R. M. 20.7 Left Bank	775.0
USX	R. M. 21.1 Left Bank	2,728.0
Unknown	R. M. 21.5 Left Bank	1,245.0
P&LE Railroad	R. M. 23.4 Right Bank	287.1
	ADJOINING YOUGHIOGHENY RIVER	
Steel Met	R. M. 1.2 Left Bank	$ 1,360.0
Steel Met	R. M. 1.3 Left Bank	1,025.0
Steel Met	R. M. 1.5 Left Bank	771.0
CSX	R. M. 2.3 Right Bank	2,076.0
P&LE Railroad	R. M. 2.6 Left Bank	1,090.0
Total Private Cost (Major Storm Sewers)		$ 24,554.0
	ADJOINING TURTLE CREEK	
Unknown	C. M.+/-1.0 Right Bank	$ 470.0
Unknown	C. M. 0.2 Right Bank	260.0
Unknown	C. M. 0.5 Right Bank	280.0
Unknown	C. M. 1.0 Right Bank	220.0
Unknown	C. M. 1.1 Right Bank	230.0
Unknown	C. M. 1.3 Right Bank	230.0
Unknown	C. M. 1.5 Right Bank	160.0
Total Project Cost (Major Storm Sewers)		$ 1,850.0
TOTAL COST (MAJOR STORM SEWERS)		$ 26,404.0

1/ Unknown ownerships are not believed to be public.

TABLE 7-2
PRIVATELY OWNED
UTILITIES AFFECTED BY
PROJECT RECOMMENDED
FOR AUTHORIZATION

Owner	Location	Estimated Cost ($1,000)
Submarine Crossings		
Allegheny Pipeline Co.	R. M. 24.6	$ 1,400.0
Columbia Gas Transmission Co.	R. M. 24.6	3,500.0
Equitable Gas	R. M. 25.4	1,325.0
Consolidated Gas (2 crossings)	R. M. 33.0	1,200.0
Peoples Natural Gas Co. (6 crossings)	R. M. 33.0	1,025.0
N.Y. State Natural Gas (2 crossings)	R. M. 34.0	1,400.0
West Penn Power	R. M. 34.1	700.0
Consolidated Natural Gas (2 crossings)	R. M. 34.3	1,200.0
(Unknown Owner)	R. M. 35.1	700.0
Manufacturers Heat & Light	R. M. 36.8	700.0
Peoples Natural Gas	R. M. 38.7	700.0
Peoples Natural Gas	R. M. 40.8	700.0
Water Intakes		
U. S. Steel Corp.	R. M. 11.2 Right Bank	$ 500.0
Duquesne Light Co.	R. M. 25.1 Left Bank	6,900.0
Pennsylvania American Water Co.	R. M. 25.3 Left Bank	5,500.0
Allegheny Power Systems	R. M. 29.0 Left Bank	9,900.0
TOTAL COST	$ 37,350.0	

TABLE 7-3
PRIVATELY OWNED
STRUCTURES AFFECTED BY
PROJECT RECOMMENDED
FOR AUTHORIZATION

Owner	Location	Estimated Cost ($1,000)
Commercial Docks		
Union Railroad Co.	R. M. 11.7-11.9 Left Bank	$ 200.0
Union Railroad Co.	R. M. 12.1 Left Bank	7,400.0
Regional Ind. Develmnt Corp.	R. M. 15.0 Right Bank	50.0
Davidson Sand & Gravel Co.	R. M. 16.1-16.2 Left Bank	60.0
Boswell Oil Co.	R. M. 16.25 Left Bank	1,000.0
St. Clair Supply Co.	R. M. 17.4 Right Bank	50.0
C & C Marine Maintenance	R. M. 18.7 Left Bank	50.0
Glassport Trans. Ctr.,Inc.	R. M. 19.1 Right Bank	200.0
Aristech Chemical Corp.	R. M. 19.4 Left Bank	86.0
Guttman	R. M. 21.8 Right Bank	110.0
Dillner Storage Co.	R. M. 24.2-24.3 Left Bank	1,000.0
Ashland Petroleum Co.	R. M. 24.6 Left Bank	1,225.0
Lock 3 Oil, Coal & Dock Co.	R. M. 24.8-24.9 Right Bank	1,000.0
Duquesne Light Co.	R. M. 25.0-25.3 Left Bank	8,100.0
Chemply Co.	R. M. 27.8 Right Bank	250.0
Mon River Terminal Corp.	R. M. 28.6-28.8 Right Bank	1,300.0
Allegheny Power System	R. M. 29.2-29.4 Left Bank	5,100.0
Mathies Coal Co.	R. M. 29.4-29.7 Left Bank	950.0
U.S. Steel Corp.	R. M. 30.1-30.6 Left Bank	7,500.0
Patterson Supply Corp.	R. M. 31.3 Left Bank	50.0
Mon. Iron & Metal Co., Inc.	R. M. 32.7 Left Bank	125.0
Riverside Iron & Steel Corp.	R. M. 33.1 Left Bank	50.0
Duquesne Slag Products Co.	R. M. 34.3 Left Bank	800.0
Babcock & Wilcox Co.	R. M. 37.2-37.3 Right Bank	5.0
McGrew Welding Co.	R. M. 38.2 Left Bank	10.0
Canastral Construction Co.	R. M. 38.5-38.6 Right Bank	200.0
Sharon Steel	R. M. 39.8-40.3 Right Bank	1,300.0
Reserve Petroleum Co.	R. M. 40.9 Left Bank	100.0

TABLE 7-3 (CONT.)
PRIVATELY OWNED
STRUCTURES AFFECTED BY
PROJECT RECOMMENDED
FOR AUTHORIZATION

Owner	Location	Estimated Cost ($1,000)
Barge Facilities		
Union R.R. Co. (Mooring)	R. M. 12.1-12.4 Left Bank	$ 3,000.0
Ingram Barge Co. (Mooring)	R. M. 16.4-17.2 Left Bank	1,000.0
Consol Coal Co. (Mooring)	R. M. 22.9-23.4 Left Bank	24.6
Clairton Slag (Loading)	R. M. 23.6-23.7 Left Bank	100.0
Hercules Inc. (Loading)	R. M. 23.8 Left Bank	1,360.0
Centofanti Marine (Marineways)	R. M. 24.5 Left Bank	450.0
Centofanti Marine (Mooring)	R. M. 24.5-24.6 Left Bank	200.0
Private Docks		
Mon-Valley Speed Club	R. M. 15.9 Right Bank	$ 15.0
Unknown	R. M. 16.3 Right Bank	1.0
Schiffman	R. M. 16.4 Right Bank	1.0
Swift Homes	R. M. 22.4 Right Bank	2.0
Elizabeth Boat Club	R. M. 22.8 Right Bank	8.0
Pine Run Outboard	R. M. 26.3 Right Bank	15.0
Evan Ford Boat Sales	R. M. 26.4 Right Bank	1,500.0
John N. Molner Marina	R. M. 29.1 Right Bank	15.0
Beach Club Marina	R. M. 30.9 Left Bank	50.0
J. Sminko	R. M. 31.4 Left Bank	50.0
Monongahela Marine	R. M. 31.8 Left Bank	20.0
Unknown	R. M. 32.6 Left Bank	15.0
Marina One	R. M. 32.1 Right Bank	1,000.0
Unknown	R. M. 33.1 Right Bank	15.0
Hamel	R. M. 34.3 Right Bank	2.0
Frank Irey Marina	R. M. 34.5 Right Bank	40.0
Gibson	R. M. 34.6 Right Bank	3.0
Launching Ramps		
Blair S. Evans	R. M. 33.2 Right Bank	15.0
TOTAL COST (STRUCTURES)	$ 47,172.6	

TABLE 7-4
MUNICIPAL FACILITIES
AFFECTED BY
PROJECT RECOMMENDED
FOR AUTHORIZATION

Owner	Location	Estimated Cost ($1,000)
Sanitary Sewers		
Boro of Elizabeth	R. M. 22.5 - 23.0 Right Bank	$ 1,425.0
Boro of West Elizabeth	R. M. 22.8 - 23.3 Left Bank	2,500.0
Sant. Auth. of Eliz. Twp.	R. M. 4.1 Right Bank (Yough River)	300.0
City of Duquesne	R. M. 11.5 Left Bank	170.0
Water Wells		
City of Duquesne	R. M. 12.5 - 12.9 Left Bank	$ 90.0
Submarine Crossings		
Boro of Charleroi (2 Crossings)	R. M. 38.7	$ 2,100.0
Boro of Charleroi	R. M. 41.0	1,050.0
Mon Valley Sewage Authority	R. M. 38.4	1,350.0
Storm Sewers		
City of Duquesne	R. M. 12.4 Left Bank	$ 340.0
City of McKeesport	R. M. 15.6 Right Bank	275.0
City of McKeesport	R. M. 15.7 Right Bank	100.0
Boro of Dravosburg	R. M. 16.4 Left Bank	2,550.0
Boro of West Mifflin	R. M. 17.0 Left Bank	1,990.0
Boro of Glassport	R. M. 17.3 Right Bank	1,170.0
Boro of Glassport	R. M. 17.8 Right Bank	270.0
PA. Dept. of Trans.	R. M. 18.9 Right Bank	1,400.0
Boro of West Elizabeth	R. M. 22.8 Left Bank	135.0
Boro of West Elizabeth	R. M. 23.0 Left Bank	270.0
Boro of Elizabeth	R. M. 23.2 Right Bank	380.0
City of McKeesport	R. M. 0.1 Left Bank (Yough River)	415.0
City of McKeesport	R. M. 2.1 Right Bank (Yough River)	2,935.0
Total Cost (Utilities)	$ 21,265.0	

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TABLE 7-4 (CONT)
MUNICIPAL FACILITIES
AFFECTED BY
PROJECT RECOMMENDED
FOR AUTHORIZATION

Owner	Location	Estimated Cost ($1,000)
Park		
Borough of Elizabeth	R. M. 22.9 Right Bank	$ 400.0
Launching Ramps		
Boro of New Eagle	R. M. 30.1 Left Bank	$ 30.0
City of Monongahela	R. M. 32.0 Left Bank	30.0
PA Fish Commission	R. M. 33.2 Left Bank	30.0
Forward Township	R. M. 34.1 Right Bank	30.0
Borough of Webster	R. M. 36.2 Right Bank	1.5
Borough of Webster	R. M. 36.4 Right Bank	1.5
City of Monessen	R. M. 38.5 Right Bank	1.5
Aquatorium		
City of Monongahela	R. M. 31.9 Left Bank	$ 190.5
Total Cost (Structures)	$ 685.0	
TOTAL COST (MUNICIPAL FACILITIES)		$ 21,950.0

b. **Conrail Railroad Bridge**

The Conrail Railroad Bridge at river mile 11.7 must be adjusted to achieve a vertical guide clearance of 42.5 feet as required by the U.S. Coast Guard (CG). In November 1990, the CG formally established the vertical guide clearance at 42.5 feet, reduced from 47.0, for the entire Monongahela River. The relocation would consist of achieving approximately 2.5' of additional vertical clearance by removing the existing channel span and constructing a new channel span with a more efficient structural design for the deck and a higher low steel elevation. It is intended that the design and construction would be performed by the railroad under a relocation contract with the Government. The cost of the adjustment would be substantially a project cost. The railroad would contribute a portion of the total railroad relocation cost in accordance with Section 6 of Public Law 647, 67th Congress 21 June 1940, as amended (33 U.S.C. 516). This cost (estimated at $2.14M) represents the expectable savings in repair or maintenance costs and proportion of the actual capital cost of the portion of the old bridge that will be required to be altered as the used service life bears to the total estimated service life.

3. **EFFECTS ON TURTLE CREEK LOCAL FLOOD PROTECTION PROJECT**

Turtle Creek is a tributary which drains 147 square miles and enters Pool 2 on the right descending bank just upstream of the upper guide wall of Locks and Dam 2. A local flood protection project, completed by the Corps of Engineers in 1967, extends from the mouth several miles upstream on the creek. Slack water from existing Pool 2 extends normally to approximate station 85+0 on Turtle Creek and heavy siltation has occurred in this reach. Upstream debris basins and dams had been provided to intercept some of the sediment for easier removal, but their maintenance as well as the channel itself has been neglected. The Pittsburgh District has been authorized to restore the project in cooperation with Allegheny County, the new project sponsor. It is expected to be completed in the 1992-1994 time frame. The project was designed to contain, within its banks, a flood with a of 280 year frequency. Since the Monongahela River at the mouth of Turtle Creek, in this situation, would be about 1 foot lower after the completion of the gated dam at L&D 2, even with a higher Pool 2, the Turtle Creek design water surface would continue to be contained within the stream banks provided the stream channel is maintained. In addition to the flood protection from high Turtle Creek flows afforded by the Corps' project, an existing pumping station located on Turtle Creek about a mile from the mouth prevents Monongahela River backwater from causing damage.

However, with Pool 2 raised to elevation 723.7 NGVD with the recommended plan, slack water would extend an additional 3,500 ft up the Turtle Creek channel to station 120+0. River levels would be higher, except during high flow periods, which would amount to only about five percent of the time overall. Therefore, velocities on the lower reaches of Turtle Creek would be lower, and increased deposition probable. The difference in channel siltation to be expected with the raised pool was analyzed and results indicate that, in five years, 56,000 cubic yards of sediment would be expected to accumulate in the channel from the mouth to station 120+0, with the present pool, after project restoration. With the proposed pool, the computations show that 47,000 cubic yards could accumulate in only three years, and that four years' accumulation would exceed 56,000 cubic yards. Therefore, to avoid any additional loss of flood protection, the frequency of channel clean outs would change from five to three years although slightly less material would need to be removed on each occasion. It is estimated that the additional cost of channel cleanout necessitated because of the increase in the proposed pool would be approximately $100,000 annually. These effects have been coordinated with Allegheny County, the local sponsor of the restoration project and they have indicated that they understand their responsibilities and will provide maintenance as required.

4. REAL ESTATE

a. **Flowage Easements**

Ordinary High Water (OHW) would be lowered between river miles 11.2 and 23.8 due to the replacement of the existing fixed crest dam with a gated structure having lower sills and a greater discharge capacity. OHW would also be lowered from river miles 23.8 to 41.5 due to the replacement of Dam 2, the removal of Locks and Dam 3 and dredging in existing Pool 3. For the same reasons, all floods would be reduced above river mile 11.2. Thus, with floods and ordinary high water being lowered, no flowage easements would be required along the Monongahela River main stem or the Youghiogheny River, also classified as a navigable tributary, pursuant to the navigation servitude powers of the Federal Government in regulating Section 10 of the Rivers and Harbors Act of 1899. However, flowage easements would be required on the non-navigable tributaries between river miles 11.2 and 23.8. The taking line would be based on the non-navigable tributary's ordinary high water with a freeboard allowance.

b. **Staging and Disposal Areas and Utility Easements**

Lands and interests required for construction of the recommended plan include two construction staging areas, three disposal areas and utility easements at L&D 4. The estates to be acquired are standard easement estates as prescribed in ER-405-1-12. One non-standard estate, a permanent easement under the tracks and right of way of a railroad is required for construction of the new dam at L&D 2. A brief discussion of each area follows.

(1) Construction Staging Area at Rankin

Located on the right bank approximately 1.6 miles downstream of existing L&D 2, in the vicinity of the Rankin Highway Bridge, this area would be obtained as a temporary work easement for the construction of the floodway bulkhead and the new dam at L&D 2. It is now a vacant, cleared industrial site. The area contains approximately 10 acres and is within a single ownership. Land access is provided by an existing public road and a temporary water access could be developed.

(2) Abutment Site at the new dam for L&D 2

The property at the abutment site would consist of two distinct areas. The first is the fee area that contains approximately 3 acres and one ownership. An additional one-half acre, more or less, would be needed for construction of a cut-off wall under the railroad, and would involve acquisition of a non-standard permanent easement estate. Vehicular access to the fee area is impractical because of the existing railroad yard.

(3) Disposal Site at Coursin Hill

Located on the right bank at approximate river mile 20 in Lincoln Borough, Allegheny County, this site would be used as a disposal area during the construction of the floodway bulkhead and the new dam at L&D 2. The site is presently undeveloped, heavily vegetated and is drained by a perennial stream. Access would be provided by an off highway haul road from a proposed barge unloading and material staging facility. Temporary work area easements and upgrades to the existing unimproved township road would be required, as well as approved railroad and highway grade crossings. The total site area is approximately 118 acres among 15 ownerships. The haul road zone contains 9 residences that would need to be relocated.

(4) Disposal Site at Bunola

Located along the right bank near river mile 27 in Forward Township, Allegheny County, this site would be used for dredged material disposal from existing Pool 3 and the disposal of materials from the removal of existing L&D 3. The site is predominantly undeveloped, with the exception of a few private dwellings, an auto salvage yard, an abandoned strip mine wall and drift mine entry, and is heavily vegetated. Access would be provided by an off highway haul road from a proposed barge unloading and material staging facility. Temporary work area easements and upgrades to the existing unimproved township road would be required, as well as approved railroad and highway grade crossings. The total site area is approximately 229 acres among 15 ownerships. Five residences would need to be relocated.

(5) Construction Staging area at Charleroi

Located along the left bank approximately 200 feet downstream of existing L&D 4, this area would be used for the construction of the new locks at L&D 4. The site has approximately 600' of river frontage and contains approximately 10 acres and one ownership. Vehicular access to the site is possible from the northern limits of the area to Route 88.

(6) Utility Easements at L&D 4

Utilities to be provided at L&D 4 include a sanitary sewer, gas and water lines. The sanitary sewer would extend from an existing manhole downstream of the lock on the right bank, parallel to State Route (SR) 306 and then under multiple railroad tracks to the lock. A perpetual pipeline easement would be acquired for installation and maintenance of the sanitary line. The gas and water lines would extend from existing main lines under SR 306, under the tracks to the lock. Two license agreements with the involved railroads would be required for the utility lines.

(7) Disposal Site at Dunlevy

Located on the left bank near river mile 45 in Dunlevy, Washington County, this site is required for the disposal of material from the work at L/D 4. It is part of a wide section of undeveloped floodplain and is accessible from the river. The site contains an area of approximately 67 acres among one ownership. No structures are involved. Vehicular access is provided by an unnamed public street crossing the railroad tracks to the upstream end of the proposed site. A temporary work area easement would be acquired but due to environmental concerns at this site, an alternative site will be required.

One possible alternative site chosen for Lock 4 disposal is located on the right bank of the Monongahela River at Bunola, PA, approximately 14.5 river miles downstream from the proposed project site. This site is described in detail in Section 4b.(4) Disposal Site at Bunola. Although this alternative site is targeted primarily for the disposal of dredge material from the proposed lowering of Pool 3, it possesses ample additional capacity to accommodate the Lock 4 material. In addition the Pangburn and Victory Hollow sites are also potential alternatives.

5. PROJECT FINANCING

The project recommended for authorization requires extensive adjustments of privately owned shoreside facilities. The total cost of making these adjustments is $111,217,000 and is entirely a private sector responsibility and expense.

Authorization is requested for all remaining costs totaling $ 556,378,000. Fifty percent of this amount, or $278,189,000 would come from the Inland Waterways Trust Fund (IWTF) and 50 percent out of General Funds (GF) of the Treasury. Table 7-5 below illustrates the breakdown of costs by item and responsibility.

TABLE 7-5
LOWER MONONGAHELA RIVER NAVIGATION STUDY
PROJECT RECOMMENDED FOR AUTHORIZATION
(October 1991 Cost Level)

ITEM	PROJECT COST 1/ ($1,000)	PRIVATE COST ($1,000)	TOTAL COST ($1,000)
Lands and Damages	$ 3,900	$ 0	$ 3,900
Relocations			
Utilities	21,265	37,350	58,615
Structures	685	47,173	47,858
Railroad	25,000	2,140	27,140
Major Storm Sewers	1,850	24,554	26,404
Reservoirs			
Remove L/D 3	9,000	0	9,000
Dams			
Modify Dam @ L/D 4 (For Locks)	2,700	0	2,700
Construct Dam 2	126,000	0	126,000
Locks			
Construct Locks 4	230,000	0	230,000
Floodway Bulkhead @ L/D 2	5,100	0	5,100
Modify Locks @ L/D 2 (For Dam)	14,200	0	14,200
Fish & Wildlife Facilities	1,400	0	1,400
Channels and Canals			
Dredging	33,000	0	33,000
Bank Stabilization	5,500	0	5,500
Cultural Resource Mgmt	1,170	0	1,170
Permanent Operating Eqpt			
L/D 2	203	0	203
L/D 3	202	0	202
Planning, Engineering and Design (PED)	37,270	0	37,270
Construction Management (CM)	37,933	0	37,933
TOTAL	$ 556,378	$ 111,217	$ 667,595

1/ Cost shared jointly by the General Fund (50%) and the Inland Waterways Trust Fund (50%).

6. ECONOMIC CONSIDERATIONS

The first cost of the project recommended for authorization in October 1991 dollars is $667.6M, of which $111.2M is private responsibility. The incremental average annual cost of the plan project recommended for authorization over the "without" plan is $9.0 million and the incremental benefit is $38.7 million. The incremental net benefit is $29.7 million with a benefit to cost ratio of 4.3. It is noted that the recommended plan also captures all of the "without" plan benefits since it provides for continued operation of the Lower Mon System.

7. PED AND CONSTRUCTION SCHEDULE

Preconstruction, Engineering and Design (PED) activities are currently scheduled to begin in FY 92 and extend through FY 96, with the first construction activity occurring in September 1996. This would consist of the construction of the floodway bulkhead for the small lock chamber at L&D 2. Design and construction would continue into FY 2004 with the completion of the work at L&D 4. The total cost of PED is estimated to be $14.3 million. A detailed description of the remaining project schedule is presented in the draft Project Management Plan (PMP).

8. ENVIRONMENTAL CONCERNS

a. Significant Impacts.

Plan 1 has significant and unavoidable adverse environmental impacts associated with the permanent removal of Locks and Dam 3. These include the loss of a tailwater and the extensive dredging to restore a nine-foot navigation channel in the lowered pool. The alternative "3 for 3" plans, including the "without" plan, avoid these impacts and for this reason are environmentally preferable to Plan 1.

The loss of a tailwater is the primary concern. Tailwaters are of high ecological value and are classified by the U.S. Fish and Wildlife Service (FWS) as "Resource Category 2" requiring in-kind replacement for mitigation. Under Plan 1, however, in-kind replacement is not practicable. The tailwater loss consequently represents a significant aquatic resource loss having values for which out-of-kind mitigation cannot compensate fully. The environmental features of Plan 1 compensate for tailwater functions such as reaeration and high quality fish habitat. Also, an incidental benefit to the fishery resulting from the pool changes is the net increase in shallow water habitat acreage. Combined with the proposed environmental features, the project would compensate, insofar as possible by out-of-kind means, for the tailwater loss.

b. **<u>Fish and Wildlife Coordination Act.</u>**

The U.S. Fish and Wildlife Service prepared a project report under Section 2(b) of the Fish and Wildlife Coordination Act. A copy of this report, dated July 1991, is included in <u>Fish and Wildlife Resources Appendix</u>, Volume 6 of the Final Feasibility Report. This Section 2(b) report contains nine recommendations to mitigate adverse impacts to fish and wildlife resources.

The environmental features of Plan 1 address all but two of the FWS recommendations. Plan 1 does not address their first recommendation (FWCA #1) to implement the environmentally preferred plan (the "without" plan), and the sixth recommendation (FWCA #6) to provide fisherman access facilities in the tailwater of a new dam. The remaining recommendations addressed by project environmental features include treatment of upland disposal sites (FWCA #2), clearing of pool raise areas (FWCA #3), instream disposal (FWCA #4), dredging restrictions (FWCA #5), dam operations (FWCA #7), aquatic habitat (FWCA #8), and dredged material testing for hazardous and toxic wastes (FWCA #9).

(1) Non-adopted recommendations.

(a) <u>FWCA #1</u>. Implement the environmentally preferred plan.

Plan 1 is recommended rather than the environmentally preferred plan (the "without" plan) because it is the National Economic Development (NED) plan and is favored by the navigation industry (the cost sharing partner). With the inclusion of all stipulated environmental features, Plan 1 would have negligible adverse impacts to fish and wildlife resources.

(b) <u>FWCA #6.</u> Provide fisherman access facilities.

With the loss of one tailwater (Dam 3), and no formal fisherman access at either Dam 2 or 4, there is an identified loss and general lack of shoreline tailwater fishing opportunity in the project area. Provision of recreational opportunities presumes the physical opportunity to construct features, and under current Corps policy requires cost-sharing with a non-Federal local sponsor. At Dam 2 there is no opportunity for fisherman access at the abutment due to the near-vertical river bank and lack of access across railroad yards adjacent to the bank. Provision of access at the existing Dam 4 abutment would require obtaining easements across non-Federal lands and possibly fee acquisition of additional shoreline acreage. It is unlikely that any potential local cost-sharing sponsor would be capable of meeting the requirements of the anticipated recreational development, and this was not actively pursued in the study's feasibility phase. However, following project authorization, any opportunities for recreational development which arise will be addressed.

(2) Adopted recommendations.

(a) FWCA #2. Wildlife improvements at disposal sites.

As a separable mitigation measure, the District will develop site specific plans for restoring wildlife habitat values at the disposal sites in coordination with the FWS, the Pennsylvania Game Commission, and the Pennsylvania Department of Environmental Resources (PaDER). These plans would include specifications for surface grading, dressing and seeding, and for use of on-site materials for habitat creation, e.g. brush piles and rock piles, and for streambed restoration.

(b) FWCA #3. Retention of vegetation in the Pool 2 inundation zone.

As a sound engineering practice, some woody vegetation to be flooded by the raised Pool 2 would be retained through a modified clearing plan. This feature would include retention of stumps over four inches diameter at breast height (dbh) and no removal of shrubs under four inches dbh to create additional shallow water habitat structure. The zone to be flooded is presently subject to periodic inundation and does not support much woody vegetation. Further evaluation of the shoreline in subsequent study phases may reveal no clearing is required.

(c) FWCA #4. Instream (shoreline) disposal of lock and dam demolition rubble.

Construction of fish reefs in the shallow water zone of the navigation pool are included to improve aquatic habitat values to compensate, in part, for the loss of the Dam 3 tailwater habitat values. The Fish and Wildlife Coordination Act 2(b) Report conceptually addresses these features in FWCA #4 and #3b. Material to construct these features (concrete rubble) would come from demolition of the replaced navigation structures. This feature is a separable mitigation measure.

(d) FWCA #5. Dredging restrictions for fishery protection.

Channel and approach dredging will be prohibited from mid-April through June 30th. This feature is included as a sound engineering practice to minimize adverse impacts to fish spawning activities. Based on subsequent conversations with the FWS and Pennsylvania Fish Commission, this feature extends the period recommended in FWCA #5 by two weeks to accommodate early spawners such as walleye and sauger.

(e) FWCA #7. Modify dam operations for water quality and fishery.

(*i*) A raised sill, low flow gate in Dam 2, and ducts to entrain air in Locks 4 discharge.

These design features are included as separable mitigation to maintain the river's existing dissolved oxygen levels during critical low flow periods downstream of L&D 4. Modification of the design of new Dam 2 and Locks 4 to incorporate these features would compensate for the loss of reaerative capacity of Dam 3 (to be removed from the middle of the proposed elongated pool), the loss of the fixed weir at Dam 4, and ensure that the discharge of Dam 2 would be reaerated to saturation levels during low flow periods. The District would develop an operational plan for these features to maximize their effectiveness, and would periodically evaluate this plan based on the results of the District's annual Monongahela River low flow water quality monitoring program.

(*ii*) Modified operating schedule for Dam 4.

To compensate, in part, for the loss of the Dam 3 tailwater recreational fishery, the District will investigate modifications to the Dam 4 operating schedule to direct flows along the abutment side to attract fish to shoreline areas. At Dam 2 there is no opportunity for fisherman access, and no need for altering the operating schedule to accommodate shoreline fishermen. This will be conducted as a sound engineering practice during normal review of the operational schedule after lock construction.

(f) FWCA #8a. Aquatic (tailwater) habitat.

In FWCA #8a, the creation of spawning shoals in tailwater areas is highly recommended. This feature is included in addition to the placement of fish reefs (FWCA #4 & 8b) in the river to offset the 45-acre tailwater fishery habitat loss. The tailwater of Dam 4 already has a significant proportion of shoals which, along with flow constrictions with new Locks 4, render tailwater improvements inadvisable. However, Dam 2 appears to have the potential for improvement which will be addressed by physical modeling studies in the PED Phase. Shoals would be constructed to the extent that materials provided by demolition debris from old Dam 2 would be suitable and available.

(g) FWCA #8b. Aquatic (shallow water) habitat.

See FWCA #4.

(h) FWCA #9. Hazardous and Toxic Waste (HTW) analysis of dredged material.

The District has tested, and will continue to test as needed, material to be disposed from dredging and excavation for contamination by EPA-designated hazardous and toxic wastes. This testing has been conducted in coordination with the PaDER.

c. **Hazardous and Toxic Wastes.**

The potential impact of Plan 1 on hazardous and toxic wastes (HTW) extends to minor ground water changes at three known shoreside industrial sites. Materials to be dredged and excavated at lock and dam construction sites are being tested, but are not expected to have significant levels of contamination requiring disposal in CERCLA approved sites. "Worst case" testing of sediments to be dredged from the navigation channel in Pool 3 revealed no indication of contamination. No known HTW sites are in the proposed Bunola and Coursin Hill disposal areas.

Three known HTW sites, situated along Pools 2 and 3, would be affected by ground water changes in response to the proposed pool changes. The ground water changes would be minor, resulting in potentially minor impacts to the monitoring wells, extraction wells and interceptor trenches currently operating at the three sites.

Historical information provides no reason to expect significant HTW contamination at the sites of Locks and Dams 2 and 4. However, contamination from one known HTW site at the Dam 3 abutment may extend into the river. Further HTW testing in the PED Phase will identify levels and extent of contamination, if any, at each of the existing structures. The results of this further testing will be evaluated in regard to the dredging of potentially contaminated sediments by private interests as a consequence of the lowering of Pool 3. Our present knowledge indicates sediment contamination in the river appears to be highly restricted and site specific rather than pervasive.

d. **Wetlands.**

The pool changes of Plan 1 covering 30.3 miles of river would have significant short term impacts on the submerged and riparian wetlands in this reach. Vegetational adjustments to new pool levels and hydrologic regimes would occur gradually in successional stages. Despite these adjustments, the long term projection is no net loss of the wetland resource. A monitoring plan will be implemented in coordination with the FWS, EPA, and PaDER to identify any changes after construction which would warrant mitigation.

Consideration was given under ER 1165-2-27 to the use of dredged material for wetland creation, but natural and man-made constraints precluded its recommendation. The project area's existing riverine wetlands are characteristically narrow linear bands at the shoreline. The watercourse is narrow and gently sinuous, and there are no islands or embayments to provide backwaters conducive to wetland development. The creation of islands or shoals with dredged material might be feasible were it not for the certainty of considerable adverse impact on commercial traffic. The river does not have sufficient width to safely accommodate both shoals or islands and a 300-foot navigation channel. In the past, the District has not approved instream disposal of dredged material largely for this reason.

Plan 1 would result in the net increase of 76.5 acres of shallow water habitat due to pool changes. This would increase the shallow water area available for wetland development while constraining navigation traffic to a narrower channel in Pool 3. In-stream disposal of dredged material to further increase the shallow water zone in Pool 3 would be of little additional benefit to wetland development. In Pool 2, opportunity for creation of shallows is limited by the intense industrial shoreline development. Also, unlike Pool 3, Pool 2 has no naturally occurring submerged wetlands and it is doubtful that a small increase in shallow water acreage would be conducive to their development. Consequently, in-stream disposal of dredged material for the purpose of wetland creation is not recommended.

e. **Justification of Separable Fish and Wildlife Mitigation Features**

(1) Reaeration features at Dam 2 and Locks 4.

Dissolved oxygen levels in the Lower Monongahela River are typically well above the state minimum criteria of 5.0 mg/l, although during summer low flow periods levels can approach this minimum below Dam 3. Low flow reaeration of the lower river is currently provided by passage over the fixed weir at Dam 4 and Dams 2 and 3. While none of these structures are highly efficient aerators because of design, they nevertheless occupy strategic locations where oxygen demands are high from industrial and municipal waste loading.

Implementation of the recommended project will remove all three existing reaerating structures and provide only one replacement dam at Dam 2. Reduction in existing low flow dissolved oxygen levels may therefore be expected below Dam 4, intensifying with distance downstream. No reaeration benefits can be attributed to the new Dam 2 if constructed with submerged sill gate bays according to current design criteria. Without mitigation, the project would consequently result in a significant reduction in dissolved oxygen levels within and below the project reach.

Opportunities to mitigate for potential dissolved oxygen impacts may generally be divided into two categories: design modifications to new structures, and artificial reaeration devices. Given operational and cost problems with artificial reaeration methods (e.g. injection of liquid oxygen), only design modifications will be pursued for mitigation.

The new Locks 4 and new Dam 2 will incorporate design options to maximize their reaeration potential. The incorporation of air ducts in Locks 4 to entrain air into lock discharges is a low cost, passive reaeration system. The cost of this mitigation feature is estimated to be $145,000. Operation and maintenance costs will be part of normal project operating costs.

New Dam 2 will be a gated structure with 5 110-foot gate bays. The sill crests of gate bays 2 through 5 will be submerged at elevation 696.7 NGVD. Gate 1 will be modified as a raised sill gate with a weir crest at elevation 714 NGVD +/- to provide a vertical drop to the Emsworth Pool (elevation 710 NGVD). This raised sill weir will be designed to maximize entrainment of air into the outflow and, based on District experience with similar structures, would produce dissolved oxygen saturation downstream of the dam. The cost of this mitigation feature is estimated at $270,000. Operation and maintenance costs would be part of normal project operating costs.

(2) Fish reefs.

Removal of Dam 3 would severely reduce the fishery habitat value of its 45-acre tailwater zone. The combination of high dissolved oxygen levels, coarse scoured substrate, and a physical barrier cannot be duplicated except by in-kind replacement. However, since in-kind replacement is not part of the recommended project, out-of-kind mitigation measures have been included to compensate for the loss of significant tailwater features. The FWS has recommended a minimum of one-for-one compensation on an acreage basis.

To compensate for the loss of scoured, coarse substrate, the FWS recommended placing stone riprap along the outside bends of rivers. This proved to be unsatisfactory for navigation safety reasons following consultation with the U.S. Coast Guard. However, the Coast Guard and commercial navigation interests have concurred with the placement of short spur dikes, i.e. "fish reefs," along the straighter reaches of the river. With proper markings, the proposed fish reefs should present no undue navigation hazard in their proposed locations.

Material to construct fish reefs is available from demolition of old Locks and Dam 3 in the form of unreinforced concrete rubble. Constraints on their placement include navigation safety, flow modifications, and shoreline ownership and usage. Hydrologic modeling studies will be conducted following project authorization to test their potential to affect navigation and flows, and to optimize their design.

The conceptual design of fish reefs is shown in PLATE 10 of Appendix I, Final Environmental Impact Statement (FEIS). No continuing maintenance over the life of the project is anticipated with this design. Five reaches in the project area totalling a linear distance of 4.7 miles have been identified to accept fish reefs (see FEIS, Appendix E, Clean Water Act Section 404(b)(1) Evaluation). These reaches would accommodate about 73 fish reefs placed on 400-foot centers. The locations and tentative spacing were developed through coordination with the navigation industry and the U.S. Coast Guard.

The intent of fish reefs is to compensate for the loss of 45 acres of scoured, coarse substrate in the Dam 3 tailwater. Individually, each fish reef has a small surface area, with about 20 required to provide one acre of substrate. However, the placement of fish reefs in series will modify and diversify the habitat around and between the structures through scour and eddy effects. The FWS has concurred with our judgement that the habitat value of the intervening shallow water zone will be improved by their construction, and may be credited toward offsetting the tailwater loss.

The projected 73 fish reefs over 4.7 miles of shoreline will improve about 28.5 acres of shallow water habitat. The estimated cost of their construction is $710,000. The use of demolition debris from old navigation structures would reduce the quantity of material to be disposed of in the upland disposal sites.

Compensation on a one-for-one basis for the loss of 45 acres of tailwater habitat as recommended by the FWS would require construction of about 120 fish reefs, or 47 in addition to the 73 proposed fish reefs. While there are adequate quantities of concrete rubble available from demolition of Locks and Dam 3 to construct more fish reefs, there are no additional sites in the project area suitable for their placement. Following project authorization, additional sites will be considered as opportunities arise. The 16.5 deficit to be compensated (45-28.5 acres) by habitat improvement will be addressed by a slight lengthening of the remaining tailwaters of Dams 2 and 4 due to increased head and by qualitative improvements to Dam 2 tailwater through instream disposal of demolition debris to create spawning shoals.

(3) Upland disposal site habitat restoration.

Clearing and filling the proposed disposal sites will impact about 125 acres. Much of this land is maturing, secondary growth woodlands on moderate to steep slopes and has moderate to good wildlife value. These sites will be acquired under temporary work easements rather than in fee. Under normal engineering practice they would be restored as gently sloped grades and seeded with grass, maintaining approximately the same acreage but reducing the overall wildlife habitat value.

To replace existing habitat values when the disposal sites are restored, the District will implement a restoration plan to be developed after project authorization with the concurrence of the FWS, Pennsylvania Game Commission and PaDER. This plan will provide for an acre-for-acre restoration of disposal site habitat through use of specially designed site grading, dressing and seeding, and on-site materials. The cost of this mitigation is estimated at $300,000. Once site restoration is completed, there will be no continuing Federal interest or operation and maintenance costs.

(4) Wetland restoration.

The recommended project will affect less than one acre of wetlands at one disposal site, and in the pool change zone will affect about 80 acres in Pool 2 and 165 acres in Pool 3. At the disposal site, less than one acre will be temporarily filled for haul road construction and mitigated by restoration when the road is removed following site completion. The need for mitigation of impacts to 245 acres of riverine wetlands due to pool changes is difficult to predict because of the natural tendency for recolonization over time at the new pool elevations. The effectiveness of natural processes will be monitored through a program coordinated with the FWS, EPA, and PaDER. The program will be designed to monitor changes to the shoreline wetland community, and permit a determination of the need and extent of mitigation required to compensate for any adverse long term impacts.

Should the monitoring program result in a determination that mitigation is necessary, a contingency mitigation plan will be implemented to provide in-kind replacement on a one-for-one acreage basis. The estimated cost of all wetland mitigation is $285,000.

9. CULTURAL RESOURCES CONCERNS

a. <u>Significant Impacts.</u>

Plan 1 would directly impact a number of structures with potential historic significance and has the potential for impacting unknown archeological sites. Although none of the known historic structures have been evaluated for National Register of Historic Places eligibility, L&Ds 2, 3 and 4, and the Conrail railroad bridge at r.m. 11.7 are potentially eligible. There are also about 14 residential structures to be relocated from the disposal sites which have not been evaluated for potential. The pool changes may impact the land wall remains of old Lock 3 (ca. 1840) and shoreline areas of Glassport and Elizabeth with archeological potential for early industrial resources. The potential for impacting prehistoric archeological sites is a concern at the disposal sites. Of these areas, only the flood plain terrace at the proposed Bunola disposal site has a high potential for containing sites, including deeply buried deposits. The pool shoreline and the valley areas of the disposal sites have a low archeological potential due to steep slopes and past disturbances.

b. **Compliance with the National Historic Preservation Act.**

To comply with Section 106 of the National Historic Preservation Act, the District is pursuing a Programmatic Agreement with the Pennsylvania Bureau for Historic Preservation and the Advisory Council on Historic Preservation to address responsibilities and actions to be taken following project authorization. These actions would include the identification and evaluation of cultural resources in the impact area, and mitigation, as appropriate. Anticipated mitigation requirements include documentation of historic structures and data recovery at archeological sites.

10. COORDINATION

a. **Public Involvement Program**

Public coordination for the study of the Lower Monongahela River Navigation System began in the 1960's, and earlier as part of the modernization studies for the overall Monongahela River Navigation System. Input received from public meetings, informal contacts, letters, reports, and public notices was reflected in the District's Reconnaissance Report on the Monongahela River Navigation System, dated January 1981. During the subsequent Feasibility Phase study for the Lower Monongahela River Navigation System, the District held the following meetings with waterway users groups, local governments and authorities, state agencies, and regional planning commissions to inform them of the study effort and alert them to the plan that appeared would be carried forward and recommended for authorization.

10 AUG 1988 - DINAMO and WATERWAYS ASSOCIATION of PITTSBURGH
13 JAN 1989 - CONSOLIDATION COAL COMPANY
10 MAY 1989 - DINAMO and WATERWAYS ASSOCIATION of PITTSBURGH
11 JUL 1989 - DINAMO and WATERWAY USERS
28 AUG 1989 - DINAMO - WATERWAYS ASSOCIATION of PITTSBURGH
19 OCT 1989 - DINAMO and WATERWAY USER INDUSTRY
2 MAR 1990 - HEAVY CONSTRUCTION CRAFTS
26 JUN 1990 - DINAMO
10 JUL 1990 - DINAMO and MONONGAHELA RIVER SHORESIDE FACILITIES OWNERS
18 JUL 1990 - DINAMO and MUNICIPALITIES
27 JUL 1990 - BOROUGH OF WEST ELIZABETH
2 AUG 1990 - CONRAIL
21 AUG 1990 - WATERWAY USER INDUSTRY
1 OCT 1990 - BOROUGH OF WEST ELIZABETH
19 OCT 1990 - CITY OF PITTSBURGH
29 OCT 1990 - PUBLIC INVOLVEMENT MEETING WITH MUNICIPALITIES
27 NOV 1990 - PENNSYLVANIA DEPT. OF COMMUNITY AFFAIRS

3 DEC 1990 - SOUTHWESTERN PENNSYLVANIA REGIONAL PLANNING COMMISSION
6 DEC 1990 - TURTLE CREEK COUNCIL OF GOVERNMENTS
11 DEC 1990 - BOROUGH OF ELIZABETH
7 JAN 1991 - BOROUGH OF GLASSPORT
12 MAR 1991 - DUQUESNE LIGHT COMPANY
16 APR 1991 - PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
4 JUN 1991 - CITY OF DUQUESNE
20 NOV 1991 - FORWARD TOWNSHIP PLANNING COMMISSION

The meeting on July 10, 1990 with facility owners within Pools 2 and 3 was attended by 34 individuals representating 24 companies, which represents about 90% of the major facility owners. The meeting was held to inform the shoreside facility owners of the best 3 for 3 replacement plan (Plan #4) and the best 2 for 3 replacement plan (Plan #1) and the impacts of each plan on their facility within the pools. At the conclusion of this meeting 27 people (6 abstained) endorsed the 2 for 3 replacement plan and each facility owner was requested to furnish the cost to adjust their facility to the new pool. In addition, the District attempted to contact all facility owners by letter and/or by phone requesting their assistance in furnishing facility cost adjustments to the new pool. The majority of the owners responded and furnished an estimated cost of adjustment for their facility. The District reviewed these estimates and where appropriate adjusted the submitted data. These owners (3 were involved) were then advised of why the adjustment was made and the final cost. Local industries, marinas, and marine operators were also contacted. This coordination provided public input on the alternative plans for modernization, and on the economic costs to affected parties.

The scope of environmental issues and studies was defined through previous District work, e.g., the <u>Monongahela River, Final Environmental Statement on the Operation and Maintenance of the Navigation System,</u> October 1975, and through coordination meetings with the U.S. Fish and Wildlife Service and the Pennsylvania Fish Commission. A Notice of Intent to prepare an environmental impact statement was filed with the U.S. Environmental Protection Agency in June 1988. Ongoing coordination through the study period with state and federal agencies, local communities, and industry provided additional feedback on studies addressing previously identified issues. These issues included impacts to commercial and recreational waterway users, shoreside facilities, relocations, water quality including ground water, fish and wildlife, wetlands, flood plains, upland disposal sites, HTW sites, and cultural resources. No specific response to the Notice of Intent was received.

b. **Required Coordination**

Required coordination with the U.S. Fish and Wildlife Service under the Fish and Wildlife Coordination Act and the Endangered Species Act produced a series of Planning Aid Reports and the Fish and Wildlife Coordination Act Section 2b Report which has been reviewed by the Pennsylvania Fish Commission and Pennsylvania Game Commission. The Pennsylvania Department of Environmental Resources' Bureau of Water Quality Management, was involved in the selection of testing sites for the navigation channel dredged material analysis and in review of the study results. Under Section 106 of the National Historic Preservation Act, the Pennsylvania Bureau for Historic Preservation provided input on the presence of known historic sites and on the need for studies to locate sites. Coordination with the Bureau for Historic Preservation and the Advisory Council on Historic Preservation will continue through the Section 106 process as studies and evaluations are completed.

SECTION 8. CONCLUSIONS

The major concerns in the Lower Monongahela River Navigation System is the poor structural condition of the aged structures and the undersized locks. The structural condition is such that immediate action is necessary to insure continuation of navigation service through this reach of the Monongahela River. If unattended, failure of major structural components could result, causing costly unscheduled lock chamber closures or loss of pool and cessation of waterborne transportation. The small existing projects with main lock chambers of 56' x 720' and auxiliary lock chambers of 56' x 360' at Locks and Dams 3 and 4 are expected to cause significant delays in the future as traffic levels approaches their capacities.

There were three study objectives: to develop a plan that ensures the safe and reliable operation of the Lower Monongahela River Navigation system into the future; to develop a plan to minimize inefficiencies to towing operations in the study area, and, in so doing; to maintain or improve, where possible, the river's present water quality, fishery and recreation values.

The initial action in the planning process requires definition of the "without" plan. This alternative represents the least costly actions to accomplish to the maximum extent possible the study objectives in the absence of Federal authorizations. The "without" plan also incorporates assumptions regarding other projects on the inland navigation system in the absence of such authorizations, including applicable operation and maintenance and rehabilitation policies. This scenario served as the baseline against which the benefits, costs and social-environmental impacts of all alternatives were measured. Table 8-1 lists the work efforts at the three existing Lower Monongahela River facilities identified as necessary in the "without" plan.

Table 8-1
Timing and Action for
"Without" Plan

Project	Action	Timing
L&D 2		
locks	rehab	2022
dam	replace	2002
L&D 3		
locks	replace	2002
dam	replace	2002
L&D 4		
locks	rehab/replace	2002/2027
dam	minor repairs	2002

The work efforts in the "without" plan would ensure safe and reliable navigation, but would do little to correct navigation inefficiencies. Several alternative plans were, therefore, formulated to solve this remaining problem area. Plan formulation, evaluation and assessment of these alternative plans clearly identified the two most cost effective plans that would improve the transportation conditions in the Lower Monongahela River Navigation system, over and above the "without" plan. They included one "2 for 3" plan where one facility would be eliminated (Plan 1) and one "3 for 3" plan that would maintain three facilities (Plan 4 Deferred). Public, environmental and industry interests to date, are generally supportive of these 2 final alternative plans, which are summarized as follows:

Plan No. 1: L&D 2 (R.M. 11.2) - Construct a new auxiliary chamber floodway bulkhead by 1997 and gated dam by the year 2002 and rehabilitate the 110' x 720' and 56' x 360' locks by the year 2022. Raise Pool 2 by 5 feet. L&D 3 (R.M. 23.8) - Remove locks and dam by 2002 and lower Pool 3 by 3.2 feet. L&D 4 (R.M. 41.5) - Construct twin 84' x 720' locks by 2002.

Plan No. 4 Deferred: L&D 2 - Construct a new auxiliary chamber floodway bulkhead and fixed crest dam by 2002 and rehabilitate the locks in the year 2022. L&D 3 - Construct twin 84' x 720' locks and a new fixed crest dam by 2002. L&D 4 - rehabilitate the locks in the year 2002 and replace with twin 84'x720' locks in the year 2027.

Plan 1, the 2 for 3 plan, is the plan that is best able to solve the structural and navigation problems of the Lower Monongahela River. It solves the structural problems in the most economical manner by constructing one new dam (at L&D 2) and two locks (at L&D 4) whereas the other plan requires the construction of two dams (at L&D 2 and L&D 3) and four locks (2 each at 3 and 4). It solves the navigation problems by eliminating one project and therefore one lockage cycle altogether and by providing larger locks at the other project. It provides the highest net benefits (NED plan) of all of the alternatives and at a cost in terms of present worth that is only 30 percent or about $200 million higher than the cost of the "without" plan.

Plan 1 is the most acceptable to industry of all the plans despite the relatively large number and costs of shoreside adjustments that result from the change in pool levels. The cost for the majority of these adjustments would be borne by the owners. The shippers alone would have to invest approximately $45.0 million to adjust their docks and other shoreside facilities, as well as provide one-half of the total project cost through fuel taxes paid to the Inland Waterway Trust Fund. Nonetheless, they are very supportive of the plan and prefer it over all of the alternatives. While others are less supportive, particularly if they have to adjust their recreational docks or other items, no one has opposed the plan. Typically the greatest opposition to navigation plans comes from those who may be relocated as a result of the plan. However, the number of residential relocations that may be required under Plan 1 are no different from the number required in the "without" plan and the other alternatives. The number is about 15 and all are a result of the need for disposal sites for material from dredging and/or the removal of the old projects. Upon notification of the need for relocation, the owners of the affected residences may oppose the plan. However, the level of opposition would be the same for any of the alternatives.

Plan 1 also contains provisions to adjust, at project expense, 30 affected non-Federal government owned facilities subject to Section 10 Permit regulations. Under provision of Section 10 of the River and Harbor Act of 1899, such owners are generally not entitled to compensation at project expense for facility adjustments required as a result of federal projects. However, on a number of occasions in the past, the Chief of Engineers has exercised his authority under Section 111 of Public Law 85-500 (as amended in Public Law 89-298) to compensate non-Federal government facility owners adversely affected by navigation projects such as the selected plan for the Lower Monongahela River. Furthermore, it is considered appropriate in this instance to obtain project-specific authority for the adjustment of these government owned facilities as a project cost. If any of these facilities as described herein are found, under more detailed evaluation, to not qualify for federally funded adjustment (e.g., are privately owned, are outside of the limits of navigation servitude jurisdiction, are not adversely affected, or fail to meet Federal and state water quality and other environmental standards), then adjustment under the project specific authority would not be undertaken. It will be incumbent upon the facility owner to demonstrate compliance with environmental regulations prior to the execution of a contract for adjustment of the facility.

At October 1991 price levels, the plan recommended for authorization is estimated to cost $667,595,000, of which $111,217,000 is the cost required to adjust private shoreside facilities. This cost does not include $67,080,000 for rehabilitation work considered necessary for existing Locks 2. This work, while included in the overall project economics, will be accomplished under existing authorities. The cost requiring new Federal authorization is $556,378,000, which would be funded 50% from the General Fund and 50% from the Inland Waterways Trust Fund, each amounting to $278,189,000.

Total average annual costs are estimated at $77,300,000, and average annual benefits are estimated at $304,500,000, for a benefit to cost ratio of 3.9 to 1.

Preconstruction Engineering and Design studies, which include the detailed design efforts necessary to ready the project for construction, including preparation of plans and specifications for award of the first construction contract, can be initiated in Fiscal Year (FY) 1992, and would extend through FY 1996. Construction could be initiated in FY 1996 and be completed in FY 2004. These schedules, however, are subject to the project's authorization and subsequent appropriations.

SECTION 9 - RECOMMENDATIONS

Having carefully considered the environmental, social, economic, engineering and public safety aspects associated with maintaining and modernizing commercial navigation facilities on the Lower Monongahela River, I recommend that Plan 1, which provides a new gated dam at Locks and Dam 2, to be renamed Braddock Locks and Dam, with a new emergency closure on the auxiliary lock, and the associated five-foot raise of Pool 2 from its nominal elevation of 718.7, the removal of existing Locks and Dam 3 and the associated 3.2-foot lowering of Pool 3 from its nominal elevation of 726.9, and new locks, with chamber dimensions of 84' x 720' at Locks and Dam 4, to be renamed Charleroi Locks and Dam, be authorized for implementation as a Federal project, with such modifications as, at the discretion of the Chief of Engineers, may be advisable. I further recommend that the 30 facilities described in Attachment I of this report and permitted to occupy lands within the limits of navigation servitude under Section 10 of the River and Harbor Act of 1899, as amended, and that are found to be in government ownership and are adversely affected by pool changes brought about by implementation of this project, should be adjusted as a project cost. The adjustments will be limited to in-kind relocations or alterations and will not include betterments. Construction of the altered or new facility or utility will meet current engineering design standards that are required by law or regulation. However, facilities or utilities will not be altered or constructed at project cost to serve the owner in other than the same manner nor to a higher degree of serviceability than the existing facility or utility. If any of the facilities described herein are found under more detailed evaluation to not qualify for project funded adjustment (e.g., are privately owned, are not adversely affected, or fail to meet Federal and state water quality and other environmental standards) then adjustment under the project specific authority would not be undertaken. Furthermore, it will be incumbent upon the facility owner to demonstrate compliance with environmental regulations prior to the execution of a contract for adjustment of the facility at Federal expense.

The total estimated project first cost, based on October 1991 price levels and conditions,is $556,378,000. Annual operation and maintenance costs for this plan are estimated to be $2,300,000.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the sponsor, the States, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Harold F. Alvord
Colonel, Corps of Engineers
District Engineer

CEORD-PE-PN 1st End
SUBJECT: Lower Mononongahela River Navigation System Feasibility Study

DA, Ohio River Division, Corps of Engineers, P.O. Box 1159, Cincinnati, OH 45201-1159

FOR CDRUSACE (CEWRSC-WLR), Kingman Building, #2593, Ft. Belvoir, VA 22060-5580

I concur in the recommendations of the District Commander.

ALBERT J. GENETTI, JR.
Brigadier General, USA
Commanding

ATTACHMENT I

ADJUSTMENT OF PUBLIC FACILITIES AS A PROJECT COST

August 14, ~~1991~~
CEORP-~~PD-F~~

LOWER MONONGAHELA RIVER NAVIGATION SYSTEM STUDY ADJUSTMENT OF PUBLIC FACILITIES AS A PROJECT COST

I. INTRODUCTION

Planning for modernization of the Lower Monongahela River is nearly complete. At a Feasibility Review Conference in Pittsburgh on 26 and 27 February 1991, the Corps and navigation industry partners reached consensus on a tentatively selected plan. This plan would result in a 5-foot (nominal) raising of existing pool 2 (R.M. 11.2-R.M. 23.8) and 3.2-foot (nominal) lowering of existing pool 3 (R.M. 23.8-R.M. 41.5). These are the changes in permanent pool levels but do not affect the limits of navigation servitude. These changes in pool elevations will adversely affect a number of facilities, both public and private, located within the existing navigation servitude defined by the upper limits of ordinary high water of the Monongahela River and a tributary, the Youghiogheny River. These facilities are permitted to occupy lands within the navigation servitude under Section 10 of the River and Harbor Act of 1899. Under provision of their permits, owners are generally not entitled to compensation at project expense for adjustments to their facilities that are required as a result of federal projects.

However, in 1958 and as modified in 1965, Congress granted the Chief of Engineers discretionary authority to make compensation at project expense for such adjustments, not withstanding the navigation servitude vested in the federal government, where the facility is <u>owned by an agency of government and used in a governmental function</u>. This authority is granted by Section 111 of 72 Stat. 303, as amended by Section 309, 79 Stat. 1094 (33 U.S.C. 633). (See Appendix A for a copy of the legislation.) On a number of occasions in the past, the Chief of Engineers has exercised his authority under Section 111 to compensate government facility owners adversely affected by navigation projects such as the tentatively selected plan for the Lower Monongahela River.

The February 1991 Feasibility Review Conference for the project established consensus that project-specific authority was desirable to ensure the acceptability of the plan to local governments in the Monongahela Valley and to obtain a clear expression of Congressional intent with respect to necessary public facility adjustments. Therefore, the tentatively selected plan for modernization of the Lower Monongahela River includes project specific authority for adjustment of government owned facilities that are within the navigation servitude and will be adversely affected by the proposed changes in pool elevation.

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Satisfying the requirements of Paragraph 3.i. of the CECW Project Guidance Memorandum dated May 10, 1991 for the Lower Monongahela Navigation Study, this report addresses adjustment of government owned facilities at project expense. Based on correspondence with owners, field reconnaissance, and preliminary engineering and real estate investigations, the District has identified 30 adversely affected public facilities that will be considered for adjustment at project expense (50% General Funds and 50% Inland Waterway Trust Funds). It has been determined that the adjustment work described herein can be accomplished within existing rights-of-way and no additional land acquisition efforts would be necessary. For each facility, this report documents the effects due to the pool changes, the rationale for adjustment, the proposed adjustment and the corresponding cost. Consistent with these investigations, only adversely affected, government owned facilities qualifying under Section 111 criteria have been identified as candidates for adjustment at project expense. It must be understood that if more detailed evaluation during PED discloses that a facility would not qualify for consideration under Section 111 criteria (e.g. privately owned, outside the navigation servitude, not adversely affected, failing to meet environmental standards), then adjustment under project-specific authority will not be undertaken. Of course, owners of private facilities within the navigation servitude under Section 10 authority will continue to be responsible for adjustments to their facilities.

II. GENERAL INFORMATION

1. Contents of Report

In conformance with paragraph 3.i of the aforementioned PGM, this investigation only addresses those facilities that are adversely affected by the proposed pool changes as defined by the eligibility criteria used in this analysis and described in Paragraph 2. The cost estimating criteria used in this analysis are described in Paragraph 3. Paragraph 4 describes the eligible facilities, including impacts, adjustments and the associated costs.

2. Criteria for Eligibility

All facilities described in this report have been determined to be publicly owned, are situated all or in part below ordinary high water (i.e. within navigation servitude), and were determined to be adversely impacted by the pool changes associated with the project.

The criteria utilized at this stage of investigation (Feasibility) to serve as a basis for establishing adverse impacts were chosen to represent conditions denoting probably adverse conditions that will be verified during subsequent, more detailed investigations (PED).

There are six general classes of applicable municipal facilities - major storm sewers, sanitary sewers, submarine crossings, water wells, parks (including an "aquatorium"), and launching ramps. Below is a discussion of the criteria used to determine the degree of project effect on each class of facility in this analysis.

(1) Storm and Sanitary Sewers

The criteria for adjusting storm and sanitary sewers are the same. At this stage of study, a storm or sanitary sewer (including the pipe and/or outfall) was considered adversely affected and requiring adjustment if any of the following three conditions would exist at the new design pool level:

(i) Submergence of the outfall is at a depth greater than 1/3 of its diameter or height. In the absence of more detailed information on inlet conditions and the slope of the pipes, this degree of submergence increases the likelihood of sediment build-up and would probably lead to unacceptable capacity reductions. Further investigations during PED would confirm this.

(ii) A flap gated outfall is submerged to any degree. Any degree of flap gate submergence would prevent its proper operation.

(iii) Maintenance access to an outlet, such as to a sewage plant line discharging effluent, is prevented.

Assumptions concerning replacement pipes were based on a review of hydraulic design calculations for other recent projects that involved a pool raise. Inverts of all new pipes would be placed above the new pool to prevent blockage. Pipes to be adjusted that are under eight feet in diameter were assumed to require an increase in flowage area of 50 percent to compensate for the reduced head. Existing pipes with diameters equal to or greater than eight feet were replaced by pipes of similar flow areas. Photographs of a typical storm and sanitary sewer are shown in Figures 1 and 2, respectively.

(2) Submarine Crossings

Publicly owned crossings in old pool 3 will be adjusted as necessary to maintain navigation clearance and at least three feet of cover.

(3) Launching Ramps

Each launching ramp will be extended to provide equal accessibility with the new pool levels. All ramps identified in this report are in pool 3 and are usable at very low river flows when the pool is near the design pool elevation of 726.9. To provide equal availability, these ramps will be extended so that they are usable at the new design pool elevation of 723.7. A photograph of a boat launch ramp identified for potential adjustment is shown in Figure 3.

(4) Parks

A number of community riverside parks presently exist along the project reach of the river. In the area of pool raise, the effect on them varies from an increase in periodic flooding to frequent inundation. Adjustments will be made to these recreation areas such that they will be available for the same purposes and for approximately the same duration as with the existing pool levels. Only one riverside park has been identified as requiring this type of adjustment. This is the Elizabeth Boro Park located on the right bank of the Monongahela River at River Mile 22.9 (see Figure 4). The lower level (deck) of the park has a freeboard above the present normal river level of about 3.6 feet. The present inundation frequency is estimated to be at least 10 percent of the time.

Implementation of the recommended plan would decrease the freeboard to approximately 0.3 feet. With such a small freeboard, the park would be subject to significantly increased flooding events (more than double the frequency) and continual submergence by wave action and the inaccuracies of maintaining pool at a constant level because of hydroelectic power releases at the Lake Lynn facility located on the Cheat River, approximately 82 river miles upstream. This change would significantly reduce the availability of the Elizabeth Boro Riverside Park for use.

One park has been identified as requiring adjustment in the pool lowered area. This is the Monongahela Aquatorium located on the left bank at river mile 31.9. The successful operation of this facility requires access by boats used by the many water related shows presented there. The lowering of the existing pool level by five feet will prevent such access and render the facility unusable and therefore adjustment to ensure continued boating access is necessary.

(5) Water Wells

Any well with top of well casing at or below the new permanent pool elevation of 723.7 will require raising to prevent contamination by river water. A photograph of a waterwell identified for potential adjustment is shown in Figure 5.

3. Current and Continuing Need For Facility

Each of the facilities discussed herein has been determined to be government owned and performing a function necessary to the well being of the communities involved. The storm and sanitary sewer facilities are owned and operated by a municipality and are presently and will continue to be necessary to provide adequate drainage control and proper functioning of the waste management systems. The submarine crossings, one sanitary sewer and two waterlines, are municipally owned and are presently and will continue to be necessary for the health and well being of the communities they serve. The boat launching ramps are municipally owned and operated an provide, free of charge, the only community access to the river. Several recent studies relating to presently available boating access to this portion of the Monongahela River have indicated not only the continuing need for the presently available access (both free and for fee) but also has recommended that additional access facilities be provided. It is therefore believed that the continued availability of these municipality owned facilities at the new lower pool levels is essential. The affected riverside parks are owned and operated by a municipality and are provided free of charge to the general public. They are the only source of this type of access to the river and their continued availability is considered to be essential. The waterwells are municipality owned and provide the only source of water supply.

4. Alternative Actions Considered

During the investigation of the adjustment of these government owned facilities, consideration was given to alternative means of their accomplishment. The District believes that the proposed adjustments listed in Table 1 entitled "PUBLIC FACILITY ADJUSTMENTS (WITHIN NAVIGATION SERVITUDE) INCLUDED IN PROJECT COST" are the most cost effective way of dealing with the problems. They are the result of a feasibility level of investigation and will be verified during the more detailed PED studies.

5. Rationale for Project Assumption of Costs.

All of the facilities described herein and proposed for adjustment as a project cost are government owned, operated and maintained. All currently provide for a necessary function and are expected to continue to do so throughout the analysis period of this Lower Monongahela Navigation Project. The local governments that own, operate and maintain these facilities are situated in a region that has experienced significant economic change in recent years. The consolidation of heavy industry throughout the Monongahela River Valley has severely reduced the tax base and associated financial capacities of most of these communities. As a result, their ability to pay for the substantial infrastructure adjustments described herein is severely limited. Project specific authority as opposed to post-authorization use of Section 111 would allow Congress to consider this situation and to provide a clear expression of their intent to these communities. It would also permit reflecting these items in the authorized cost ceiling for the project. It must be emphasized that neither the proposed project specific authority nor its exercise would exceed that which can be granted under Section 111. Implementation of facility adjustments under project specific authority would use criteria identical to those under Section 111 authority.

6. Conformance With Federal and State Water Quality and Other Environmental Regulations.

Section 111 is silent as to the necessity for the facilities to be relocated to be in accordance with appropriate environmental laws. The question of whether the particular facility to be relocated is in compliance is really a local matter. This report indicates the estimated amount that the Government would provide to relocate, alter or adjust the facility to a suitable standard assuming that such a relocation, alteration or adjustment may be permitted by state or local authorities. It will be incumbent upon the facility owner to demonstrate compliance with environmental regulations prior to the execution of a contract for adjustment of the facility.

7. Basis for Cost Estimates

The District made an extensive effort to obtain facility adjustment costs for all known public facilities from the owner. All cost estimates submitted by the owner were reviewed by the District. When no cost estimate was provided, field investigations were made from which the need for adjustment was ascertained and quantities and costs estimated in-house with an appropriate allowance for contingencies. Engineering and Design and Construction Management costs are also included.

8. Facilities Proposed for Adjustment with Project Funding

Table 1 lists each facility tentatively identified as adversely affected by the proposed pool changes, the location, description of adjustment, impacts due to pool changes, proposed adjustment and the associated cost of adjustment. Facilities are arranged by river mile with those facilities on the Monongahela River listed first and followed by those on the Youghiogheny River. The total cost of the adjustments listed in this Table is $24.3 million, and represents about three percent of the total project costs.

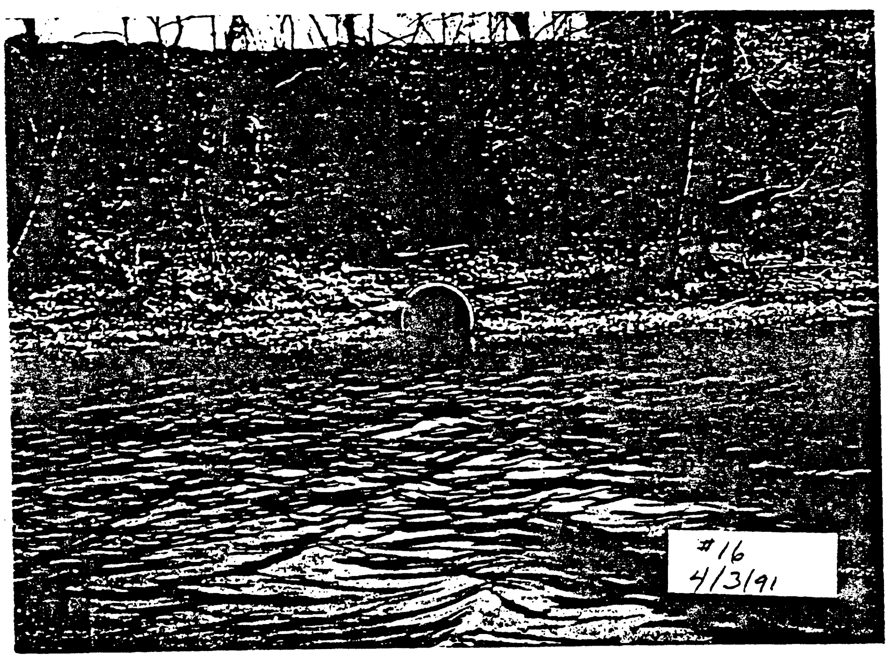
Ord.
High Water
Elev.: **730.8**

Invert
Elev.: **718.9**

Pool Elev. in
Photo: **721.4**

Proposed Pool
Elev.: **723.7**

Figure 1. Storm Sewer Outfall, Glassport, PA
36 Inch Diameter Cast Iron Pipe
Monongahela R.M. 15.7



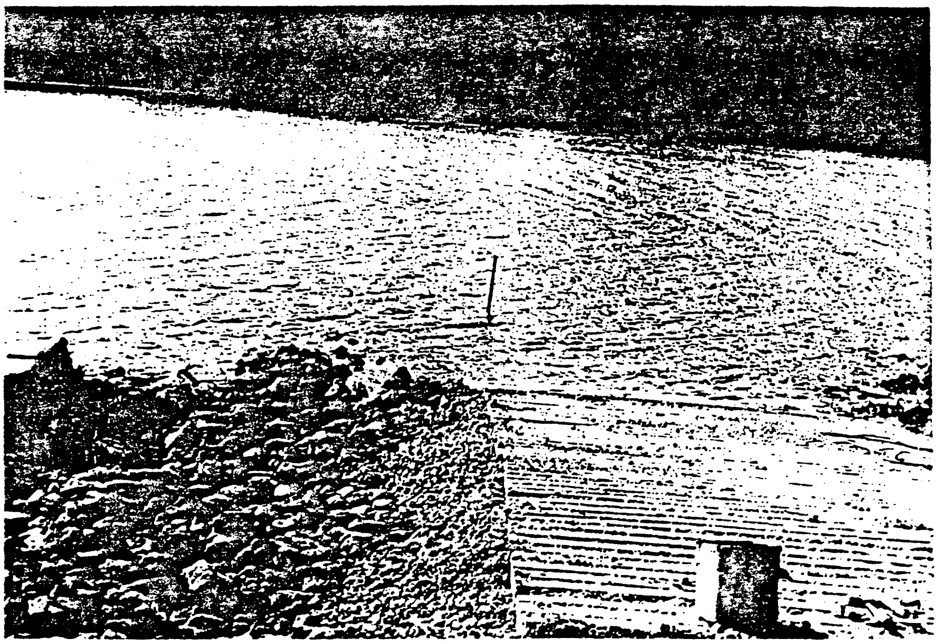
Ord.
High Water
Elev.: 731.5

Invert
Elev.: 720.3

Pool Elev. in
Photo: 721.5

Proposed Pool
Elev.: 723.7

Figure 2. Sanitary Sewer Outfall, McKeesport, PA
54 Inch Reinforced Concrete Pipe
Monongahela R.M. 17.8



Ord.
High Water
Elev.: 739.5

Bottom of Ramp
Elev.: 724.0

Pool Elev. in
Photo: 729.0

Proposed Pool
Elev.: 723.7

Figure 3. Boat Launch Ramp, Forward Twp., PA
Monongahela R.M. 34.1

Ord. High Water Elev.: 733.0	Deck Elev.: 724.0	Pool Elev. In Photos: 720.4	Proposed Pool Elev.: 723.7

Figure 4. Two Views Of Riverside Park, Elizabeth, PA
Monongahela R. M. 22.9

Ord. High Water Elev.: **729.5**

Top of Manhole Elev.: **726.8**

Top of Wellhead Elev.: **721.8**

Pool Elev. in Photo: **720.2**

Proposed Pool Elev.: **723.7**

Figure 5. Water Well, Duquesne, PA
Monongahela R.M. 12.5

TABLE 1

PUBLIC FACILITY ADJUSTMENTS (WITHIN NAVIGATION SERVITUDE) INCLUDED IN PROJECT COST

Table 1 - Sheet 1/6

Owner	Description of Facility (ies)[1]	Location (R.M.-Bank)[2]	Function	Impact on Facility by Proposed Project	Description of Adjustment	Cost (Incl. E&D and Const. Mgt.
City of Duquesne	Sanitary Sewer	11.5 (L)	Wastewater discharge from plant.	Outfall would be totally inundated.	Raise outfall and replace approx. 1700' of sanitary sewer pipe. Assume 1% grade.	$400,000
City of Duquesne	48" Brick Storm Sewer	12.4 (L)	Passes surface drainage from city to river.	Outfall would be totally inundated.	Raise 48" pipe. Assume 1% grade, 25 ft. deep.	$200,000
City of Duquesne	8 Water Wells	12.5-12.9 (L)	Water Supply	Pool increase will inundate wellheads. River water will percolate into well water.	Raise 8 wells approx. 3 feet ea. Relay and bury 4600' of electric lines in conduit.	$175,000
City of McKeesport	36" CIP Storm Sewer	15.6 (R)	Passes surface drainage from city to river.	Totally inundate outfall.	Plug existing pipe and place a 45" RCP at a higher elevation. Approximate length of new pipe is 300 ft.	$300,000
City of McKeesport	36" CIP Storm Sewer	15.7 (R)	Passes surface drainage from City to river.	Totally inundate outfall.	Plug existing pipe and place a 3'x3' RCP box culvert at a higher elevation. Approximate length of new pipe is 130'.	$120,000

[1]CIP denotes Cast Iron Pipe
RCP denotes Reinforced Concrete Pipe

[2]All River Miles are for the Monongahela River unless indicated for the Youghiogheny River.

Table 1 - Sheet 2/6

Owner	Description of Facility (ies)[1]	Location (R.M.-Bank)[2]	Function	Impact on Facility by Proposed Project	Description of Adjustment	Cost (Incl. E&D and Const. Mgt.)
Dravosburg Boro	3.5′ x 4.8′ Brick Storm Sewer	16.4 (L)	Passes surface drainage from city to river.	Totally inundate outfall.	Plug existing pipe and place a 72" and connecting RCP pipes at a higher elevation. Approx. lengths of 72" and new connecting pipes are 525′ and 640′, respectively.	$2,730,000
West Mifflin Boro	15" CIP Storm Sewer	17.0 (L)	Passes surface drainage from city to river.	Totally inundate outfall.	Plug existing pipe and replace with a 20" RCP at a higher elevation. Approx. length of new pipe is 4200′.	$2,165,000
Glassport Boro	48" RCP Storm Sewer	17.3 (R)	Passes surface drainage from city to river.	Inundate outfall over 2/3 of its diameter.	Plug existing pipe and replace with a 60" RCP at a higher elevation. Approx. length of new pipe is 520′.	$1,250,000
Glassport Boro	48" RCP Storm Sewer	17.8 (R)	Passes surface drainage from city to river.	Inundate outfall over 2/3 of pipe diameter.	Plug existing pipe and replace with 60" RCP at a higher elevation. Approx. length of new pipe is 260′.	$290,000
PA Dept. of Transportation	66" Brick Storm Sewer	18.9 (R)	Passes surface drainage from City to river.	Totally inundate outfall.	Plug existing pipe and replace with 84" RCP Approx. length of new pipe is 540′.	$1,530,000

Table 1 - Sheet 3/6

Owner	Description of Facility (ies)[1]	Location (R.M.-Bank)[2]	Function	Impact on Facility by Proposed Project	Description of Adjustment	Cost (Incl. E&D and Const. Mgt.)
Elizabeth Boro	Interceptor Pipe (1500'-14"CIP, 1300' - 16" CIP)	22.5-23.0 (R)	Wastewater discharge.	Interceptor inundated which allows river water to infiltrate into system.	Replace entire line at higher elevation.	$1,675,000
West Elizabeth Boro	Sanitary Sewer	22.8 (L)	Discharges effluent from W. Eliz. Sewage treatment plant.	Totally inundate outfall.	Plug existing pipe and replace with 36" RCP at a higher elevation. Approx. length of new pipe is 100'.	$140,000
Elizabeth Boro	Riverside Park	22.9 (R)	Recreation area for local residents.	Significant increase in frequency of inundation, park becomes unusable.	Add 2 feet of concrete to park area (approx. 5000 sf) and add additional row of seating to replace row lost due to adjustment.	$440,000
West Elizabeth Boro	15" CIP Storm Sewer	23.0 (L)	Passes surface drainage from city to river.	Totally inundate outfall.	Plug existing pipe and replace with 20" RCP at higher elevation. Approx. length of new pipe is 225'.	$290,000
Elizabeth Boro	30" CIP Storm Sewer	23.2 (R)	Passes surface drainage from City to river.	Totally inundate outfall.	Plug existing pipe and replace with a 39" main and 30" connecting pipe. Approx. lengths are 175' and 400', respectively.	$420,000

Table 1 - Sheet 4/6

Owner	Description of Facility (ies)[1]	Location (R.M.-Bank)[2]	Function	Impact on Facility by Proposed Project	Description of Adjustment	Cost (Incl. E&D and Const. Mgt.)
West Elizabeth Boro	Sanitary Sewers	22.8-23.3 (L)	Wastewater discharge.	Introduce river water into combination sewer system.	Separate sewers, construct 15000' of sanitary sewers, install PVC liner in 2200' interceptor sewer and construct 7000' of storm sewers	$2,500,000
New Eagle Boro	Boat Launch Ramp	30.1 (L)	Provide access to river for boaters.	Ramp is unusable at lower permanent pool.	Lengthen and repave boat launch to maintain current function.	$40,000
City of Monongahela	Aquatorium	31.9 (L)	Recreation area for local residents.	Pool lowering prevents access by boat to the auditorium area.	Add lower deck area for boat access which will require additional piling, paving, dredging and railing.	$220,000
City of Monongahela	Boat Launch Ramp	32.0 (L)	Provide access to river for boaters.	Ramp is unusable at lower permanent pool.	Lengthen and repave boat launch to maintain current use, adjust floating docks and adjust signage.	$40,000
PA Fish Commission	Boat Launch Ramp	33.2 (L)	Provide access to river for boaters.	Ramp is unusable at lower permanent pool.	Lengthen and repave boat launch to maintain current use.	$40,000

Table 1 - Sheet 5/6

Owner	Description of Facility (ies)[1]	Location (R.M.-Bank)[2]	Function	Impact on Facility by Proposed Project	Description of Adjustment	Cost (Incl. E&D and Const. Mgt.)
Forward Twp.	Boat Launch Ramp	34.1 (R)	Provide access to river for boaters.	Ramp is unusable at lower permanent pool.	Lengthen and repave boat launch to maintain current use.	$40,000
Webster	Boat Launch Ramp	36.2 (R)	Provide access to river for boaters.	Ramp is unusable at lower permanent pool.	Lengthen and repave boat launch to maintain current use.	$2,000
Webster	Boat Launch Ramp	36.4 (R)	Provide access to river for boaters.	Ramp is unusable at lower permanent pool.	Lengthen and repave boat launch to maintain current use.	$2,000
Mon Valley Sewage Authority	Submarine Crossing	38.4	Transport waste across river to sewage treatment plant.	Channel dredging extends below submerged pipe crossing.	Lower 1000' of pipe to maintain existing cover.	$1,585,000
City of Mones-sen	Boat Launch Ramp	38.5 (R)	Provide access to river for boaters.	Ramp is unusable at lower permanent pool.	Lengthen and repave boat launch to maintain current use.	$2,000

Table 1 - Sheet 6/6

Owner	Description of Facility (ies)	Location (R.M.-Bank)	Function	Impact on Facility by Proposed Project	Description of Proposed Adjustment	Cost (Incl. E&D and Const. Mgt.)
Charleroi Boro	2-12" Submarine Crossing Water Pipes	38.7	Transport water across river from treatment plant.	Channel dredging extends below submerged pipe crossing.	Lower 2000' of pipe to maintain existing cover.	$2,470,000
Charleroi Boro	1-20" Submarine Crossing Water Pipe	41.0	Transport water across river from treatment plant.	Channel dredging extends below submerged pipe crossing.	Lower 1000' of pipe to maintain existing cover.	$1,230,000
City of McKeesport	24" Corrugated Metal Storm Sewer	0.1 (L) Yough River	Passes surface drainage from city to river.	Totally inundate outfall.	Plug existing pipe and replace with a 30" RCP at a higher elevation. Approx. length of new pipe is 400'.	450,000
City of McKeesport	60" Brick and Stone Storm Sewer	2.1 (R) Yough River	Passes surface drainage from city to river.	Totally inundate outfall.	Plug existing pipe and replace with a 78" RCP at a higher elevation. Approx. length of new pipe is 1100'.	$3,200,000
Elizabeth Twp.	Sanitary Sewers	4.1 (R) Yough River	Wastewater discharge from plant.	Submerge portion of flap gate.	Raise manhole structures, monitor bypass level at the Boston Pump Station and install pump.	$360,000

APPENDIX A
Section 111 Legislation

APPENDIX A SHEET 1/3

chase, acceptance of donation, exchange, exercise of the power of eminent domain, or otherwise.

(b) The Secretary of the Army further is authorized out of appropriations hereafter made for civil functions administered by the Department of the Army to cause the canal to be repaired and modified for the purpose of placing the same in proper condition for public recreational use other than through-navigation, including (but not limited to) the repair or reconstruction of the aforesaid Government dam across Rock River; the repair or reconstruction of retaining walls, embankments, and fixed portions of the lock and dam structures, on both the feeder and the main portions of the canal; the removal of presently existing lock gates and the construction of fixed dams in lieu thereof; the repair of culverts, drainage ditches, fences, and other structures and improvements, except bridges and roads, which the United States has maintained or has been obligated to maintain; the replacement of aqueducts with inverted siphons or flumes; such other repair, renovation, or reconstruction work as the Chief of Engineers may deem necessary or advisable to prepare the canal for public recreational use other than through-navigation; and the sale or other disposition of equipment, building, and other structures, which are designated by the State of Illinois as not suitable or needed for such use. The work of repair and modification shall be performed by the Corps of Engineers, and upon completion thereof the Chief of Engineers shall certify such completion to the Secretary of the Army. The work of repair and modification authorized in this subsection, as well as the land acquisition authorized in the preceding subsection, shall not be commenced prior to the approval by the Chief of Engineers and the responsible State representative of the agreement authorized in subsection (e) which shall include assurance from the State of Illinois that it will accept the conveyance of all right, title, and interest of the United States in and to the canal. Upon such conveyance the United States shall have no further obligation with respect to the canal.

(c) Upon the request of the State of Illinois and of any corporation owning a railroad which crosses a bridge over the canal, the Secretary of the Army is authorized to convey to said corporation, at any time before the conveyance of the canal to the State of Illinois as provided in subsection (d) of this section, all right, title, and interest of the United States in and to such bridge, and the delivery of any such bridge conveyance shall operate as a complete release and discharge of the United States from all further obligation with respect to such bridge. If the request also provides for the replacement of such bridge with a land fill, the Secretary of the Army further is authorized to permit the said corporation to make such replacement, but shall require adequate provision for culverts and other structures allowing passage of the waters of the canal and necessary drainage, and for right-of-way for necessary and appropriate road crossings.

(d) The Secretary of the Army further is authorized and directed, upon execution of the foregoing provisions of this section, to convey and transfer to the State of Illinois, by quitclaim deed and such other instruments as the Secretary may deem appropriate, without further consideration, the property of the canal; and to execute such other documents and to perform such other acts as shall be necessary and appropriate to complete the transfer to the said State of all right, title, and interest of the United States in and to the canal. Upon and after the delivery of such deed, the State of Illinois is authorized, at all times, to use such quantity of water drawn from Rock River at Sinnissippi Lake, as is adequate and appropriate to operate the canal for public recreational use other than through-navigation.

(e) In the execution of the provisions of this section, the Chief of Engineers is authorized to enter into agreements with the duly authorized representatives of the State of Illinois with respect to the details of repair and modification of the canal and the transfer thereof to the State.

(f) There is hereby authorized to be appropriated the sum of $2,000,000 to carry out the provisions of this section.

Sec. 111. Whenever, during the construction or reconstruction of any navigation, flood control, or related water development project under the

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direction of the Secretary of the Army, the Chief of Engineers determines that any structure or facility owned by an agency of government and utilized in the performance of a governmental function should be protected, altered, reconstructed, relocated, or replaced to meet the requirements of navigation or flood control, or both; or to preserve the safety or integrity of such facility when its safety or usefulness is determined by the Chief of Engineers to be adversely affected or threatened by the project, the Chief of Engineers may, if he deems such action to be in the public interest, enter into a contract providing for the payment from appropriations made for the construction or maintenance of such project, of the reasonable actual cost of such remedial work, or for the payment of a lump sum representing the estimated reasonable cost: *Provided*, That this section shall not be construed as modifying any existing or future requirement of local cooperation, or as indicating a policy that local interests shall not hereafter be required to assume costs of modifying such facilities. The provisions of this section may be applied to projects hereafter authorized and to those heretofore authorized but not completed as of the date of this Act, and notwithstanding the navigation servitude vested in the United States, they may be applied to such structures or facilities occupying the beds of navigable waters of the United States.

~~Sec. 112. The Secretary of the Army is hereby authorized and directed to cause surveys to be made at the following named localities and subject to all applicable provisions of section 110 of the River and Harbor Act of 1950[2]:~~

~~Stave Island Harbor at South Goldsboro, Maine.~~

~~Tashmoo Pond, Martha's Vineyard, Massachusetts.~~

~~Sachem's Head Harbor at Guilford, Connecticut.~~

~~Poquonock River at Groton, Connecticut.~~

~~Water route from Albany, New York, into Lake Champlain, New York and Vermont, including the advisability of modifying existing Federal and State improvements, with due consideration of ultimate connection with the Saint Lawrence River in Canada.~~

~~Hammonds Cove entrance to Locust Point Harbor, Long Island Sound, New York.~~

~~Indian River Bay to Assawoman Canal known as White's Creek, and up White's Creek, Delaware.~~

~~Indian River Bay via Pepper's Creek to Dagsboro, Delaware.~~

~~Chesapeake Bay and tributaries, Maryland, Delaware, and Virginia, with a view to elimination of the waterchestnut (Trapa Natans).~~

~~Area from Cuckold Creek through Neale Creek and Neale Sound to the Wicomico River, Charles County, Maryland, to determine the feasibility of providing a safe and continuous inland channel for the navigation of small boats.~~

~~Currioman Bay, Virginia.~~

~~Tabbs Creek, Lancaster County, Virginia.~~

~~Wrights Creek, North Carolina.~~

~~Savannah River, with a view to providing nine-foot navigation to Augusta, Georgia.~~

~~Little Gasparilla Pass, Charlotte County, Florida.~~

~~Frenchman Creek, Florida.~~

~~Streams and harbor facilities and needs therefor at and in the vicinity of Bayport, Florida, in the interest of present and prospective commerce and other purposes, with the view of improving the harbor facilities of Bayport as a port for commerce and for refuge on the Gulf of Mexico.~~

~~Channel from Lynn Haven Bayou, Florida, into North Bay, Florida.~~

~~Small-boat channel from the port of Panacea, Florida, into Apalachee Bay, Florida.~~

~~Dredged channel, vicinity of Sunshine Skyway, Tampa Bay, Florida.~~

~~Tampa Bay, Florida, with a view to determining the feasibility of a fresh-water lake at that location.~~

~~2. U.S.Code Cong.Service 1950, p. 163.~~

:ndment To Section 111 APPENDIX A SHEET 3/3

Raisin Point, its entrance into Lake Erie, is declared to be not a navigable stream of the United States within the meaning of the Constitution and the laws of the United States, and the consent of Congress is hereby given for the filling in of the old channel by the riparian owners on such channel.

Sec. 309. Section 111 of the River and Harbor Act of 1958 (72 Stat. 303) is amended to read as follows:

"Sec. 111. Whenever, during the construction or reconstruction of any navigation, flood control, or related water development project under the direction of the Secretary of the Army, the Chief of Engineers determines that any structure or facility owned by an agency of government and utilized in the performance of a governmental function should be protected, altered, reconstructed, relocated, or replaced to meet the requirements of navigation or flood control, or both; or to preserve the safety or integrity of such facility when its safety or usefulness is determined by the Chief of Engineers to be adversely affected or threatened by the project, the Chief of Engineers may, if he deems such action to be in the public interest, enter into a contract providing for (1) the payment from appropriations made for the construction or maintenance of such project, of the reasonable cost of replacing, relocating, or reconstructing such facility to such standard as he deems reasonable but not to exceed the minimum standard of the State or political subdivision for the same type of facility involved, except that if the existing facility exceeds the minimum standard of the State or political subdivision, the Chief of Engineers may provide a facility of comparable standard, or (2) the payment of a lump sum representing the estimated reasonable cost thereof. This section shall not be construed as modifying any existing or future requirement of local cooperation, or as indicating a policy that local interests shall not hereafter be required to assume costs of modifying such facilities. The provisions of this section may be applied to projects hereafter authorized and to those heretofore authorized but not completed as of July 3, 1958, and notwithstanding the navigation servitude vested in the United States, they may be applied to such structures or facilities occupying the beds of navigable waters of the United States."

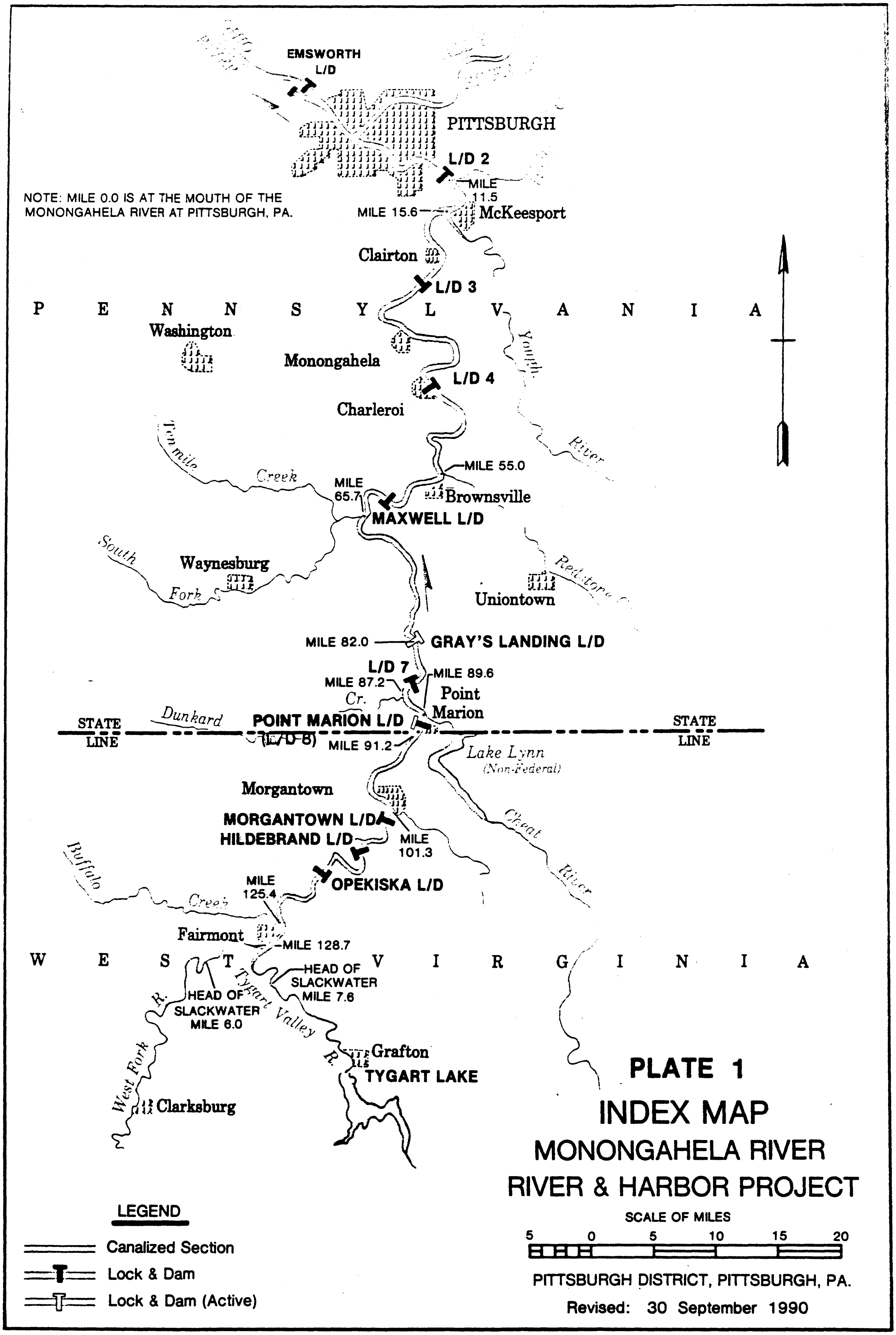
Sec. 310. (a) (1) Subsection (a) of section 107 of the River and Harbor Act of 1960 (33 U.S.C. 577)[30] is amended by striking out "$2,000,000" and inserting in lieu thereof "$10,000,000".

(2) Subsection (b) of such section 107 is amended by striking out "$200,000" and inserting in lieu thereof "$500,000".

(b) Section 3 of the Act entitled "An Act authorizing Federal participation in the cost of protecting the shores of publicly owned property", approved August 13, 1946, as amended (33 U.S.C. 426g),[31] is amended (1) by striking out "$3,000,000" and inserting in lieu thereof "$10,000,000", and (2) by striking out "$400,000" and inserting in lieu thereof "$500,000".

(c) The amendments made by this section shall not apply to any project under contract for construction on the date of the enactment of this Act.

30. 33 U.S.C.A. § 577.
31. 33 U.S.C.A. § 426g.



EMSWORTH L/D
PITTSBURGH
L/D 2
MILE 11.5
NOTE: MILE 0.0 IS AT THE MOUTH OF THE MONONGAHELA RIVER AT PITTSBURGH, PA.
MILE 15.6
McKeesport
Clairton
L/D 3
P E N N S Y L V A N I A
Washington
Monongahela
Yough. River
L/D 4
Charleroi
Ten mile Creek
MILE 55.0
MILE 65.7
Brownsville
MAXWELL L/D
South Fork
Waynesburg
Redstone
Uniontown
MILE 82.0
GRAY'S LANDING L/D
L/D 7
MILE 89.6
MILE 87.2
Point Marion
Dunkard Cr.
STATE LINE
POINT MARION L/D (L/D 8)
STATE LINE
MILE 91.2
Lake Lynn (Non-Federal)
Morgantown
MORGANTOWN L/D
HILDEBRAND L/D
MILE 101.3
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5 0 5 10 15 20
LEGEND
Canalized Section
Lock & Dam
Lock & Dam (Active)
PITTSBURGH DISTRICT, PITTSBURGH, PA.
Revised: 30 September 1990

LOWER MONONGAHELA RIVER NAVIGATION SYSTEM STUDY

FINAL ENVIRONMENTAL IMPACT STATEMENT

December 1991

U.S. Army Engineer District, Pittsburgh
1000 Liberty Avenue
Pittsburgh, Pennsylvania

FINAL
ENVIRONMENTAL IMPACT STATEMENT

LOWER MONONGAHELA RIVER
NAVIGATION SYSTEM STUDY

The responsible lead agency is the U.S. Army Engineer District, Pittsburgh.

Abstract: The Pittsburgh District has completed a feasibility report which addresses the problems of poor structural conditions and inadequate navigational features at Locks and Dam Nos. 2, 3, and 4, the three lowermost navigation structures on the Monongahela River. The feasibility report presents an evaluation of an array of alternatives for maintenance and improvement of the navigation system, and a recommended plan for the most economical and efficient approach to continue providing safe and reliable navigation on the Lower Monongahela River. This environmental impact statement considers the environmental, economic, and social consequences of the various plans for maintenance and improvement of the navigation system.

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LOWER MONONGAHELA RIVER NAVIGATION SYSTEM STUDY

FINAL ENVIRONMENTAL IMPACT STATEMENT

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A. Major Conclusions.

Locks and Dam Nos. 2, 3, and 4 on the Lower Monongahela River are approaching 90 years in age and are reaching the end of their useful life. Also, Locks 3 and 4 have the smallest capacity of all nine navigation structures on the Monongahela River, and are a significant constraint on the flow of river traffic. To insure safe, efficient river navigation in the future, major rehabilitation or replacement of these facilities is imperative.

The Pittsburgh District performed a navigation system study on the Lower Monongahela River which included extensive coordination with the waterway industry and public in the study area. The study considered 39 structural and two non-structural alternatives, and evaluated economic, social, and environmental constraints. A final array of four structural alternatives was selected for detailed evaluation. This array included the Without Project Condition (the "no action alternative") - essentially the continuation of the status quo with major rehabilitation, Plan No. 1 (the "recommended plan") - replacement of three structures with two improved structures, Plan No. 4 - replacement of three structures with three improved structures, and Plan No. 4 Deferred - a modification of Plan No. 4 in which construction of new Locks 4 would be deferred to the future, Year 2027.

The District circulated the study's Draft Feasibility Report and Draft Environmental Impact Statement for public review in September 1991 presenting Plan No. 1 as the tentatively recommended plan. All public comments received were supportive of modernization of the Lower Monongahela River Navigation System. However, not all commentors supported Plan No. 1 as the recommended plan. In general, the navigation and construction interests support Plan No. 1 citing the navigation benefits of having fewer and larger locks on the river. Other commentors favored the "three-for-three" plan (i.e., Nos. 4 or 4 Deferred) citing the substantially lower non-Federal costs for these plans and the greater environmental impacts associated with pool level changes and loss of a tailwater. Many are concerned that the $111.2 million in non-Federal costs for Plan No. 1 would be an unjustifiable economic burden on this economically depressed region. Several commentors requested selection of different (uninhabited) disposal sites from those identified in the draft report, or that affected properties be purchased in fee rather than through temporary easement.

Based on objections to the identified disposal sites from local officials and residents during the public interest review, the District has committed to further study of alternative disposal sites subsequent to project authorization. This additional study will also evaluate options such as instream disposal in Pool 2, recycling concrete rubble, and cooperative ventures with other development projects in need of fill material which may become available during the next five years. These additional studies will be subject to compliance with the National Environmental Policy Act and other Federal statutory requirements as applicable.

All of the final alternatives have large disposal requirements (over 2.6 million cubic yards of material) with the "three-for-three" plans (Nos. 4 and 4 Deferred) having the largest requirement (3.9 million cubic yards). The need for disposal sites is common to all alternatives, so that site selection is essentially a separate issue from selection of an alternative navigation development plan.

Several commentors favoring the "three-for-three" plan do so on the basis of the significantly greater non-Federal costs ($111.2 million as opposed to $10.3 million for Plan No. 1). Most of these non-Federal relocation costs would be borne by those expected to benefit most from improvements to navigation, i.e., the towing companies, the power companies, and the railroad (part of trans-modal shipment). Private marinas and other recreation facilities should generally benefit from having the longer pool. Even with these significant non-Federal costs, Plan No. 1 has the greatest net economic benefits of all the final alternatives and is identified as the National Economic Development (NED) plan. Its primary advantage over other alternatives is in the elimination of one of the three navigation structures and retention of the serviceable features of the two remaining structures. From the aspect of improved river transportation, industry favors Plan No. 1 because the structure to be removed, Locks and Dam No. 3, has been a bottleneck in the busiest section of the river. The other alternatives derive greater costs from the continued operation and maintenance of three structures as opposed to two, or in the complete replacement of two structures having serviceable features with one entirely new structure at a new location. After consideration of public comments, the NED plan, Plan No. 1, remains the District's recommended plan.

Plan No. 1 entails construction of a new gated dam and rehabilitation of the locks at Locks and Dam No. 2, raising Dam 2 five feet, removal of Locks and Dam No. 3, lowering of Pool 3 about 3.2 feet, and construction of new locks at Locks and Dam No. 4. No major work is proposed at Dam 4 which was reconstructed in 1967 and is in good condition. Environmental features are included to maintain existing dissolved oxygen levels in the river, and to improve aquatic habitat to compensate for the loss of the Dam 3 tailwater.

All of the final alternatives would cause environmental impacts since all necessitate construction work at each of the aging structures and disposal of large quantities of material. Significant environmental impacts associated with some or all of the final alternatives include channel and approach dredging, construction at existing or new sites, removal of existing structures, pool changes, and disposal of dredged and excavated materials. The environmentally preferred plan, due primarily to the avoidance of pool changes and new site development, is the No Action Alternative (Without Project Condition).

With the following exceptions, the short and long term environmental impacts of the No Action Alternative and Plan Nos. 4 and 4 Deferred are essentially the same. The No Action Alternative has significant projected commercial lockage delays at Locks 3 and 4 beyond Year 2020 which would be avoided in the other alternatives. These delays also would be expected to produce adverse localized water quality and fishery impacts, and significant recreational lockage delays. On the other hand, Plan Nos. 4 and 4 Deferred would have greater short term aquatic impacts from dredging in the 0.8-mile reach where the pool would be lowered, and the terrestrial habitat impacts from the large excavation requirement at the proposed replacement site for Locks and Dam No. 3. Plan No. 1 would have significantly greater short and long term impacts than the other final alternatives due to extensive pool changes (30.3 miles), the large dredging requirement over a 9.5-mile reach to restore a nine-foot channel in the lowered Pool 3, and the loss of one tailwater.

The primary adverse impacts associated with dredging are short term and include removal of river bottom habitat and benthic organisms, and generation of turbidity. Benthic recolonization is generally rapid and no adverse long term impacts to the benthic community are anticipated. Increased turbidity from dredging would not exceed turbidity levels found during natural events, e.g. high flow periods, except possibly in duration and time of year. These impacts would be minimized through prohibiting dredging during the peak fish spawning season (mid-April through June) and by coordinating with downstream water users during dredging operations.

Pool changes (the raising of Pool 2 and lowering of Pool 3 with Plan No. 1 and lowering of 0.8 miles of Pool 3 with Plan Nos. 4 and 4 Deferred) would cause both short and long term impacts. Plan No. 1's changes over 30.3 miles of river would necessitate numerous shoreside facility adjustments such as reconstruction of docks, intakes and outfalls, boat ramps, and the raising of one railroad bridge. The costs of these adjustments would be borne by the owners of private facilities ($111.2 million), and by the Federal Government for publicly owned facilities ($63.8 million). Short term environmental impacts would include the adjustment and reestablishment of wetland and upland riparian communities to the new pool levels and hydrologic regime, and the additional near-shore dredging requirement for docks in the lowered Pool 3. The riparian vegetative communities, including wetlands, along the existing Pools 2 and 3 have developed fortuitously with respect to the existing navigation system and man-made alterations to the river bank. The reestablishment of vegetation at the new pool levels would involve a successional process that would be expected to result in species composition and community boundaries similar to existing conditions. Plan No. 1 would be expected to increase the amount of emergent wetlands in the project area because of the projected net gain in shallow water habitat.

The most significant long term adverse aquatic impact with Plan No. 1 would be the loss of a tailwater with the removal of Locks and Dam No. 3. Tailwaters are a unique riverine resource which are of such high biological value that the U.S. Fish and Wildlife Service recommends in-kind replacement for mitigation. Since in-kind replacement is not practicable under Plan No. 1, the U.S. Fish and Wildlife Service has recommended for this alternative that compensation for the tailwater loss include quantitative and qualitative improvement in the area's shallow water habitat. The inclusion in Plan No. 1 of shallow water structural habitat features (to be created with lock and dam demolition debris), design features in the new Dam 2 and

Locks 4 to maximize their reaeration potential, and the projected net gain in shallow water habitat acreage from pool changes would provide adequate compensation for the tailwater loss.

Plan No. 1, as well as the other final alternatives, would generate large quantities of material requiring disposal. These materials would come from channel and approach dredging, excavation for new structures, and demolition of the old structures. Initial screening of a number of potential upland disposal sites, including previously disturbed areas such as strip mines, resulted in the selection of three sites for further evaluation. One of these sites, near Dunlevy, PA, was subsequently dropped from consideration prior to the public review period due to the potential for impacting wetlands. During the public review period, the two recommended sites, narrow valleys near Bunola and Coursin Hill, PA, were opposed by residents and public officials of these areas. While these two valley sites remain as part of the recommended plan, the District has committed to further study of alternative disposal sites after project authorization to investigate other sites which may become available between authorization and construction.

In order to implement the requirements of Section 404 of the Clean Water Act, an exemption is being sought under Section 404(r) as part of the authorization process by including the Section 404(b)(1) evaluation in the environmental impact statement.

B. Areas of Controversy.

During preparation of the draft environmental impact statement, two social and environmental issues associated with Plan No. 1's pool changes generated controversy with public interests. One issue was the public's concern for increased flooding with the proposed five foot raise of Dam 2. Their concern had two aspects: loss or reduction of function of shoreside facilities due to the pool raise or attendant changes in ground water, and increased damages from flood events. The second issue was the potential for changes in the new pool's water quality which might adversely affect the operations of two electric power generating stations and the Pennsylvania-American Water Company (PAWC) treatment plant in the lower end of Pool 3. A third issue arose during public review of the draft environmental impact statement concerning the impacts to local residents from development of the proposed disposal sites.

1. Flooding and Relocations.

As part of the Lower Monongahela River Navigation Study, the District inventoried all shoreside facilities which the alternatives' pool changes would adversely affect. These facilities included, for example, public and private docks, marinas, sewage systems, intakes and outfalls, and pipelines. All facility owners were then contacted and asked to provide an estimate of costs they would incur in adjusting their facilities to function at the new pool elevation. These costs were then included as part of the project alternative costs.

Facilities adjoining the mainstem navigable waterway are regulated by Department of the Army permit under Section 10 of the River and Harbor Act of 1899. Pursuant to the Federal Government's navigation servitude powers, adjustments to permitted facilities necessitated by changes in the navigation system are the responsibility of the owner. However, on many occasions, potentially affected public entities have been assured that relocation of their facilities at Federal expense would be an integral part of the recommended project. Specific authority is being requested to include non-Federal, government-owned facility adjustment costs as a Federal project cost. There is no provision under law, however, for use of Federal funds to relocate or adjust privately owned facilities, and these costs would be borne by the owners. The private facility owners have been informed of this possibility, and to date, the District has received only one protest, that coming from the Pennsylvania-American Water Company which is a *privately* owned, *public* utility. They have been advised that the criteria used as the basis for which affected non-Federal, government-owned facilities were designated as a Federal cost, contained in Section 111 of P.L. 85-500, as amended, clearly stipulate the requirement of *public ownership*. Consequently, as a privately owned, public utility, they do not qualify under the criteria for relocation of facilities at Federal expense.

The second component of the flooding issue dealt with the public's misconception that a raised Pool 2 would necessarily increase flood event heights and cause increased flood-related damages. This misconception was based on an incomplete understanding of the proposed project's features and their functions. The recommended plan would not only raise Dam 2 five feet, but would also replace the existing fixed crest dam with a gated structure. Any potential for increased flood heights from the raised pool behind Dam 2 would be more than offset by the function of the gated dam (see "IV.E. Hydrology", and "V.I. Flood Plains").

The issue of reimbursement for relocations due to pool changes has been fully discussed and resolved with all potentially affected parties. The issue of perceived increased flood damages has been resolved through public coordination and explanation of the features and operation of the proposed project.

2. Water Quality.

The second issue centered around the potential adverse effect that removal of Locks and Dam No. 3 and altering the pool elevations could have on thermal conditions in the river. The Duquesne Light and West Penn Power electric generating stations which discharge cooling water into Pool 3 operate under thermal variances incorporated in their Pennsylvania Department of Environmental Resources (PaDER) permits. The electric utilities maintain that any changes in the lower end of Pool 3, such as removing the dam or moving the dam upstream, would adversely affect the conditions under which the thermal variances were granted. Both Duquesne Light and West Penn Power contend that extensive modeling studies would have to be conducted to predict the changes that any of the final alternatives would have on thermal conditions and on station operations. The future prevailing thermal conditions and impact on the electric utilities would ultimately be determined by the PaDER.

The District maintains that all project alternatives (including the No Action Alternative) would result in the elimination or relocation of Locks and Dam No. 3 which would modify the conditions under which the thermal variances were issued. However, none of the project alternatives would reduce river flow, or, consequently, increase the thermal loading to the river. Therefore, although the Pennsylvania Department of Environmental Resources may choose to reexamine the thermal variances under any future conditions, with no reduction of flow and no change in thermal discharges, the navigation project would not impact the thermal loading of the river.

A related issue, raised by the Pennsylvania-American Water Company, centered around the potential for increased algal blooms in the proposed elongated pool of Plan No. 1 or in the shortened Pool 3 with Plan Nos. 4 and 4 Deferred. Their concern is that changes in pool conditions could result in increased temperatures and algal concentrations at their intake located between the discharges of the two electric generating stations. Algal blooms, particularly thermophilic blue-green algae, can cause taste and odor problems increasing water treatment costs. It is the District's conclusion (see "V.A. Water Quality") that the recommended plan (Plan No. 1) would not cause an increased algae problem at the PAWC intake. However, the PAWC contends, along with the electric utilities, that extensive modeling studies would be required to predict the behavior of the changed pool.

3. Disposal Sites.

All of the final alternatives have a requirement for disposal of large quantities of dredged and excavated materials. The study to find sites which could accept these materials considered capacity, river access, and impacts to residences and environmental resources. An emphasis was given to locating previously disturbed sites. Although a number of small, scattered strip mines were identified, the preliminary estimates of access impacts and limited capacities eliminated most of these sites from further consideration. Two valley sites were finally selected at Coursin Hollow, Lincoln Borough, and Bunola, Forward Township, both in Allegheny County, Pennsylvania.

At the October 22, 1991 public meeting, residents opposed the use of these areas and requested that if these sites were developed that their properties be acquired in fee rather than by temporary easements. Subsequent meetings were held with the concerned residents and officials of Lincoln Borough and Forward Township to discuss these issues. Their recommendations were to consider other uninhabited disposal sites or alternate uses of the disposal materials.

As a result of objections received during the public review process, the District has made a commitment to further study alternative sites following project authorization which would reduce social and environmental impacts without increasing project costs. A number of possibilities are being considered which include disposing dredged material in Pool 2, using other sites such as Pangburn Hollow and smaller strip mined areas, making material available to large development projects needing clean fill such as restoration of the old steel mill sites at McKeesport, Duquesne and Aliquippa, and recycling concrete from the old locks and dams. The District will resolve this issue by fulfilling our commitment to conduct the necessary studies and coordination to evaluate alternative sites.

With respect to fee acquisition of properties, the District held subsequent meetings with the residents and public officials of the proposed disposal areas to explain the Corps' acquisition policy under P.L's. 85-500, 86-645, and 91-646. It is the Corps' policy to acquire the minimum interest in property for project purposes. In the case of a disposal area and haul road where the use of the land is for a temporary period of time, temporary work area easements are all that is required. When structures are located within the limits of the proposed work area, they are purchased at fair market value and the owners/tenants provided relocation benefits. However, if the remainder of the property is determined to be an uneconomic remnant subject to the easement and removal of the structures, then purchasing the entire parcel would be considered in accordance with good real estate practice.

In light of this policy, the District explained to the residents that we cannot make a commitment to purchase fee interest in any specific property at this time. Following project authorization and development of specific real estate requirements, the District Engineer will hold a landowners public meeting. At this time the District will discuss specific land interests to be acquired, approximate acquisition lines, an acquisition schedule, and public rights and benefits. A commitment as to whether the Corps would purchase fee interest in specific properties would be made at that time.

C. Unresolved Issues.

At the present time, the District is not aware of any unresolved issues associated with this project.

II. NEED FOR AND OBJECTIVES OF ACTION

A. Study Authority.

The Feasibility Report and Environmental Impact Statement for the Lower Monongahela River Navigation System was prepared as an interim effort under an authorizing resolution adopted on September 23, 1976 by the House of Representatives Committee on Public Works and Transportation. The resolution reads as follows:

> "Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on the Monongahela River navigation system, printed as House Document Number 209, 50th Congress, Second Session, House Document Number 288, 67th

Congress, Second Session, House Document Number 22, 70th Congress, Second Session, Senate Document Number 100, 81st Congress, First Session, and other pertinent reports with a view toward determination of the need for modifications or improvement of the existing project at this time."

B. Public Concerns.

Locks and Dam Nos. 2, and 3, and Locks 4, the lower three navigation structures on the Monongahela River, range in age from 87 to 55 years (Dam 4 was reconstructed in 1967). The major problem with these older structures is their physical deterioration and ability to continue to safely handle river traffic. Specific descriptions of structural conditions are contained in Section 4 of the Feasibility Report. A second concern is whether the system has adequate capacity to efficiently handle projected river traffic. The continued use of these three facilities for the long term future necessitates the consideration of the alternatives that include major rehabilitation, or their replacement with new, larger capacity facilities. Aside from river navigation, the existing projects also provide significant incidental water supply and water quality benefits to local municipalities and industry. The river supports an improving fishery and is an important regional recreation resource.

C. Planning Objectives.

The following planning objectives were employed in plan formulation:

1. To ensure that the navigation projects will continue to operate safely in the future,

2. To provide navigation projects that will minimize inefficiencies to towing operations in the area, and

3. To maintain or improve the river's present water quality, fishery, and recreational values.

III. ALTERNATIVES

A. No Action Alternative (Without Project Condition).

The No Action Alternative is the ongoing operation and maintenance of the Lower Monongahela River Navigation System. For this study, the implementation of the No Action Alternative is referred to as the "Without Project Condition," which represents the most likely condition expected to exist in the future in the absence of a new navigation project. National Environmental Policy Act (NEPA) review of the continued operation and maintenance of the Monongahela River Navigation System was addressed in *Monongahela River, Final Environmental Statement on the Operation and Maintenance of the Navigation System*, October 1975. However, the No Action Alternative includes activities, such as in-kind replacement, that were not part of the proposed action defined in the 1975 Final Environmental Statement. Were the No Action Alternative to become the proposed action, any departure from normal operation and maintenance activities would be considered under NEPA review. To determine the most probable course of action to rehabilitate the existing Locks and Dam Nos. 2, 3, and 4, the District evaluated a variety of alternatives within the Corps of Engineers current policy guidance against three objectives - reliability, technical effectiveness, and service parity.

1. Navigation Features.

The No Action Alternative consists of building a new fixed crest dam at Dam 2 by Year 2002, rehabilitating Locks 2 by Year 2022, replacing Locks and Dam No. 3 in kind by Year 2002, rehabilitating Locks 4 by Year 2002 and replacing them in kind by Year 2027. All work would be done essentially at the existing locations. Although no pool level changes and navigation channel dredging would be required, dredging in the approaches to Locks 3 and 4 would be required. Also, to improve the upstream approach conditions to Locks 3 about 23.5 acres of the protruding terrace on the right bank between r.m. 24.0 and 25.0 would be removed. Material quantities to be generated for disposal include 410,000 cubic yards of dredged material from lock approaches and 2,194,900 cubic yards of excavated material. This No Action Alternative would provide reliable navigation service (established by a detailed engineering analysis to evaluate its effectiveness), and parity with the existing system in terms of lockage service levels through the selection of the size and number of locks.

2. Environmental Features.

The No Action Alternative would include minor design features in the replacement locks and dams to improve their low flow reaeration effectiveness, use of demolition debris for aquatic habitat improvement through instream disposal, and improvement of fisherman access and safety to the tailwaters. Removal of the protruding terrace upstream of Locks and Dam No. 3 would require separable mitigation measures to replace lost wildlife habitat values in the form of fee purchase and management of similar lands. Terrestrial habitat values in the upland disposal areas would be restored through surface treatment schemes including site specific grading and seeding plans, and the use of onsite existing materials to create structural features for wildlife, such as brush piles, and for stream habitat diversification.

B. Plans Eliminated from Further Study.

The Lower Monongahela River Navigation Study investigated 13 different locations between river miles (r.m.) 4.5 and 41.5 as potential replacement sites for Locks and Dam Nos. 2, 3, and 4. Several of the same locations were also considered as combination replacement sites for Locks and Dam Nos. 2 and 3 or Locks and Dam Nos. 3 and 4. As part of this analysis, 39 different replacement "options" were initially examined that could be selected individually or combined with other options to create alternative replacement "plans". Consideration was also given to either a fixed crest or gated dam for each potential replacement.

During the formulation process, these 39 options were reduced to 24 due to one or several of the following reasons: river bank developments, effect of pool level adjustments, general navigation conditions, or preliminary costs. Each of the 24 options were then modeled by the Corps of Engineers Waterways Experiment Station (WES) to determine the navigation entrance conditions. Through results obtained by WES, use of the simulation model, and replacement costs based upon currently available data, seven plans were selected for more detailed study. From this group of plans, two were selected for a final evaluation against the No Action Alternative: Plan No. 4, the most economically favorable "three-for-three" plan, and Plan No. 1, the most economically favorable "two-for-three" plan. A sensitivity analysis conducted on Plan No. 4 resulted in the formulation of another alternative, "Plan No. 4 Deferred," which was also carried through the final evaluation. These plans are discussed below in "C. Plans Considered in Detail."

In addition to the above structural replacement options, two nonstructural alternatives were evaluated - a switchboat plan, and a change in lockage policy. The switchboat plan involved the use of helper boats to extract multi-cut lockages from the lock chamber and move them to a mooring area away from the locks. The change in lockage policy at Locks and Dam No. 3, which presently is restricted to one-cut lockages, would allow the passage of larger tows in multi-cut lockages. It was concluded that neither of these alternatives would improve the operating efficiencies of the existing projects or address the deteriorating physical condition of the existing structures. Consequently, the nonstructural alternatives were determined to be infeasible.

C. Plans Considered in Detail.

1. Plan No. 1. (Recommended Plan)

Navigation Features.

This alternative consists of rehabilitation of Locks 2 by Year 2022 and replacement of the fixed crest Dam 2 with a gated dam by Year 2002, elimination of Locks and Dam No. 3, and replacement of Locks 4 with twin 84-foot by 720-foot lock chambers by Year 2002. The elimination of the 8.2-foot lift at Locks and Dam No. 3 would be accommodated by raising the elevation of new Dam 2 five feet and lowering Pool 3 by 3.2 feet. The new 30.3-mile pool would be maintained at elevation 723.7[1]. Navigation channel dredging would be necessary to restore a nine-foot channel through the lowered Pool 3. Improvement of lock approach conditions would include approach dredging and installation of submerged dikes upstream of Locks 2 to reduce approach velocities. Combined dredging would generate for disposal an estimated 2,431,650 cubic yards of material. Excavation for the new Locks 4 and Dam 2 abutment would remove an estimated 841,110 cubic yards of material. Bank stabilization, as

[1]All elevations are expressed in feet above the National Geodetic Vertical Datum (NGVD)

needed, in the form of stone riprap is proposed along the raised Pool 2. For drawings of project features, see "Appendix I, Project Drawings, Plan No. 1."

Environmental Features.

Plan No. 1 includes specific design, construction, and operational features to avoid, minimize, or compensate for adverse impacts to significant resources. With implementation of these features, this plan would have negligible adverse impact on fish and wildlife resources, and no separable mitigation features would be required. Mistake. See pp 7-4, -5 which describe mitigation - sound engr practice.

To maintain existing levels of dissolved oxygen in the river during critical low flow periods, the project design includes a raised sill, low flow gate at Dam No. 2 and an air entrainment system at Locks No. 4. The District would develop an operational plan for these features to maximize their effectiveness, and would periodically evaluate this plan based on the results of the District's ongoing water quality monitoring program for the Monongahela River.

Compensation for the loss of tailwater habitat (the removal of Locks and Dam No. 3) would be provided, in part, by the construction of fish reefs and rubble beds along selected shoreline locations in Pools 2 and 3. Material for construction of these aquatic habitat improvement features would come from demolition of the locks and dams (see Appendix I).

Bank stabilization in Pool 2 has the potential to eliminate riparian wetlands. Adverse impacts to this wetland resource would be avoided by limiting riprap protection to only active erosional areas.

Terrestrial habitat values in the upland disposal areas would be restored through surface treatment schemes including site specific grading and seeding plans, and the use of onsite existing materials to create structural features for wildlife, such as brush piles, and for stream habitat diversification.

2. Plan No. 4.

Navigation Features.

This plan consists of construction of a new fixed crest dam at Dam 2 by Year 2002 and rehabilitation of Locks 2 by Year 2022, relocation and replacement of Locks and Dam No. 3 to r.m. 24.6 with twin 84-foot by 720-foot locks and a new fixed crest dam by Year 2002, and construction of new twin 84-foot by 720-foot locks at Locks and Dam No. 4 by Year 2002. Between the old and new sites of Locks and Dam No. 3 (0.8 mile), the pool would be lowered 8.2-feet to the elevation of the existing Pool 2. Approach and channel dredging total an estimated 344,450 cubic yards of material, and excavation totals an estimated 3,523,680 cubic yards. Approximately two-thirds of the excavation is for the new Locks 3 on the right bank at r.m. 24.6.

Environmental Features.

Plan No. 4 would include minor design features in the replacement locks and dams to improve their low flow reaeration effectiveness, use of demolition debris for aquatic habitat improvement through instream disposal, and improvement of fisherman access and safety to the tailwaters. Removal of the protruding terrace at r.m. 24.6 for the construction of new Locks and Dam No. 3 would require separable mitigation measures in the form of fee purchase and management of similar lands to replace lost wildlife habitat values.

Terrestrial habitat values in the upland disposal areas would be restored through surface treatment schemes including site specific grading, dressing and seeding plans, and the use of onsite existing materials to create structural features for wildlife, such as brush piles, and for stream habitat diversification.

3. Plan No. 4 Deferred.

Navigation Features.

This alternative is identical to Plan No. 4 except for the timing of the replacement of Locks 4. Instead of their replacement by Year 2002, Locks 4 would be rehabilitated by Year 2002 and replaced by new twin 84-foot by 720-foot locks by Year 2027.

Environmental Features.

The environmental features are identical to those described for Plan No. 4 above.

D. Disposal Site Selection.

All alternatives including the No Action Alternative would generate large quantities of materials requiring disposal. The primary sources of materials would be dredged material from the navigation channel and lock approaches, excavation of river bank and river bed for new construction, and rubble from the demolition of old structures. There are a number of approved disposal sites along the Lower Monongahela River. However, many are small or near capacity, and none would contain the volume estimated for disposal (in excess of two million cubic yards).

A search was conducted for new potential disposal sites which would have adequate capacity, accessibility from the river, and adequate offloading/dewatering capacity along the river. Potential sites which appeared to meet these criteria in a mapping level study were then investigated for possible social, environmental, and historic resources concerns.

Strip mines and other previously disturbed sites in the study area were given primary consideration in the mapping level study. Field verification, however, ruled out most sites on the basis of small capacity, inaccessibility to the river, and restored condition. Many mapped strip mines turned out to be reclaimed, vegetated old-growth sites. The currently active mines would be completed and reclaimed before the future disposal activities would be implemented. One previously mined site in Pool 3, the Bunola site, was identified as a potential disposal site.

Mapping level studies identified two additional potential disposal sites, one each in Pools 2 and 4. Other sites which met the accessibility and capacity requirements were eliminated because the social (relocation) impacts would be significantly greater than the above sites. The first site at Coursin Hill in Pool 2 is a narrow, wooded valley across the river from Clairton (see Appendix H, Study Area Maps). The second site near Dunlevy in Pool 4 was eliminated from further consideration following wetland investigations due to the potential for significant wetland impacts.

A more detailed description of the potential disposal sites is provided in "IV. F. 5. Terrestrial Habitat."

E. Comparative Impacts of Alternatives.

The Lower Monongahela River Navigation System feasibility study evaluated alternatives over a 50-year study period through Year 2050. In this section, the Without Project Condition through the study period (i.e. implementation of the No Action Alternative) is described and presented as the basis for comparison of the alternative plans. This is followed by a discussion of the impacts common to the alternatives, as well as those impacts which are significantly different between alternatives. A comparative summary of the impacts of the final alternative plans on significant resources is presented in Table I. Detailed discussion of these resources is contained in EIS Section IV, and impacts to these resources in EIS Section V.

1. No Action Alternative (Without Project Condition).

The present status of the navigation system and traffic projections through Year 2050 are summarized in the Feasibility Report. The annual tonnage growth rate for all commodities is projected at 1.6 percent for the Lower Monongahela River and 1.4 percent for the entire Monongahela River. Coal is expected to remain the predominant commodity shipped on the river. The growth in annual tonnage shipped is tied to increases in coke production, electric power generation, and exports.

Increased traffic levels mean increased lock usage, which would eventually result in congestion on the lower river. The congestion is of two types: first, increased fleeting above and below the locks as lockage delays increase, and; second, increased activity around the projects as operators use helper boats to shuttle barges away from the projects to minimize lockage times. Lockage delays at Locks and Dam Nos. 3 and 4 are expected to run between 1.5 to 2.5 hours at each structure through Year 2020. Delays would peak by Year 2030 when they reach a combined level of over 45 hours per tow through Locks and Dam Nos. 3 and 4. Recreational lockages would decline sharply with lockage delays of a few hours, while after

Year 2030, Locks 3 and 4 would be virtually unavailable for recreation lockages. The dual problems of high delays and increased shuttling activity would be expected to persist throughout the future.

The significant lockage delays and shuttle boat operations expected in the vicinity of Locks and Dam Nos. 3 and 4 from Years 2020 to 2050 would cause locally significant aquatic impacts. Both above and below the locks and dams, fleeting and shuttle operations would produce scour and turbidity which would adversely affect the fishery habitat value of these areas.

Throughout the study period, environmental resources in the project area as a whole are expected to remain at the status quo condition or exhibit gradual improvements. Water quality should continue to show improvements as sources of pollution are brought into compliance, although the rate of improvement would be much less dramatic than that of the past 30 years. Responding to the return of good water quality, the fishery and macrobenthic community should become increasingly diverse as time permits recolonization. Riverine wetlands should remain in the status quo condition. The temporary and localized impacts of project construction at the existing lock and dam sites would not cause any lasting or significant changes in the river's overall character and condition.

Continuation of the existing navigation system would cause no change in the 100-year flood plain elevations through the study period. Recreation usage and demand should continue to increase resulting in a moderate increase in traffic levels and shoreline marina development. This development would be concentrated in Pool 3 due to lack of access and suitable shoreline in Pool 2. The No Action Alternative would have limited impact on cultural resources. Potentially significant structures affected would include the old (ca. 1840) Lock and Dam No. 3 land wall, and the existing Locks and Dam Nos. 2, 3, and 4. There is also a potential for impacting prehistoric archeological materials in the disposal areas and on the right bank between r.m. 24.0 and 25.0 which would be removed to straighten the upper approach to Locks and Dam No. 3.

2. Alternatives' Similarities.

Plan Nos. 1, 4, and 4 Deferred share common elements and attendant impacts with the No Action Alternative. All alternatives would incur construction impacts with the replacement of Dam 2 and Locks 4, and the removal of Locks and Dam No. 3, regardless of the size or type of replacement structure. However, differences in the reconstruction of Locks and Dam No. 3 and the timing of Locks 4 replacement have significant environmental impact differences between alternatives and are discussed below. The following significant resources: endangered species, 100-year flood plain, prime farmlands, and scenic river status, would not be impacted by any of the alternatives.

All alternatives would also require the utilization of two or three upland disposal sites. The site development would be identical regardless of the alternative. The specific capacities of the two primary sites and consequently the need for a third site will not be known until further studies are conducted following project authorization.

Plan Nos. 4 and 4 Deferred, and the No Action Alternative would also have similar impacts on the right bank flood plain terrace between r.m. 24.0 and 25.0. Plan Nos. 4 and 4 Deferred would develop this site as the new location for the replacement Locks and Dam No. 3, while for the No Action Alternative, much of this terrace would be removed to improve the upper approach to Locks 3. This area would not be affected with Plan No. 1.

3. Alternatives' Differences.

The significant differences in environmental impacts between the alternatives are directly related to the future disposition of Locks and Dam No. 3, whether it is to be eliminated, or retained in a new location. Plan No. 1, which would eliminate Locks and Dam No. 3, would result in 30.3 miles of pool changes through Pool 2 (12.6 miles) and Pool 3 (17.7 miles). By comparison, the No Action Alternative has no pool changes while the relocation of Locks and Dam No. 3 under Plan Nos. 4 and 4 Deferred would result in a 0.8-mile pool lowering.

The relocation of Locks and Dam No. 3 under Plan Nos. 4 and 4 Deferred, and the 8.2-foot drop in pool level between r.m. 23.8 and 24.6 would impact only a few shoreside facilities. However, two electric generating stations which have thermal discharges in the lower end of Pool 3 maintain that any change in the location of Dam 3 (or its removal as under Plan No. 1) would negatively impact thermal conditions in the river, and lead to a requirement to construct cooling towers or to reduce loads during high energy demand periods. Their thermal discharges are regulated under the PaDER National Pollutant Discharge Elimination System program.

The extensive pool changes associated with Plan No. 1 would cause extensive impacts affecting water quality, the fishery, recreation, and socio-economic resources. Of greatest concern to shoreside facility owners would be the requirement to adjust their facilities to the new pool elevations. The costs of relocating privately owned facilities would be borne by the owners, estimated at $111.2 million. Publicly owned facilities would be relocated at full Federal expense under specific project authority. These costs are estimated at $63.8 million.

Plan No. 1's elimination of Locks and Dam No. 3 and creation of a 30.3-mile pool from two shorter pools would benefit recreational boaters as well as commercial traffic. The longer pool allows boaters to travel greater distances without lockages, and opens Pool 2, with presently poor access, to access points situated in Pool 3. These beneficial attributes would be expected to attract additional marina services to the area providing additional social economic benefits.

Plan No. 1's elimination of Locks and Dam No. 3 and its consequential pool changes would cause significant impacts to water quality and the fishery not associated with Plan Nos. 4 and 4 Deferred, and the No Action Alternative. This unavoidable adverse impact could have a potentially significant effect on water quality and the fishery without compensatory measures. However, the impact on the fishery would be compensated by the gain in shallow water habitat acreage due to the lowering of Pool 3 and the improvement of shallow water habitat by instream placement of fish reefs and rubble beds. Impacts on water quality, primarily the loss of turbulent reaeration of Dam 3 overflow, would be compensated for by the design of a low flow water quality gate in the new Dam 2 and air entrainment in the new Locks 4 discharge to maximize their reaeration capabilities. Water quality characteristics of Pools 2 and 3 would change noticeably with the pool changes from removal of Locks and Dam No. 3. Increased depth in the lower end of the elongated pool would reduce velocity, encouraging clarification, and thermal and dissolved oxygen stratification. Thermal characteristics are significantly influenced by thermal loading from two electric generating stations in the lower end of Pool 3. The electric utilities maintain that removal of Locks and Dam No. 3 would necessitate modeling studies to assess the impact on thermal conditions in the river which could consequently affect station operations. The District has assumed for this study that the thermal conditions in the river would be maintained or improved based on the PaDER regulation of thermal discharges under the NPDES program. The overall impacts of Plan No. 1 on water quality, then, with the inclusion of structural features at Locks 4 and Dam 2 to reaerate discharges, are expected to be an improvement over conditions expected with Plan Nos. 4 and 4 Deferred, and the No Action Alternative.

The difference in lock sizes between Plan Nos. 1, 4, 4 Deferred, and the No Action Alternative, and in the type of replacement dam at Dam 2 would have long term impacts. The larger locks (84-foot wide as opposed to the existing 56-foot width) with Plan Nos. 1, 4, and 4 Deferred would result in fewer tows moving on the river because the tows would consist of more and larger barges. With larger locks and fewer tows, delays at the locks would be minimal and fleeting activity around the projects would be considerably reduced. The exception to this is Plan No. 4 Deferred which retains the small locks at Locks 4 until Year 2027. Until that year the plan would have effects similar to those in the Without Project Condition. In general, however, all alternative plans would prevent the significant lockage delays expected with the No Action Alternative following Year 2027. With more efficient lockages, Plan Nos. 1, 4, and 4 Deferred all provide economic and recreational benefits over the No Action Alternative, and would also avoid site specific aquatic habitat impacts resulting from queuing at lock approaches.

Table I
Lower Monongahela River Navigation Study
Comparison of Alternative Impacts

RESOURCE	ALTERNATIVE			
	NO ACTION	PLAN NO. 1	PLAN NO. 4	PLAN NO. 4 DEFERRED
Water Quality	Status quo in near term, localized impacts during construction periods and lockage congestion	Localized impacts during construction periods and extensive channel dredging, loss of Dam 3 tailwater benefits replaced by design and operation of new Dam 2 & Locks 4	Status quo, except for temporary construction impacts at each structure	Same as Plan No. 4
Ground Water	No change	No significant impact, minor raise in Pool 2 and drop in Pool 3 near river banks	Minor impacts between r.m. 23.8-24.6 where pool drops 8.2 feet, no impact beyond 1,500 feet landward of river bank	Same as Plan No. 4
Wetlands	No net loss. Monongahela River - no change; Bunola disposal site - temporary fill in less than one acre	No net loss. Pool change adjustments (30.3 miles); Bunola disposal site - temporary fill in less than one acre	No net loss. Pool change adjustments (0.8 mile); Bunola disposal site - temporary fill in less than one acre	Same as Plan No. 4

Table I, cont'd.
Lower Monongahela River Navigation Study
Comparison of Alternative Impacts

RESOURCE	ALTERNATIVE			
	NO ACTION	PLAN NO. 1	PLAN NO. 4	PLAN NO. 4 DEFERRED
Aquatic Habitat	Status quo in near term, localized impacts during construction, approach dredging (410,000 yd^3), and future lockage congestion	Loss of one tailwater replaced by construction of fish reefs, rubble beds, & net gain 76.5 acres shallow water habitat; extensive dredging impacts (2,431,650 yd^3), localized construction impacts	Localized construction impacts, net gain 1.4 acres shallow water habitat, minor dredging impacts (344,450 yd^3)	Same as Plan No. 4. Localized impacts from congestion at Locks 4 until 2027
Terrestrial Habitat	Disposal site impacts: 125+ acres (2,604,900 yd^3 material); loss of about 23.5 acres of flood plain terrace	Disposal site impacts: 125+ acres (3,272,760 yd^3 material)	Disposal site impacts: 125+ acres (3,868,130 yd^3 material); loss of about 41 acres of flood plain terrace	Same as Plan No. 4
Fish and Wildlife	Temporary construction impacts at locks and dams, dredging sites, and disposal areas	Same as No Action, loss of one tailwater fishery	Same as No Action	Same as No Action
Endangered Species	No impact	No impact	No impact	No impact
Prime Farmland	No impact	No impact	No impact	No impact

Table I, cont'd.
Lower Monongahela River Navigation Study
Comparison of Alternative Impacts

RESOURCE	ALTERNATIVE			
	NO ACTION	PLAN NO. 1	PLAN NO. 4	PLAN NO. 4 DEFERRED
HTW Sites	Dam 3: At same location, known soil contamination at abutment; At new location, potentially signifiant impact from ground water drop at one HTW site	Pool changes: Minor ground water impact at three HTW sites	Removal of Dam 3: Potentially significant impact at one HTW site from ground water drop; New Dam 3: Potential for contaminated soils at abutment (r.m. 24.6)	Same as Plan No. 4
Flood Plains	Status quo over long term, potential for increased flooding during cofferdam phases of construction	Same as No Action	Same as No Action	Same as No Action
Recreation	Status quo to 2020, followed by significant lockage delays	Boating benefits from elongated pool & avoidance of future lockage delays; loss of tailwater fishery (3,300 rec-days)	Status quo, avoidance of future lockage delays	Status quo, avoidance of future lockage delays, except at Locks 4 until after 2027
Scenic Rivers	No impact	No impact	No impact	No impact

Table I, cont'd.
Lower Monongahela River Navigation Study
Comparison of Alternative Impacts

RESOURCE	ALTERNATIVE			
	NO ACTION	PLAN NO. 1	PLAN NO. 4	PLAN NO. 4 DEFERRED
Socio-Economic Net Benefits: Relocations: -Shoreside $Fed. -Shoreside $Non-Fed. -Disposal sites	 $ 209.7 million $ 0 Federal $ 0 Non-Federal 14 residences, 1 business	 $ 230.3 million $ 63.8 million Federal $ 111.2 million Non-Fed. 14 residences, 1 business	 $ 221.8 million $ 0 Federal $ 10.3 million Non-Fed. 14 residences, 1 business	 $ 226.1 million $ 0 Federal $ 10.3 million Non-Fed. 14 residences, 1 business
Cultural Resources	Three locks and dams, remains of Old Lock 3 (ca. 1840), potential for archeological sites in disposal sites and flood plain terrace (r.m. 24-25)	Three locks and dams, one railroad bridge, potential for archeological sites in disposal sites	Three locks and dams, remains of Old Lock 3 (ca. 1840), potential for archeological sites in disposal sites and flood plain terrace (r.m. 24-25)	Same as Plan No. 4

IV. AFFECTED ENVIRONMENT

A. Location.

The Lower Monongahela River Navigation System is in Allegheny, Washington, and Westmoreland Counties of Southwestern Pennsylvania. It includes the Monongahela River from the "Point" in Pittsburgh to Maxwell Locks and Dam (r.m. 61.2). The navigation structures in the study area include Locks and Dam No. 2 (r.m. 11.2), Locks and Dam No. 3 (r.m. 23.8), and Locks and Dam No. 4 (r.m. 41.5). Environmental impacts of the alternatives considered are generally confined to the river corridor between Locks and Dam Nos. 2 and 4, and to the proposed disposal sites. Maps of the environmental impact study area are included in Appendix H.

B. Physiography and Topography.

The mainstem of the Monongahela River, and most of its drainage basin, is located in the Kanawha section of the Appalachian Plateau physiographic province. This region is a maturely dissected plateau characterized by a gently rolling upland, deep and narrow valleys, and steeply rising slopes. The local relief is 200 to 300 feet along minor tributary streams and 400 to 500 feet along the major streams. The maximum relief within the drainage basin is nearly 4,000 feet. Within the study area, the valley floor varies in width from about 0.4 to 0.5 miles. At Pittsburgh, the Monongahela River is at elevation 710.0.

C. Climate.

The climate of the Upper Ohio Basin is continental, with marked contrasts in temperature and moisture. Average annual temperature is about 54° F for the basin as a whole, with warm and humid summers and relatively cold winters. The average frost-free period varies from 145 days in the northern part of the basin to 180 days in the south. Mean minimum temperatures occur in January, with mean maximum temperatures occurring in July. Annual precipitation also varies considerably, with extremes ranging from 20 inches to 72 inches. The heaviest amounts of precipitation usually occur in June or July, with the minimum amounts occurring in October. Although heavy snowfalls may occur, they are usually followed by gradual thawing periods.

D. Geology.

The Monongahela drainage basin is located at the margin of the Appalachian Plateau province up to its eastern edge, known as the Allegheny Front. The Kanawha section of the province, which contains the mainstem of the Monongahela River, is a region of mild structural folding, particularly in Pennsylvania. These structures trend about north 30° east and include (from east to west) the Uniontown Syncline, the Fayette Anticline, the Lambert Syncline, the Brownsville Anticline, the Port Royal Syncline, and the Belle Vernon Anticline. The amplitude of folding diminishes from east to west from about 800 feet at the Fayette Anticline to about 200 feet at the Belle Vernon Anticline.

The western portion of the Monongahela drainage basin lies within a shallow structural basin. This feature is called the Pittsburgh-Huntington Basin and has an elongated axis approximately parallel to the trend of regional folding, or about north 30° east. Bedrock strata dip gently toward the central axis of the structural basin; formations of Permian Age are exposed throughout the central part.

From Point Marion to Pittsburgh, PA, the channel of the Monongahela River assumes a due north course. Bedrock structures in this portion of the river are mild and do not exert a major influence over the channel direction, except for occasional segments. From r.m. 90 to 70, the river cuts obliquely across the Lambert Syncline and the Brownsville Anticline. The Monongahela turns to follow a northeast trend along the axis of the Port Royal Syncline from r.m. 70 to 47. Between r.m. 47 and 0.0, the river follows the northeastern edge of the Pittsburgh-Huntington Structural Basin. The anticlinal and synclinal folds are so gentle that their structural influence on the channel direction is negligible.

The topography of much of the Monongahela River Basin is rough, and many areas are sloped at varying degrees of steepness. The process of erosion usually prevents or slows down the soil development to the point that most of the organic soils in the region of the Monongahela River are classed as immature (lacking a well-stratified organic profile), with their distinguishing characteristics more or less determined by the nature of the underlying parent materials.

E. Hydrology.

1. Basin Characteristics.

The Monongahela River basin drains 7,386 square miles in northern West Virginia, southwestern Pennsylvania, and northwestern Maryland. The drainage area above Locks and Dam No. 2 at Braddock, PA encompasses 7,337 square miles, or 99 percent of the total basin. The Monongahela River is formed by the West Fork and Tygart rivers at Fairmont, WV. The West Fork and Tygart rivers contribute 881.4 and 1,373.7 square miles, respectively, of the total drainage basin area. The Monongahela flows in a northerly direction for about 128 miles before joining the Allegheny River at Pittsburgh to form the Ohio River.

The Monongahela River has two major tributaries, one of which, the Youghiogheny River, is in the study area. The Youghiogheny River drains 1,764 square miles and enters Pool 2 at McKeesport, PA, r.m. 15.5. The other tributary, the Cheat River, enters Pool 7 at Point Marion, PA, r.m. 89.6, and drains 1,442 square miles.

2. Streamflow Characteristics.

Unregulated stream discharges in the Monongahela River basin show a very wide seasonal variation. The highest flows generally occur from December through April, although it is possible for major floods to occur at any time of the year. The basin can be characterized as low-yielding at base flow with the ground water contribution to stream flow being particularly low in the western portion of the basin. The discharge of unregulated streams is often negligible in the late summer and early fall and low flows can be expected primarily during this period. Discharge extremes and averages for the lower Monongahela River recorded by the U.S. Geological Survey are shown in Table II. In addition to measured extreme flows, a common means of expressing low-flow stream characteristics is the "7Q10," the average 7-consecutive-day, once-in-ten-year low flow. The 7Q10 flow is calculated as 650 cubic feet per second (cfs) at Locks and Dam No. 4 (r.m. 41.5) and 1,150 cfs at Locks and Dam No. 2 (r.m. 11.2).

Table II
Lower Monongahela River
Streamflow Discharge[1]

River Mile	Streamflow Discharge (cfs = cubic feet per second)		
	Maximum	Minimum (daily)	Average
11.2 (Braddock)	210,000 cfs[2]	703 cfs[4]	12,430 cfs[5]
24.0 (Elizabeth)	178,000 cfs[3]	none determined	9,095 cfs[6]

[1]From: U.S.G.S. Water Resources Data PA, Vol. 3, 1988
[2]March 18, 1936
[3]November 6, 1985
[4]September 3, 4, 22, 1946
[5]Period of record: 1938-1988
[6]Period of record: 1933-1988

Five major reservoirs in the Monongahela River Basin regulate a portion of the basin's discharge. Three reservoirs {Stonewall Jackson Lake (1989), Tygart Lake (1938), and Youghiogheny River Lake (1943)} are operated by the U.S. Army Corps of Engineers for a combination of flood control, recreation, and low-flow augmentation for water quality and navigation. Tygart Lake is operated to provide a minimum 340 cfs flow in the Upper Monongahela River, and Youghiogheny River Lake provides a minimum flow of 200 cfs at Connellsville, PA, the control point on the Youghiogheny River. The other two reservoirs, Deep Creek Lake (1925) and Lake Lynn (1926), are owned by private power companies and are operated primarily to produce peak load power of 51 and 19 megawatts, respectively.

One additional, Federal, multi-purpose reservoir has been proposed for the basin, the Rowlesburg Lake project on the Cheat River. Although this project was placed in an inactive status in January 1978, the November 1985 Monongahela River basin flooding stimulated renewed Congressional, state, and local interest in reactivating the Rowlesburg Lake study. The Chief of Engineers has returned the project to active status in response to a specific request from the governor of West Virginia, but restudy funds have not been provided and no study is now scheduled.

3. Channel and Hydraulic Characteristics.

Under historical conditions prior to the advent of slackwater navigation improvements, the Monongahela and neighboring upper Ohio and Allegheny Rivers were characterized as abounding with physical impediments and hazards to all forms of water transport activities. Shallow areas, as a result of sandbar or shoal formation, were numerous. During normal flow conditions, the Monongahela River could apparently be waded, particularly immediately downstream of major tributaries where natural deltas formed. An 1833 river survey and other historical observations substantiate the Monongahela's almost complete lack of islands contrasted with the upper Ohio and Allegheny Rivers. The river meander pattern was relatively gentle as is evident today.

Development of the Monongahela River, primarily for purposes of navigation, has gradually changed its hydraulic characteristics. The earliest forms of navigation improvements consisted of stone wingwalls to concentrate flows and thus increase water depths. Later, snagging and clearing operations to remove the larger boulders and snags were conducted in the earlier part of the 19th century. This was followed by the completion of the first slackwater locks and dams, generally with less than a ten-foot lift, beginning in the 1840s. As the earlier locks and dams deteriorated, they were replaced almost invariably with fewer and larger structures, reaching present-day lifts of as much as 22 feet.

The navigation dams have significantly altered the hydraulic characteristics of the river, particularly under low flow conditions. The effect has been to create almost constant river stages within each pool, accompanied by slight increases in river width and large increases in river depth. Channel thalweg (deepest continuous thread of the river) depths vary from about 15 feet (exclusive of shallower depths in areas of shoal formation) in the reaches immediately downstream of the navigation dams to about 25 to 35 feet in the reaches directly upstream of the dams where slackwater depths are greatest.

Gated dams, e.g., Monongahela River Dam No. 4, are capable of maintaining more stable pool elevations than fixed crest dams. This is accomplished by raising individual gates to pass increasing flows and maintain a stationary river level immediately upstream of the dam.

As flows continue to increase and all the gates are raised out of the river, the river assumes essentially natural flow conditions. By contrast, upstream of fixed crest dams, e.g. Dam Nos. 2 and 3, pool levels rise continuously over the top of the dam as flows increase. As a consequence, elevations of high frequency floods behind gated dams are lower compared to fixed crest dams. However, the difference decreases as the flood's recurrence interval increases; the elevations of the 100-year flood being nearly indistinguishable upstream of either type of dam. Also, because of the greater fluctuation in elevations with flows behind fixed crest dams, the ordinary high water (OHW) zone is higher than behind gated dams. Contrary to a commonly held misconception, gated dams are **not** capable of impounding flood waters to reduce downstream flood elevations. The function of the gates is to maintain a relatively constant upstream pool elevation while passing higher flows downstream.

F. Significant Resources.

The following resources are considered significant to the scope of this study based upon institutional, public, or technical recognition. Institutional recognition includes identification in Federal, state, or local laws, regulations, and guidelines. Significance based on public recognition means that some segment of the public recognizes the importance of a resource. Technical recognition means that characteristics of a resource are deemed significant through scientific or technical knowledge or judgement.

1. Water Quality.

The Monongahela River is a complex headwaters system whose water quality is significantly influenced by its four major tributaries and surrounding human developments. The tributaries include the Tygart and West Fork rivers whose juncture forms the Monongahela River, and the Cheat and Youghiogheny rivers. The river has been heavily modified over the past 150 years and bears little resemblance to a "natural" river. The first major modification of the Monongahela River took place from the 1840s to 1903 with the construction of locks and dams creating a slackwater environment over its entire length from Pittsburgh to Fairmont. This ended the severe seasonal fluctuations in water levels, but changed the free flowing nature of the river to a series of shallow, flowing impoundments. The resulting consistent year-round water supply and transportation system encouraged industrial development, and from the late 1800s through the 1960s water demands and effluents of both industries and communities seriously degraded the Lower Monongahela River. At the same time, acid mine drainage from most of the basin severely degraded the entire mainstem. The severity of these impacts was such that by 1900 the river barely supported aquatic life, and much of the native aquatic fauna had been extirpated.

In recent years there has been a dramatic improvement in Monongahela River water quality and aquatic life through abatement of acid mine drainage, domestic and industrial sewage treatment, and the loss of much of the steel industry. However, there are still substantial domestic and industrial pollution problems in the Lower Monongahela River which are most evident during summer low flow conditions.

Water quality problems in the Lower Monongahela River study area include elevated temperatures, reduced dissolved oxygen, elevated iron and sulfate ions, and high levels of turbidity and dissolved solids. All of these parameters are affected by the flow levels of the river. Also, contaminated substrates have been identified with polychlorinated biphenyls (PCBs), chlordane (an organochlorine pesticide), and aromatic volatile organic compounds being of greatest concern.

In general, at intermediate flows or greater, the Monongahela River exhibits a gradual downstream warming and little vertical temperature variation. At low flows, when pool retention times increase, the temperature pattern is significantly modified by industrial discharges and tributary inflows. For example, the thermal discharges from two coal-fired electric generating stations significantly elevates summer low flow period water temperatures in the lower end of Pool 3. As this warmer water travels downstream, it overflows the cooler, denser inflow of the Youghiogheny River in Pool 2 producing thermal stratification. This pattern, however, lasts only a short distance before it is effectively broken by passage over Dam No. 2. Another factor working against thermal stratification is the turbulent mixing influence of navigation traffic on the relatively shallow pools of the Lower Monongahela River.

Closely related to the temperature problem is the level of dissolved oxygen in the river. In the lower portion of Pool 3, the effects of biochemical oxygen demanding wastes from point and non-point sources, and the heating of the river by power plants and industry become obvious at low flow. Thermal pollution intensifies the dissolved oxygen problem in this reach because the solubility of gases in water varies inversely with water temperature. In Pool 2, an oxygen deficiency in the lower levels of the pool becomes progressively more extreme moving downstream until the cooler, well aerated water from the Youghiogheny River disrupts its progression. Passage over Dam No. 2 provides mixing and moderates dissolved oxygen stratification.

Until recently, the Monongahela River was severely degraded by acid mine drainage from its head at Fairmont, West Virginia to its mouth at Pittsburgh. By the mid-1970s, abatement of acid mine drainage in the Monongahela River Basin had reduced pH problems considerably. Corps of Engineers pH readings in Pool 2 from 1975 to 1988 range from 6.5 to 7.9, with most readings above 7.0.

A significant source of acidity to the mainstem is the Cheat River. Acidic conditions can develop downstream of the mouth of the Cheat River when the flow above the mouth is low and cannot dilute and neutralize the acidic Cheat River water. At low flow periods, the travel time below the Cheat River is relatively slow which allows the acidic discharge to be retained and concentrated in the Pool 7 area. By the time these flows reach the Lower Monongahela, however, the pH is near neutral or basic. When Monongahela River flows are at intermediate levels, the acidic inflow from the Cheat River is quickly neutralized in the mainstem and only a slight pH depression is observed in the Pool 7 area.

A detailed water quality report on the Lower Monongahela River is included as EIS Appendix A.

2. Ground Water.

The water-bearing alluvial fill in the Monongahela and Youghiogheny valleys has a maximum average thickness of 65 feet, but depths in excess of 80 feet are recorded in some wells in the McKeesport and Duquesne areas. The top 0-25 feet of the thicknesses are fine-grained silt deposits of recent age. The basal section of the alluvium is generally very fine-grained and, in many areas, is indistinguishable from the more recent deposits. In some instances, however, coarse sand and gravel lenses and channels are enclosed in the finer sediments. Coarse, permeable units may be found in the otherwise fine-grained deposits.

3. Wetlands.

Because of its steep topography and decades of developmental flood plain growth, large expanses of wetlands are generally not found along the Lower Monongahela River. Due to the absence of islands and embayments in the study area, those wetlands which do occur are confined to the shoreline and tributary mouths. Despite the limited area available for wetland development, however, it is noteworthy that the Monongahela River supports almost all of the aquatic beds of submerged aquatic vascular plants in the District's navigable waters which include the Allegheny and upper Ohio rivers. Although the majority of the Monongahela River's wetlands occur in West Virginia upriver of the study area, there is a significant concentration of emergents and submerged aquatic beds in Pool 3. The lower Allegheny and upper Ohio rivers support emergent wetlands, but have few aquatic beds.

From April 23 - May 8, 1991, the District performed a wetland delineation for Pools 2 and 3, r.m. 11.2 - 41.5, and for three proposed upland disposal sites. The delineation was performed using the routine on-site determination method described in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands*, published in 1989. In accordance with this method, dominant vegetation was determined, soils examined and hydrology established. The field investigations revealed that, in general, along the relatively undisturbed portions of the shoreline, a wetland band covered the area between the normal pool level and ordinary high water line. This zone averaged 40 to 60 feet in width. Wetland types in this zone included aquatic bed, emergent, shrub-scrub and forested. Typical plant communities in these areas were a mix of wetland obligate, facultative wet and facultative species, as would be expected along frequently inundated flood plain areas. No submergent plants were visible during the field evaluation. Areas of emergent vegetation were identified in shallows and along the river shoreline. Based on a review of available information, including examination of aerial photographs and navigation charts, and the site visits, it was determined that 80 acres of riparian wetlands exist along Pool 2 and 165 acres of riparian and submergent wetlands exist in Pool 3.

Examination of the two proposed disposal areas, Coursin Hill and Bunola, did not provide evidence of wetlands at the former, but yielded two small wetlands (approximately 2.4 acres total) at the latter. The third proposed disposal area, Dunlevy, has about nine acres of wetlands in 11 separate tracts. Because of the potential for impact to wetlands at the Dunlevy site, the District eliminated it from further consideration as a potential disposal site.

A separate, detailed report on the wetlands of the Lower Monongahela River is included as EIS Appendix B.

4. Aquatic Habitat.

The aquatic habitat of the Monongahela River can be segmented into five zones, the *main channel*, the *main channel border*, and the *shoreline-debris zone* which occur across the river channel, the *tailwater zone* which occurs below each lock and dam, and the *creek mouths and flooded channel zone* which is poorly represented in the project area. Another typical riverine zone, the *side channels, sloughs, and embayment zone* is absent entirely from the Lower Monongahela River. These river channel zones include the substrate and the overlying water column.

With the improved water quality in the Lower Monongahela River, the aquatic substrate may be the single-most significant factor in the continued growth of the fishery. Although species of fish may use all the various aquatic habitat zones during one or more of their life history stages, spawning success was deemed to be most critical to the evaluation of aquatic habitat and the impacts of project alternatives. The following discussion, therefore, emphasizes the value of the aquatic habitat zones for fish reproduction.

The *main channel* includes the designated navigation channel (minimum width, 300 feet) and additional areas where the water depth is greater than nine feet. The substrate consists primarily of sand, although silt, gravel, rubble, and bedrock may be present. This zone is constantly scoured by tow traffic and is believed to be of limited value regarding reproductive success. The *main channel border* is a transitional area between the *main channel* and *shoreline-debris zone.* The substrate is often sand or silt, but occasional deposits of gravel or rubble may occur. This typically narrow zone is apparently used successfully for spawning by freshwater drum, emerald shiner and gizzard shad.

The *shoreline-debris zone*, which may also be called "shallow water habitat," extends from the shoreline riverward to up to 150 feet. Water depths range from 0 to about five feet which is the approximate limit of light penetration during the summer growing season in the project area. This zone is characterized by the presence of organic debris, such as sunken logs and branches, and the occasional presence of rooted aquatic vegetation. In the project area, this zone's substrate varies from a hard rocky bottom, through coarse gravel and sand, to silt depending on site specific currents. Sediments collected in 1989 at many stations in the project area exhibited oil contamination, and the U.S. Fish and Wildlife Service observed in 1987 oil and organic contamination in the Lower Monongahela River substrate, in addition to high levels of slag and coal fines. This zone receives the most use by reproducing fishes when suitable substrate is available. In Pools 2 and 3 there is an estimated 308 acres of existing shallow water habitat.

The majority of the spawning of the walleye and sauger is believed to occur in the *tailwater zone*. Turbulence and currents which provide a clean substrate and oxygen-rich water attract fish to this zone, while the dams act as barriers to some of the more migratory fish such as sauger and walleye. The more concentrated use of this area compared to the navigation pools is reflected in significantly greater fishing success in dam tailwaters. Spawning success of walleye in the Lower Monongahela River cannot be determined from available survey data because of the substantial yearly stocking efforts by the PFC and local fish clubs. Based on substrate coarseness as determined by sampling below Locks and Dam No. 3, the Dam 3 tailwater extends one-half mile below the dam. Between one-half and one mile below the dam is a transitional area where the percent composition of cobble and gravel rapidly decreases. Below one mile, sands and silts dominate the substrate composition.

Creek mouths and flooded channels are in short supply in Pools 2 and 3. Turtle Creek and the Youghiogheny River are the two main tributaries in this reach, and both are in Pool 2. Minor tributaries include Peters Creek (Pool 2) whose mouth is culverted under the Clairton coking works and Pigeon Creek (Pool 3). In the absence of backwaters, these areas become crucial to nest building species such as the smallmouth bass and sunfishes (*Lepomis sp.*). The lack of backwater habitat and flooded creek mouths in the project area is probably the limiting factor for these species.

5. Terrestrial Habitat.

The Lower Monongahela River study area is heavily developed with large riverside industrial plants and extensive urban lands. A narrow band of riparian vegetation persists along the water's edge, even in the heavily developed sections. The riparian areas are dominated by black willow and silver maple, and to a lesser extent, sycamore and box elder. Numerous concrete walls, large docks, and slag piles line Pool 2. In the study area, development is primarily restricted by topography to the flood plain on the inside of the river bends. The bank opposite the developed flood plain is typically a steep, forested hillside.

Land cover maps of the river corridor in the study area were prepared by the U.S. Fish and Wildlife Service in 1981. Five classes of habitat other than wetlands were delineated using a U.S. Geological Survey land cover classification system: *Urban or Built-up Land, Agricultural Land, Rangeland, Forest Land, and Barren Land.* Wetlands are described separately in "IV.F.3. Wetlands," and in Appendix B. The predominant cover type is urban, which includes residential, commercial, industrial, and transportation usages. This cover type occupies most of the developable flood plain and lines both river banks. Steep undeveloped hillsides and the small amount of undeveloped flood plain classified as forest land comprises the second largest cover type. *Rangeland, Barren Land* and other vegetated disturbed lands represent a minor percentage of the area. *Agricultural Land* is all but missing from the river corridor. The few areas classified as agricultural could better be described as garden plots.

The sites of Locks and Dam Nos. 2, 3, and 4 are classified as *Urban or Built-up Land, Transportation*. Federal land holdings outside of the navigation structures are minimal, and are kept primarily as mown lawns. The proposed replacement site for Locks and Dam No. 3 under Plan No. 4 contains a mixture of cover types, including *Urban or Built-up Land, Industrial; Barren Land; and Forest Land, Deciduous Forest*. The industrial areas are primarily used for bulk materials handling and storage. The barren areas include recent (as of 1981) dredged material disposal. Since this area was photographed and classified, these disposal areas have naturally revegetated and provide wildlife habitat of reduced value. Each of the three cover types occupies about one-third of the total area.

The proposed disposal areas, Coursin Hill and Bunola, all have a variety of cover types. *Deciduous Forest*, the predominant cover type, *Industrial*, and *Residential* are common to both sites. The Coursin Hill area includes a forested ravine dominated by a mature stand of red oak with little ground or shrub cover. A small perennial stream drains the ravine. The *Residential* component (nine residences) is at the lower end of the ravine, and the *Industrial* component, a bulk materials handling area, occupies the flood plain terrace along the river at the mouth of the ravine. The Bunola area includes a forested flood plain terrace and extends up a narrow valley with three branches. These branches contain a mixture of cover types, *Deciduous Forest*, *Industrial* (old strip mined area and an automobile junkyard), and *Residential* (five residences). Wetlands occur only at the Bunola site.

6. Fish and Wildlife.

Until 1970, the Monongahela River Basin was considered the watershed most intensely polluted by acid mine drainage in the United States. In addition to upper river acidity sources, water quality in the lower river was further degraded by numerous inadequately treated industrial and urban discharges. The Monongahela River aquatic community was greatly suppressed as a consequence of this long-term degradation of water quality.

Based on lock surveys spanning the past 20 years and recent sampling results, the lower Monongahela River fishery has shown marked improvement. Sampling results indicate that many fish species are increasing in abundance where gravel and rocky substrates exist. Species diversity has also steadily increased over the past 20 years. Although the physical habitat has not changed substantially, improved water quality has allowed many species to return to the river.

During a study conducted by the NUS Corporation at West Penn Power Company's Mitchell Power Station (r.m. 29.4) during 1981 and 1982, approximately 415 fish were collected, with 16 different species represented. The dominant fish were gizzard shad, freshwater drum, emerald shiners, channel catfish, bluegill, and white crappie. Subsequent sampling by the U.S. Fish and Wildlife Service in 1984, 1985, and 1988 uncovered further increases in abundance and species diversity, especially in the lower two pools of the Monongahela River. The most recent sampling yielded healthy populations of channel catfish, smallmouth bass, spotted bass, and walleye. Further information on the current status and remarkable recovery of the lower Monongahela River fish community is available in the *Fish and Wildlife Coordination Act Report Assessing Impacts of Proposed Modifications to Locks and Dams 2, 3, and 4, Lower Monongahela River Navigation Project, Allegheny, Westmoreland and Washington Counties, Pennsylvania* (reference: Feasibility Report, Appendices).

The benthic macroinvertebrate community in the Monongahela River also evidences marked improvement. A study conducted during September and October 1988 in the lower 40 miles of the Monongahela River yielded a diverse invertebrate community of 139 taxa. These included hydras, roundworms, moss animals, flatworms, spiny-headed worms, leeches, aquatic worms, crustaceans, insects, snails, and clams. Of the 139 taxa, 72 taxa were arthropods, insects, and crustaceans, and 54 taxa were leeches and aquatic worms. The macroinvertebrate community of the Lower Monongahela River can be characterized as aquatic worm/midge/Asiatic clam dominated. The Asiatic clam, *Corbicula fluminea*, is an exotic bivalve species which has colonized the area's waterways in recent years, and is considered a nuisance by utilities and industries for fouling water cooling systems. It is more of a problem on the Ohio River than the Monongahela River.

Native freshwater mussels (*Unionidae*) are not well represented in the Lower Monongahela River. Around the turn of the century, industrial and municipal pollution was blamed for elimination of freshwater mussels from the river. Through 1985, no living mussels were found in the lower river. However, in a 1988 study, *Anodonta imbecilis* was found at three of 16 locations sampled. The improved water quality appears to have allowed some recent isolated recolonization, though the lack of clean, suitable substrate is a limiting factor.

Many of the collected taxa were intolerant of pH values below 5.0 and of organic pollution. As stated in the Fish and Wildlife Service coordination act report, the improved water quality, increased fish population, and greater benthic community species richness appear to be positively correlated.

Studies monitoring the contamination of fish flesh (channel catfish and carp) between 1978 and 1985 indicate a decreasing contaminant burden in the fishery. Coupled with the increasing numbers of game fish in the river, this trend is encouraging. However, although 1985 levels of PCBs and chlordane in fish flesh are lower than previous studies, they are still relatively high and could be expected to cause adverse impacts to sensitive wildlife species.

The Pennsylvania Fish and Wildlife Database lists 47 species of mammals, 260 species of birds, 58 species of reptiles and amphibians, and 65 species of fish that may be present in this region. However, limited habitat for wildlife restricts numbers of individual species in the study area. The more conducive habitats for colonization by less-urbanized wildlife species are limited to the scattered woodlands and steep hillsides along the river. Forested areas along the lower river support wildlife that is tolerant to humans (including the gray squirrel, raccoon, opossum, Norway rat, eastern cottontail, small rodents, English sparrows, starlings, and pigeons). Habitat is also provided for many migrating birds.

Another prospective member of the aquatic community is the zebra mussel, *Dreissena polymorpha*, a small freshwater mollusk. This exotic species has rapidly colonized the Great Lakes and may invade other drainage basins such as the Monongahela River because of its effective dispersal capacities. Filter feeders with voracious appetites, they can decrease the phytoplankton content of the water to a degree that it could affect the river's food web dynamics. Thick encrustations on the shells of native mussels are believed to contribute to their death, which has serious implications for their survival or potential for recolonization of former ranges. The zebra mussel's ability to attach to any firm surface also has serious implications for water users through obstruction of intakes and valves, and encrustation of boat hulls, buoys, docks and piers.

7. Endangered and Threatened Species, and Species of Special Concern.

Three federally listed endangered birds are expected to be found as transient species in the project area. They are: Bald eagle (*Haliaeetus leucocephalus*); peregrine falcon (*Falco peregrinus*); and Kirtland's warbler (*Dendroica kirtlandii*). There is no listed critical habitat for these species in the project area. Kirtland's warbler is not expected as a regular visitor to the project area. The bald eagle may stop to feed and rest along the river during migration. During the summer of 1990, a pair of peregrine falcons was spotted in downtown Pittsburgh, and in the spring of 1991 they established a nest in the downtown area.

The project is within the historic range of the Indiana bat (*Myotis sodalis*), but there are no populations of this species known to occur there. The distribution of this species is strongly correlated with the major rivers within its range and it has been postulated that the major rivers are navigation routes for the Indiana bat. Small nursery colonies have been located in some areas under the loose bark of dead trees. Although suitable habitat for nursery colonies may be found within the project area, there is no evidence that any Indiana bat nursery colonies exist in the project area.

Although there have been no recent collections of endangered mussels from the Monongahela River, the following federally-listed species have historically occurred in the project area: Rough Pig-Toe (*Pleurobema plenum*) and the Ohio Orb Shell (*Lampsilis orbiculata = L. abrupta*). Also, in addition to these species, the Orange Footed Pearly Mussel (*Plethobasus cooperianus = P. striatus*) has historically occurred in the upper

Ohio River. The U.S. Fish and Wildlife Service tested for mussels in 1985, and found no evidence, past or present, of native freshwater mussels in the upper 40.0 miles of the mainstem of the Ohio River or in the lower 41.5 miles of the Monongahela River. However, in 1988, *Anodonta imbecilis* was found in three locations along the Lower Monongahela River during benthic macroinvertebrate sampling. Research literature indicates that the freshwater mussel populations in the Lower Monongahela River were eliminated by water pollution around the turn of the century. Recent improvements in water quality and the fishery indicate that conditions may be suitable for repopulation of mussels. However, given the limited habitat available and the great distance to existing populations (seed sources), it is not likely that native mussel populations will increase significantly in the near future.

Species of special concern are those species designated as endangered, threatened, or of special concern by the Commonwealth of Pennsylvania, and listed in the Pennsylvania Natural Diversity Inventory (PNDI) - plant listings maintained by the Pennsylvania Bureau of Forestry and the Western Pennsylvania Conservancy, or the Pennsylvania Biological Survey - animal listings maintained by the Pennsylvania Fish Commission and Pennsylvania Game Commission. Species of special concern likely to be found in the study area are listed in EIS Appendix C. Fish species of special concern collected from the Lower Monongahela River include the river redhorse (*Moxostoma carinatum*), longnose gar (*Lepisosteus osseus*), freshwater drum (*Aplodinotus grunniens*), spotted bass (*Micropterus punctulatus*), ghost shiner (*Notropis buchanani*), smallmouth buffalo (*Ictiobus bubalus*), and warmouth (*Lepomis gulosus*).

8. Soils and Sediment.

Prime Farmland.

There are no designated prime farmland soils at the existing or proposed lock and dam sites, or at the proposed disposal areas.

Hazardous and Toxic Waste Sites.

Hazardous and toxic waste (HTW) sites were identified in areas of potential project impact which included the river from the vicinity of Locks and Dam No. 2 to the vicinity of Locks and Dam No. 4, and the potential disposal areas. Along the river, all sites within one-quarter mile from the top of bank were identified. An initial site listing was prepared with the aid of the U.S. Environmental Protection Agency's (EPA) Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS). The Pennsylvania Department of Environmental Resources (PaDER) reviewed the list for the purpose of adding or deleting sites, and to further characterize the nature of materials retained at each site. A total of 22 sites have been identified bordering the river (see Appendix F). No known sites are located in the Bunola and Coursin Hill potential disposal areas.

Sediments.

The predominant source of sediment supply in the Monongahela River basin is area-wide sheet erosion. Localized erosion and sloughing of stream banks, degradation of stream channels and flood plains, and gully formation represent lesser sources of sediment supply. Some of the sediments produced in upland areas through sheet and other forms of erosion are permanently trapped in major reservoirs upstream of the project reach. Other sediments are temporarily deposited on flood plains and in stream channels where they represent future sources of sediment supply to the main river channel.

During low and intermediate flow conditions, which occur the majority of the time, the primary sediments in tributary streams are fine sand, silt, and clay-sized particles supplied by sheet erosion. These materials either result from immediate runoff or from channel erosion of bars and shoals formed during previous recessions of flood flows. Most of these fine soil particles are transported as suspended sediment by turbulent action, which is primarily influenced by the velocity of the flow, although small quantities of coarser grained particles (fine sand and larger) are transported as bed load.

During flood conditions, higher flow velocities result in much greater transport of sediments in the upstream watershed and tributary streams, both in suspension and as bed load. The high flow in combination with high sediment concentrations can result in greater quantities of suspended sediment production from upstream areas during a single major flood lasting several days than for a period of a year or more of low and intermediate flows. Bed load movement can also be very high during major flood flows. Forces generated by the November 1985 flood, for example, removed years of accumulated sediments from creek mouth deltas such as the Peters Creek bar at r.m. 19.6.

The proportion of sediments transported into the project reach that are actually deposited therein to cause shoaling problems varies with the sediment size and flow conditions. During lower flow conditions, most of the suspended sediments transported into the project reach are deposited because of considerably lower velocities in the Monongahela River than in its tributaries. Small quantities of bed load material entering the Monongahela River under low flow conditions are likewise deposited.

During intermediate flow conditions, a greater proportion of the suspended sediments entering the project reach remain suspended to be transported downstream into the Ohio River. However, little bed load movement is expected to occur in the Monongahela River.

During high flow conditions, fine sand and smaller sediments supplied to the project reach in large quantities as suspended matter from tributary streams or deposited by previous low and intermediate flows are largely transported downstream into the Ohio River. However, some silts and most of the larger particles - sands, gravels, and cobbles - are largely deposited in the form of natural deltas near the mouths of tributaries or in downstream areas of reduced velocities. This is the case in particular during the recession of flood flows. Areas of reduced velocity where shoals may form include the inside of channel bends and the entrances and exits to lock chambers where flow is restricted.

Commercial traffic on the river churns up bottom sediments to some degree, suspending them for movement downstream, and wave action from commercial and recreational traffic suspends shoreline sediments. These man-made influences affect and modify to varying degrees natural patterns of sediment suspension, transport, and deposition. The magnitude of the effect depends on many factors, such as flow, channel depth, river width, and frequency of use.

Based on past experience with navigation system operation and maintenance, it can be inferred that river bottom sediment quality tends to mirror the history and intensity of urban and industrial pollution paralleling the watercourse. As a consequence, one would expect that sediments in the Lower Monongahela River would contain higher contaminant levels than less urbanized river segments.

To provide additional insight on contaminant levels, potential dredged material from the navigation channel was sampled at nine locations between r.m. 23.8 and 41.5. The samples were analyzed for U.S. Environmental Protection Agency designated "priority pollutants." The sampling locations represented perceived "worst case" situations within the navigation channel (i.e., proximity to suspected pollution sources and drinking water intakes, location of new navigation facility construction, and areas of maximum proposed dredging). One ten-foot core sample from the channel substrate and one background water sample (taken just above the water-sediment interface) were collected at each sampling location. Surface and maximum depth subsamples were taken from each core; additional subsamples were taken of any observed fines or clay layers.

The data collected during this investigation demonstrated that with the exception of some scattered and relatively thin lenses of dense clays the substrate of the navigation channel study reach of Monongahela River Pool 3 consists primarily of coarse sand and gravel sized particles. Perhaps because of the coarseness of the substrate, and in spite of the river's long history of intense industrial activity, the sediments of the navigation channel proved to be remarkably clean of priority pollutant contaminants. Further discussion of the study results can be found in *Monongahela River Pool 3, Investigation for the Presence of Priority Pollutants in the Navigation Channel Substrate*, published by the Pittsburgh District in July 1990.

Sediment analyses to date have focused on mid-channel areas that would be dredged to restore navigable depth, and which comprise the majority of dredging with alternative plans involving pool alterations. These analyses have not yielded contaminant levels that would warrant special handling and disposal of dredged material. Further analyses of sediments will be undertaken in areas outside the navigation channel, e.g., in areas of proposed abutment and lock excavation, to examine for the presence of contaminants. Based upon historical use in Pool 4 and a cursory sediment sample examination above the Dam 2 abutment, there is no present indication that the materials at Locks and Dam No. 2 and 4 would evidence significant levels of contamination. At Locks and Dam No. 3, however, a known hazardous and toxic waste site (Hercules-Picco) is situated at the dam abutment. The testing of sediments above and below the abutment will determine if the contamination has affected the materials to be disturbed by removal of the dam. The results of this testing will determine the need for special materials handling and disposal requirements.

9. Flood Plains.

Under Executive Order (E.O.) 11988, Flood Plain Management, it has been determined that all of the project alternatives would be situated in the 100-year flood plain. There are, by necessity, no practicable alternatives to river navigation structures outside of the flood plain. Disposal of dredged and excavated material will generally occur outside of the 100-year flood plain.

The 100-year flood plain in the study reach varies in width from approximately 800 to 2,000 feet. Most of the flood plain is urban in nature, with many residences, businesses and industries being located there. Some of the low land areas are brush covered and unused.

There are 42 municipalities located along Pools 2, 3, and 4 of the Monongahela River. The Federal Emergency Management Agency (FEMA), under guidelines of the National Flood Insurance Program (NFIP), has prepared a Flood Insurance Study for all 42 communities. The NFIP and these studies regulate development within the flood plain and are used by local and regional planners to promote sound land use and flood plain development. Maps delineating the 100- and 500-year frequency flood boundaries as well as the floodway along the Monongahela River are included with each study. The floodway is the channel of the stream, plus any adjacent flood plain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights.

10. Recreation.

The study area for purposes of examining recreation and impacts thereon is the Monongahela River and its banks from the "Point" in Pittsburgh to Maxwell Locks and Dam at r.m. 61.2. Although Pools 2 and 3 would be the most directly affected by modification of the lower river's navigation facilities, the adjacent pools (Emsworth Pool below Pool 2 and Pool 4 above Pool 3) influence the use of these pools. A full discussion of Lower Monongahela River recreation is included in EIS Appendix D.

Recreational use of the Lower Monongahela River has been influenced by topography, water quality, industrialization of the flood plains, coal mining and occupation of the river's banks by railroads. Topographically, the Monongahela River Valley is characterized by steep banks on both sides of the river that impede recreational access from riparian sites. The development of the railroads along the river banks has deprived recreationists of access to the river along most of the study area. Water quality has been seriously affected by industrialization and coal mining for over a century. Although the Lower Monongahela River's water quality has recently improved, the provision of access to it has lagged behind.

Generally, the Monongahela River from its mouth upstream to Locks and Dam No. 2 is poorly served by recreational access facilities. Four boat launching ramps are distributed equally on either bank, but there are no docks or marinas. All of the boat launching ramps are near bridges.

The situation in Pool 2 is somewhat better, particularly regarding private facilities. Of the five public boat launching ramps in Pool 2, three are on or associated with the right bank (two are on the Youghiogheny River) and two are on the left bank. All are in the center reach of the pool. Also in the center to the upstream reach of the pool on the right bank are one marina and two boat clubs. In the same section of the river are seven small private boat docks and two private boat launching ramps. Eight of these are on the right bank, while one ramp is on the left bank. There are bridges reasonably near to all of these twelve recreation facilities.

In Pool 3, both public and private access to the river is much more adequate than it is downstream. There are nine public boat launching ramps which are distributed throughout both banks from about r.m. 25.0 to 41.5. The ramps upstream of r.m. 35, however, have access and parking constraints and are in general need of improvements. About mid-pool is the Monongahela City Aquatorium, a public amphitheater on the left bank. Private facilities in the pool include two boat clubs, seven commercial marinas (six of which are on the right bank, six of which are in the lower half of the pool, and five of which have boat launching ramps), two boat launching ramps, and at least 14 private docks ranging in capacity from one to six boats in the middle and upper reaches of the pool. Many of these small docks are related to two riverside residential developments. There is evidence of recent substantial growth in the number of private recreational facilities in Pool 3, much of which appears to be attributable to these subdivisions. All of the pool's recreation facilities are located reasonably near to bridges.

Pool 4 is also reasonably well served by access facilities, but all of them are on the left bank, and there are bridges only at the upper and lower ends of the pool. Interspersed throughout the lower three-quarters of the pool are five public boat launching ramps and one public boat dock. Two boat clubs are located in the lower part and middle of the pool, while five commercial marinas, each of which has boat launching facilities, are available throughout the pool. There are two private boat docks within two miles of Locks and Dam No. 4, however, one of these appears to be actually operating as a small marina.

There is evidence in the available facility development records that, over the past two decades, growth in the recreational use of the Monongahela River has increased substantially despite the declines in the riverside communities. This growth is attributed to metropolitan Pittsburgh and the remainder of Allegheny County, and to a lesser extent, the surrounding counties. The number of all kinds of facilities, public and private, has increased. Particularly numerous are new marinas and small private docks in Pools 3 and 4. The connection of some of these new marinas and private docks to residential subdivisions appears to be a relatively new phenomenon along the Monongahela River. These subdivisions have been a motivating factor in an acceleration of recreation development in the two pools, and some of them have many lots with river frontage that have yet to be developed. The upward trend in recreational usage of Monongahela River Pools 2, 3 and 4 can generally be expected to continue. Current economic conditions may slow the rate of increase temporarily, but over the next decade the trend will probably continue.

Based on the recreation visitation figures shown above and the inventory of recreational facilities available, the number of public facilities appears to be adequate and can be expected to remain so well into the future. Problems with recreational opportunities more involve their distribution throughout the pools of the study area and their quality including the ease and safety with which they may be used. Private facilities in the study area are much closer to capacity than public ones. Usually, however, the private sector is able to provide needed private facilities more quickly than governments can provide new public ones. Although some areas suitable for private facilities are becoming saturated, there are still adequate reserves to satisfy a reasonable amount of future demand.

A significant amount of fishing occurs in all of the pools of the study area. There are a large number of sites along the Lower Monongahela River that are regularly used for fishing. Most of these are merely places along the riverbank that people are able to reach and where they fish undisturbed. Fishing access as provided by these impromptu sites and the existing developed recreation sites seems to be adequate. The availability of fishing opportunities tends to partially regulate the activity, and the addition of opportunities would probably stimulate a small amount of latent demand. In the study area, though, activity occurrence is controlled more by the quality of the resource than by access opportunities.

At Locks and Dam No. 2, no fishing except by boat below the dam occurs in the immediate project area. In this case, the limiting factors appear to be a lack of access and suitable space, because the tailwater fishery should also attract bank fishermen. Fishing occurs immediately above and below the land wall on the right bank and above and below the dam from boats at Locks and Dam No. 3. A large chemical plant adjacent to the abutment prevents fishing access on the left bank in the vicinity of the dam. The locks have road access, but only by lease from the railroad and only for Corps of Engineers operations. At Locks and Dam No. 4, fishing from the dam abutment is popular, although legal public access to the site is not available. Fishing also occurs from boats below the dam. Access to the locks by road is available only for Corps of Engineers operations, so fishing does not occur near the project on the right bank.

11. Scenic Rivers.

The Pennsylvania Scenic Rivers Inventory, revised in April 1987, lists the Monongahela River from Point Marion to Pittsburgh (r.m. 91 - 0) as a proposed Modified Recreation

Classification, Priority Group 3. A Modified Recreation river is considered to have the capability to maintain recreational use, as well as certain levels of residential, commercial, and industrial use which would not degrade the recreational aspect. The criteria for the Modified Recreation Classification are:

> Modified recreational rivers may contain calm water that can be or is being restored to support appropriate water-based recreation, aquatic and fish life. Shoreline development may be extensive provided it does not inhibit public use or detract from enjoyment of the river. The river shall be readily accessible.
>
> 1. Impoundments. Water may have characteristics of an impoundment. Flow may be regulated by upstream control devices. Low dams are permitted if the river remains in full-bank width during periods of normal flow.
>
> 2. Water Quality. Water quality should be capable of meeting minimum criteria for desired types of recreation, except where such criteria would be exceeded by natural background condition. In addition, the water should be capable of supporting propagation of aquatic life normally adapted to the stream habitat or in the process of being restored to that quality.
>
> 3. Development. Shorelines may be extensively developed. Lands may include small communities as well as dispersed or clustered residential, commercial and industrial development.
>
> 4. Accessibility. Water shall be readily accessible. Combinations or paralleling roads or railroads, bridge crossings, and river access points are permissible.

The listing of the Monongahela River in the Pennsylvania Scenic Rivers Inventory identifies it as a potential component of the Scenic Rivers system but does not convey it Scenic River status. Future detailed waterway studies to determine the significance and eligibility for inclusion in the Scenic River system, and to recommend legislation needed for designation are undertaken on a priority basis.

State waterways are categorized into three priority groups; the Monongahela River has been assigned Priority 3. This group and Group 2 indicate a waterway considered to be of local or regional significance while Group 1 indicates Statewide or even National significance. The lower priority ratings do not equate, however, to a de-emphasized need for protection.

12. Social Resources.

Socio-Economic Conditions.

The project area is an old industrial area characterized by massive steel mills, numerous small business districts, and old residential neighborhoods. The project area includes 15 communities in parts of three counties, all in Southwestern Pennsylvania. A listing of these communities is provided in Table III (see also Appendix H, Study Area Maps).

During the 1980's, a majority of the steel mills in the area were closed with the expectation that they would either be demolished or sold. The closed steel producing plants include those at Duquesne, McKeesport, Clairton, Donora, and Monessen. The closures resulted in the loss of tens of thousands of jobs for the people who lived in the area and the loss of a significant tax base for the local communities. At present, there are few opportunities in the area for alternative employment or sources of revenues.

Table III
Communities in Project Area

Allegheny County	Washington County	Westmoreland County
Clairton	Donora	Monessen
Dravosburg	Elrama	Webster
Duquesne	Monongahela	
Elizabeth	New Eagle	
Glassport	North Charleroi	
McKeesport	Charleroi	
West Elizabeth		

The loss of opportunities for employment in the steel mills exacerbated the historic trend of population declines in many of the project area communities. From 1950 through 1990, Duquesne and Clairton lost more than half of their populations. Many of these losses were due to movements to outlying communities where the quality of life was considered to be better. However, from 1980 to 1990, the 15 communities in the project area lost 12.8 percent (Table IV) of their populations with most of the losses reflecting out-migration to areas where employment opportunities were greater. The out-migration, which consisted primarily of younger people, along with the loss of the tax base due to the closure of the mills, left these communities with a predominantly elderly and low-income population unable to afford even the most basic of government services, such as local police protection. In 1975 the city of Clairton had 32 full-time police officers, but today (1991) it has none. The city is patrolled by the state police. While the situation is not as drastic in the other communities, the revenues available to provide services are generally more limited than they were in the past.

Table IV
Population in the Project Area

Community	1980	1990	Percent Change
Clairton	12,188	9,656	-20.8
Dravosburg	2,511	2,377	-5.3
Duquesne	10,094	8,525	-15.5
Elizabeth	18,161	16,322	-10.1
Glassport	6,242	5,582	-10.6
McKeesport	31,012	26,016	-16.1
West Elizabeth	808	634	-21.5
Donora	14,114	12,531	-11.2
Elrama	5,521	5,421	-1.8
Monongahela	12,540	11,321	-9.7
New Eagle	2,617	2,435	-7.0
North Charleroi & Charleroi	16,478	15,071	-8.5
Monessen & Webster	15,837	13,307	-16.0
TOTAL	148,123	129,198	-12.8

Community Development and Navigation.

The communities in the project area developed in the late 1800's in response to the development of the local steel industry. In turn, the steel industry developed in the area due to the abundance of coal in the Monongahela Basin and the ability to transport the coal into the area by barge. Barge transportation was possible because of the construction of a series of lock and dam projects on the river that made it navigable year-round.

While coal is still transported on the river, its principal use has shifted from fueling area blast furnaces to producing coke and electricity. Two large coal-fired electric generating stations are situated along Pool 3 in the project area and these plants depend on the navigation system for transportation. Despite the closure of many area mills, the area still contains significant coke producing capacity. The coke plant at Clairton is the largest plant of its kind in the country. Like the electric plants, the coke plants also depend on the river for transportation.

In addition to its use by industry for transportation, the river is also used for municipal and industrial water supplies, recreational activities, and water runoffs. All of these uses of the river require facilities that may be affected by changes in pool levels.

Shoreside Facilities.

In 1986, an inventory and evaluation of shoreside facilities between r.m. 11.2 and 41.5 which could be affected by the various study alternatives was undertaken. The facilities evaluated included docks (commercial, public, and private), water intakes, bridges, and the following miscellaneous structures: barge moorings, launching ramps, power towers, settling basins, riverfront parks, pipelines along the river, ore bridges, aquatoriums, barge unloaders and coal hoists, shipyards, marine ways, boiler/power houses, substation foundations, and guy wire piers. Subsequent studies examined outfalls, pipeline crossings, and bank protection.

Seventy-seven docks of various construction are located within the limits of the 30.3-mile study area. With the exception of the reach below Locks and Dam No. 2, this reach of the Monongahela River probably has one of the highest concentrations of commercial docks and mooring facilities on the river (total = 59). Coal is the primary commodity transported, and also significant quantities of petroleum products, limestone, sandstone, sand and gravel. There are 16 private docks and facilities in the study area all of which are situated between r.m. 15.9 and 36.3. Two public docking facilities are operated by the Borough of Elizabeth and the City of Monongahela. In addition to these facilities on the Monongahela main-stem, there are three recreational docks along the Youghiogheny River near its mouth in McKeesport.

Twelve bridges cross the Monongahela River in the study area - four railroad bridges, one county highway bridge, and seven state highway bridges. The railroad bridges are the oldest in this group (ca. 1890 and 1902). The two oldest state highway bridges (ca. 1905) are listed on the National Register of Historic Places (see "IV.F.13, Cultural Resources"). The newest bridge is the Monongahela Bridge at r.m. 32.4, built in 1987.

There are 22 industrial and municipal water intakes in the study area. Only nine are active, the other 13 are classified as either inactive or abandoned. Of the nine active intakes, only one is used for potable supply, the Pennsylvania-American Water Company intake at r.m. 25.3.

The remainder of shoreside facilities, classified under miscellaneous, number 25. Eleven of these structures are boat launching ramps, two of which are owned by the Pennsylvania Fish Commission, one at r.m. 33.2 and the other at the mouth of the Youghiogheny River.

13. Cultural Resources.

The cultural resources study area for the Lower Monongahela River study included the entire river corridor between the railroad lines which parallel both sides of the river between Locks and Dams Nos. 2 and 4. In most instances along the flood plains this is within one-quarter mile of the river, but in the steeper areas this can be as little as a few feet. Not all of this area would be impacted by the various project alternatives; the railroad lines provided a convenient boundary for study purposes. Also included in the study area were the sites outside the river corridor selected for disposal of excavated and dredged material.

The present study consisted of a records search and informant survey to identify all known sites in the study area. In all likelihood, this is not a complete listing of all historical sites since many probably remain to be discovered. Many of the foregoing studies which identified the known sites were based on resource themes, political boundaries, or were subject to other biases which limited the scope of their consideration. However, these previous studies provide a substantial framework on which to base predictions on the potential for unknown sites occurring in the study area, and their potential historical significance.

There are numerous sites of known or potential historical significance in the study area along the main channel of the Monongahela River (Table V). Two sites, the Webster-Donora Bridge (r.m. 36.4) and the Charleroi-Monessen Bridge (r.m. 41.0), both state highway bridges, are listed on the National Register of Historic Places. Many other sites, including prehistoric sites, have been inventoried, but not evaluated for National Register significance.

Twenty-one prehistoric archeological sites have been recorded in the study area, four in the Pool 2 area and 17 in the area of Pool 3. Shoreline erosion and industrialization have affected all known sites to the extent that many had been essentially destroyed by the time they were formally recorded in the 1930-1960 period. The Pool 2 area has been so heavily industrialized as to almost eliminate any future potential for intact sites. In Pool 3, most of the habitable flood plain has been industrialized, but some areas may have only received surface disturbances leaving a potential for intact deeply buried deposits.

Historic sites related to transportation, industry, residences, and public works have been identified throughout the study area. The majority, 15 of 24, are transportation sites - six river navigation structures or sites, and nine bridges. There are two potential industrial archeology sites, three residential structures, and a ca. 1880 Bureau of Water building. The remaining three sites include the waterfront portions of the towns of Elizabeth, Monongahela, and Webster, which may have limited potential for archeological remains related to the early boat-building industry.

Neither of the proposed disposal areas have recorded prehistoric or historic sites. The Coursin Hill site has low archeological potential due primarily to steep terrain and the Bunola area site has been partially impacted by surface mining. The floodplain terrace associated with the Coursin Hill site has been in the past completely disturbed or covered with fill, and has no archeological potential. The floodplain terrace at the Bunola site may have archeological potential.

Table V
Cultural Resources
Lower Monongahela River*

LOCATION Pool Number	PREHISTORIC Site Number/Name	HISTORIC Site Name/Type	
POOL 2 r.m. 11.2-23.8	36AL 72 McKeesport (Fisher C-6) Peters Creek Mound Fisher 62 36AL 27 Barry Salsi Site	Locks and Dam No. 2 Union Railroad Bridge PA (CONRAIL) Railroad Bridge Mon. Navigation Co. No. 2 McKeesport/Duquesne Br. No. 5 USS National Works Bridge Bur. of Water, McKeesport Glassport glass works Glassport-Clairton Bridge C.I.S. Co. (Union RR) RR Bridge Elizabeth	navigation bridge bridge navigation bridge bridge public bldg. archeol. bridge bridge town
POOL 3 r.m. 23.8-41.5	36AL 2 Lock #3 36AL 3 Castor Site Fisher 87 (=36AL 3?) Fisher 61 Fisher 59 (=36AL 4?) Fisher I-4 36AL 4 Bunola Site 36WH 32 West Penn Power Site 36WH 30 PA Indian Research #50 Fisher 69 Glades Path 36WH737 (unnamed) Fisher A-4 36AL 10 Liggetts #2 36AL263 Riverfront Park Site Fisher B-2 Fisher 30	Locks and Dam No. 3 Mon. Navigation Co. No. 3 Gardner House, Greek Revival 19th C. River Mill/Factory Monongahela (Parkinson's Ferry) "Hotel", Greek Revival house Williamsport Bridge (pier) Gray House/Gallatin Patch Webster Webster-Donora Bridge Mon. Navigation Co. No. 4 Charleroi-Monessen Bridge Locks and Dam No. 4	navigation navigation residence archeol. town residence bridge residence town bridge navigation bridge navigation

*Study area includes r.m. 11.2-41.5 from river to railroad tracks

V. ENVIRONMENTAL EFFECTS.

A. Water Quality.

All final alternatives have a potential for affecting water quality through short-term construction and dredging impacts. Plan Nos. 1, 4, and 4 Deferred have long-term changes associated with pool changes and the relocation or removal of structures. None of the alternatives would affect the river above the upper approach to Locks and Dam No. 4, so the following discussion focuses on impacts from this structure (r.m. 41.5) downstream beyond Locks and Dam No. 2 into the Emsworth Pool. A more detailed discussion of water quality is presented in "EIS Appendix A, Water Quality of the Lower Monongahela River." The issues and concerns of Section 404 of the Clean Water Act are evaluated for the recommended plan, Plan No. 1, in "EIS Appendix E, Clean Water Act Section 404(b)(1) Evaluation."

1. No Action Alternative.

Short term impacts in the form of sediment suspension and increased turbidity would occur with construction activities at each of the structures from dredging, and cofferdam construction and removal. Adverse effects to the aquatic biota from dredging would be minimized by restricting dredging activities during the primary fish spawning season, mid-April through June. Over the long term, projected fleeting and shuttle boat operations in the vicinity of Locks 3 and 4 due to significantly delayed lockages would have localized impacts in the form of scour, turbidity, and sedimentation.

2. Plan No. 1.

The following aspects of Plan No. 1, a two-for-three replacement plan, would affect water quality:

The replacement of Locks No. 4.

The removal of Locks and Dam No. 3 (normal pool elevation 726.9 feet).

Replacement of the existing low head, fixed crest Dam No. 2 (crest elevation 718.7 feet) with a higher lift, gated dam (crest elevation 723.7 feet).

Dredging to deepen the navigation channel in the upper reach of Pool 3.

Dredging the approaches to Locks and Dam Nos. 2 and 4.

Locks and Dam No. 4 provides moderate reaeration benefits to the river downstream of r.m. 41.5, a mean summer dissolved oxygen (DO) increase of 0.6 mg/l. The Federal Energy Regulatory Commission (FERC) recognized this benefit and has recommended that the license for any retrofit hydropower development at this dam include a provision for a continuous 500 cfs spillage discharge to assure continued reaeration below r.m. 41.5. Since the gate sills at Dam No. 4 (elevation 724 feet) are moderately submersed in the tailwaters (elevation 726.9 feet), it is suspected that a significant portion of the low flow reaeration benefits observed at the project are achieved by spillage over the fixed weir section. Replacement of the locks at this structure would eliminate this weir and, consequently, a significant portion of this structure's reaeration benefits. However, this potential loss would be offset by gains resulting from the drop in elevation of Pool 3. The 3.2-foot lowering of Pool 3 would increase the normal lift at Locks and Dam No. 4 from 16.6 to 19.8 feet. The increased head and decreased gate sill submergence would both tend to augment the reaeration potential of Locks and Dam No. 4. This increased head, combined with an air entrainment system in the replacement locks for use during low flow periods, would result in a positive water quality impact that should compensate for the loss of the fixed weir section.

The data presented in the Water Quality Appendix suggests that Locks and Dam No. 3 does not provide a large degree of reaeration benefits to the river. In fact, the mean summer DO of the tailwaters of the dam was actually 0.2 mg/l lower than the mean DO immediately upstream of the dam. The low head (8.2 feet of lift), gentle plunge angle, and fairly smooth flow over the weir of Dam No. 3 are not conducive to efficient turbulent gas exchange. However, it is contraintuitive that the project would not provide at least some minimal level of reaeration, and it is assumed that attempts to document the benefits have been obscured by rapid water temperature change interferences from the heated effluents discharged in the vicinity of the dam. Therefore, it is likely that a loss of reaeration and volatile organic compound (VOC) stripping would occur in the reach downstream of r.m. 23.8 from the removal of Locks and Dam No. 3. Also, mixing of heated surface waters with cooler deeper waters would no longer occur abruptly at r.m. 23.8.

Normal lift at Locks and Dam No. 2 is 8.7 feet, and it is similar in design to Locks and Dam No. 3. While the observed summer season increase in DO below Locks and Dam No. 2 was only 0.2 mg/l, it is possible that attempts to quantify its reaeration capacity have been obscured, and its effectiveness underestimated by interference from thermal discharges and local water temperature increases. Even though the amount of aeration from Locks and Dam No. 2 appears to be modest, it is strategically located in a very DO sensitive portion of the navigation system. Locks and Dam No. 2 is located downstream of a major potential source of VOCs and upstream of important domestic water supply intakes. Because of its location at the upstream end of the Emsworth Pool, the importance of its contributions to the water quality of the Lower Monongahela and Upper Ohio Rivers have been acknowledged by the District and FERC. Therefore, efficient gas exchange at the Locks and Dam No. 2 replacement structure is a high priority consideration of the navigation modernization program.

An innovative concept and dam design has been developed which is expected to meet both discharge criteria and water quality objectives for the project. This proposed dam design calls for four gates, 110 feet wide, with inverts at elevation 696.7 feet (13.3 feet submergence), a fixed weir, 87.5 feet wide, adjacent to the locks, and next to the weir, a water quality gate, 110 feet wide, with a sill elevation of 714.0 feet. A water quality gate sill configuration has been developed which will permit a steep plunge angle which will create turbulence and maximize entrained bubble contact time in the tailwater. The discharge capacity of the water quality gate (10,000 cfs) will be sufficient to provide water quality benefits throughout low to moderate flow periods which are of principle concern from a water quality perspective, and will aerate a significant portion of the river during higher flow regimes.

The most significant impacts of Plan No. 1 on phytoplankton and related parameters would likely occur within the extended pool of the Locks and Dam No. 2 replacement dam. Some clarification of the reach of river impounded by this proposed gated dam might occur as a consequence of a longer retention time, and a tendency towards more stable pool levels. In particular, water level fluctuations that now occur during low flows from Cheat River/Lake Lynn peaking power hydroelectric generation waves, as they are translated through the pools of the fixed-crest dams, would be substantially moderated.

Under most circumstances, water level fluctuation control and turbidity reductions would be considered very welcome benefits. However, the Pennsylvania-American Water Company (PAWC) has anticipated increased transparencies in the Locks and Dam No. 2 replacement dam pool, and expressed concern that this might lead to increased primary biological production and algae taste and odor problems at their Elrama intake. In addition, any aspect of the project that could contribute to the tendency for reverse flows of heated effluent discharge plumes near their Elrama intake, and stimulation of blue-green algae blooms, would be considered a threat to the quality of their intake waters. Most of the clarification would probably occur in the lower 12.6-mile reach where pool elevation, cross sections, storage, and retention time would be increased and velocity decreased. Conversely, along the upper 17.7-mile reach of the pool which is of interest to the PAWC, the average pool elevation would be decreased over three feet and velocities would be increased. Higher velocities in this area would locally discourage sedimentation and turbidity reduction processes, and probably reduce the degree, extent, and frequency of flow reversal events.

In summary, in relation to dissolved oxygen and volatile organic compounds, Plan No. 1 would have no water quality impact on Monongahela River Pool 4 (the 19.7-mile reach of the study area between r.m. 61.2 and 41.5). The plan would likely have a negative water quality impact between r.m. 23.8 and 11.2 from the removal of Locks and Dam No. 3. This loss, however, would be at least partially offset by benefits realized between r.m. 41.5 and 23.8. A more substantial positive impact is anticipated from r.m. 11.2 to the mouth of the Monongahela River and extending 6.2 miles down the Ohio River to Emsworth Locks and Dams. It is notable that there are no active domestic water supply intakes along the 12.6 miles of river (r.m. 41.5 to 23.8) which could be negatively influenced by implementation of Plan No. 1. In contrast, there are three major active intakes, serving a population of approximately one million persons, along the 35.1 miles of river that would likely experience positive water quality impacts from the Plan No. 1 alternative.

An evaluation of fill material and specified sites under Section 404(b)(1) of the Clean Water Act is included in Appendix E. The fill material to be placed in the waters of the United States primarily consists of steel and concrete for the navigation structures, clean rock fill for bank protection, and concrete rubble from demolition of the old navigation structures. The proposed fill sites for the majority of the fill include the existing navigation structure sites and their approaches. A number of environmental features for the design, construction, and operation of the proposed project have been developed to minimize or compensate for the primary and secondary impacts of fill activities. With these features, the preliminary determination is that the proposed disposal sites for the discharge of fill material are specified as complying with the requirements of the Section 404(b)(1) evaluation guidelines (40 CFR 230).

In order to implement the requirements of Section 404 of the Clean Water Act, an exemption is being sought under Section 404(r) as part of the authorization process by including the Section 404(b)(1) evaluation in the environmental impact statement.

3. Plan Nos. 4 and 4 Deferred.

Plan Nos. 4 and 4 Deferred are three-for-three replacement plans resembling the No Action Alternative with the exceptions of larger locks at Locks 3 and 4, and the relocation of Locks and Dam No. 3 upriver to r.m. 24.6. The relocation of Locks and Dam No. 3 closer to the thermal discharges of the two electric generating stations in Pool 3 would alter the water temperature patterns and may adversely affect the conditions permitted under the existing water quality variance granted by the PaDER. The electric utilities maintain that the dam relocation to this site would result in the requirement for either load reduction at these generating stations or alternative forms of cooling, such as cooling towers.

There would be an opportunity to make modest gas exchange capacity improvements to the low head, fixed-crest Dam 3 replacement weir, and to the lock emptying apparatus at Locks 3 and Locks 4. Otherwise these plans would result in water quality conditions essentially identical to those described previously for the No Action Alternative.

B. Ground Water.

Proposed pool changes for Plan No. 1 would result in a raise of nominal pool elevation of five feet between r.m. 11.2 and 23.8. This is expected to result in a raising of the ground water surface under the flood plains on either side of the river. However, the actual magnitude of this raise is expected to be considerably less than the five-foot increase in pool elevation. This is because the existing pool, because it is maintained by a fixed crest dam, is normally well above its nominal (minimum) elevation. The future pool, however, would be maintained by a gated dam and would remain at its nominal elevation except during transient periods of high flows. The existing pool is now above elevation 721.7 (which is within two feet of the proposed pool elevation of 723.7) for over 200 days per year, and the Ordinary High Water elevation throughout the reach of the pool raise would actually be lowered by two to four feet.

Consequently, the predicted increase in average ground water elevation in the reach of the pool raise is expected to be two feet or less, and seasonal maximum ground water elevations should be virtually unchanged. Water supplies from wells and ground water influence on underground structures should thus be completely unaffected by the pool raise.

With Plan No. 1, there is also a proposed lowering of the existing nominal pool elevation between r.m. 23.8 and 41.5 by 3.2 feet. This would result in a lowering of the ground water in proximity to the river bank by approximately that amount. However, this effect would be dissipated rapidly in the landward direction due to the relatively low permeability of the upper overburden soils. The lowering of the water table is expected to be negligible beyond about 100 yards from the river's edge. The effects anticipated from the lowering within the narrow affected zone would be limited to a very small loss in capacity of any wells which might already be producing close to capacity.

Plan Nos. 4 and 4 Deferred would affect a small ground water zone in the pool lowering area between r.m. 23.8 and 24.6. In the downstream half of this reach, the ground water in proximity to the river bank would be lowered an amount approximating the pool drop, about 8.2 feet. This effect would lessen with increasing distance from the bank to about 1,000 to 1,500 feet from the river where the change would be negligible. The overall lowering of the ground water would be lessened in the upstream half of the affected reach due to the influence of the higher upstream pool and ground water elevations behind the dam. The effects anticipated from the lowering of the ground water zone in this limited reach would be a very minor loss in well capacity.

C. Wetlands.

Plan No. 1 entails pool changes that would modify existing river bank inundation levels in Pools 2 and 3. The riparian wetlands that border these pools have developed opportunistically in response to the pool levels that were created by the present navigation system. The raising of Dam 2 would result in the inundation and elimination of the riparian wetlands which currently exist along the shorelines of Pool 2. Because of the relative narrowness of wetland bands along Pool 2 and the many steep-walled areas along commercial docks, railroad embankments, and slag dumps, the increase in elevation of Pool 2 would be expected to eliminate the estimated 80 acres of wetlands in this reach. No re-establishment of wetlands at different elevations in Pool 2 would occur as the raise in pool would fall within the Ordinary High Water (OHW) zone without a corresponding increase in OHW elevation (due to the operation of the replacement gated dam). With respect to Pool 3, the removal of Locks and Dam No. 3 would result in the de-watering of adjacent wetlands and the temporary loss of an estimated 165 acres of wetlands. The proposed increase in elevation of Pool 2 and decrease in elevation of Pool 3 would set in motion successional changes that would re-establish the lost riparian wetlands along the new shoreline over time. It is anticipated that these successional changes, in combination with the creation of an additional 76.5 acres of shallow water habitat with the pool changes, would result in no significant loss of existing riparian wetland habitat.

Disposal operations for all of the final alternatives would not result in wetland impacts at the Coursin Hill site, but would impact approximately one acre of wetland at the Bunola site. The latter impact is a consequence of access road improvement at Bunola, which necessitates that approximately one acre of wetland be temporarily filled. This fill would be removed and the site completely restored at the conclusion of disposal operations.

Plan No. 4 would result in no significant impact upon existing riparian wetlands. Lowering the pool between r.m. 23.8 and 24.6 would de-water a small riparian area which would re-establish at the lower pool elevation. A small increase in shallow water habitat (about 1.4 acres) would provide additional area available for emergent wetland development.

The No Action Alternative would result in no significant impact upon existing riparian wetlands. The only impact on wetlands associated with this alternative would be at the proposed Bunola disposal site, described above.

Further details on wetland impacts are provided in Appendix B.

D. Aquatic Habitat.

Now that water quality has evidenced an improving trend over two decades, it has been suggested that further and sustained growth of the fishery may be most closely associated with the availability of suitable aquatic habitat. Existing aquatic habitat could be altered by dredging, foundation excavation for new navigation structures, elimination of a tailwater zone through removal of a navigation structure, changes in pool levels, and instream disposal of dredged or excavated materials.

Because of their high level of aeration, turbulent cleansing of the substrate, and colonization value for aquatic macrobenthic organisms, the tailwater zones are recognized as prime spawning and feeding habitats for many Monongahela River fish species. The loss of one tailwater zone (one-third of available tailwater areas in the Lower Monongahela River) would be expected to pose an unfavorable impact to the fish community as a consequence of the reduction of preferred habitat (increasing the competition among and between fish species for substitute habitats).

Plan No. 1 would entail the loss of a tailwater through removal of Locks and Dam No. 3. This tailwater as reflected in the cobble and gravel content of the substrate extends 0.5 miles, encompassing 45 acres. The loss of tailwater turbulence, reaeration, and the dam's physical barrier to fish movement would reduce the overall fishery value of the present Locks and Dam No. 3 tailwater zone. The U.S. Fish and Wildlife Service has recommended that shallow water habitat be improved or increased to compensate for the loss of tailwater habitat on an acre-for-acre basis. A net increase of available shallow water habitat (water depth less than five feet) from about 308 to 384 acres would result from the changes in elevations of Pools 2 and 3. The net gain in shallow water habitat (+ 76.5 acres) would more than offset the tailwater habitat loss

(- 45 acres) based on the U.S. Fish and Wildlife Service's recommendation. To compensate for the loss of other tailwater functions, Plan No. 1 includes maximizing the reaeration capability of Locks and Dam Nos. 2 and 4 (see "V.A. Water Quality") and creating shallow water structural features to benefit the fishery such as fish reefs and rubble beds. Material to construct these structural features would be available from the demolition of the old navigation structures.

In contrast to Plan No. 1, Plan Nos. 4 and 4 Deferred would not result in the loss of a tailwater zone. Also, under these plans, the pool change zone would be confined to a 0.8-mile section of river between the old and new Locks and Dam No. 3 sites, where the existing pool would be dropped 8.2 feet. The shallow water habitat within this river segment would be increased about 1.4 acres.

All final alternatives have lock approach dredging requirements. In addition, Plan Nos. 1, 4, and 4 Deferred have navigation channel dredging requirements to compensate for pool level changes. Plan No. 1 requires 9.5 miles and 1,670,000 cubic yards of channel dredging and 761,650 cubic yards of approach dredging, a total of 2,431,650 cubic yards. Plan Nos. 4 and 4 Deferred require for 0.8 miles and 72,200 cubic yards of channel dredge work, and 272,250 cubic yards of approach dredging, a total of 344,450 cubic yards. Total dredging for the No Action Alternative, approach dredging only, would be 410,000 cubic yards. The primary adverse impacts inherent in dredging are the removal of river bottom habitat and benthic organisms from the waterway and the modification of wildlife habitat associated with upland disposal operations. Other impacts resulting from dredging include turbidity generation, redistribution of any sediment contaminants, the settling of disturbed sediments downstream of the dredge site, removal of substrate armoring, greater uniformity in river bottom depth (a decrease in submerged structure and heterogeneity), temporary instability of lateral slopes adjacent to the dredge cut, and changes in established current patterns associated with the new river bottom configuration.

Despite radical short-term changes in aquatic habitat due to dredging, no significant long term impacts are anticipated. Recolonization by the benthic community would be expected to follow cessation of dredging activities. Valuable shallow water habitat would not be dredged, but may experience some turbidity and sedimentation from dredging operations. The potential adverse impacts of sedimentation on fish spawning success would be minimized by prohibiting dredging from the peak spawning period, mid-April through June.

E. Terrestrial Habitat.

Terrestrial habitat would be impacted primarily at the sites of lock and dam construction and rehabilitation, within zones affected by pool changes, and in areas either adjacent to or apart from the river that would be used for rehandling and disposal of dredged and excavated materials. With all alternative plans, construction site activities at Locks and Dam Nos. 2 and 4 would entail only temporary use of previously disturbed material storage areas. At Locks and Dam No. 3, Plan No. 1 would have no terrestrial habitat impact. The No Action Alternative would require a small, temporary material storage area near the Dam 3, and proposes the removal of a protruding terrace of land to improve the upper lock approach. This would result in the permanent loss of about 23.5 acres of terrestrial habitat of which about 14.5 acres is of no or reduced value to wildlife. Plan Nos. 4 and 4 Deferred, which would relocate Locks and Dam No. 3 to r.m. 24.6, would result in the loss of about 41 acres of terrestrial habitat through excavation and conversion to a navigation structure. Approximately two-thirds, or about 26 acres, of this total area is of no or reduced value to wildlife. The loss of land on this terrace with Plan Nos. 4, 4 Deferred, or the No Action Alternative would require the long term management of separable mitigation lands to replace the loss of habitat value.

Pool changes associated with Plan Nos. 1, 4, and 4 Deferred would result in a net gain of terrestrial (riparian) habitat in both instances, originating in the Pool 3 area where pool lowerings are proposed. There are no pool changes with the No Action Alternative.

Clearing and filling of disposal sites would affect as much as 23 acres at Coursin Hill and 102 acres at Bunola. Upslope of the valley fills at Coursin Hill and Bunola, drainage ditches to intercept and divert flows originating above the disposal sites would be constructed. Disturbances in these additional areas (95 acres and 127 acres, respectively) would be minimal. In the disposal areas, the terrestrial habitat ranges from slag fill to mature, cove woodland. When completed, disposal activities would replace the existing cover with an early oldfield cover type, but would have little change on total available acreage. A grading and seeding plan, with use of on-site materials for wildlife improvements and stream restoration, would compensate for construction impacts to habitat values.

F. Fish and Wildlife.

The greater the change modernization entails in the status quo condition of the current navigation system, the greater the magnitude of potential impacts on fish and wildlife resources. By virtue of its elimination of a tailwater zone associated with the removal of Locks and Dam No. 3, a requirement for better than 30 miles of pool adjustment, and the substantial quantity (2.4+ million cubic yards) of channel and approach dredging, Plan No. 1 is regarded as the alternative of most significant impact upon fish and wildlife resources. The loss of the tailwater would remove a prime spawning and feeding area for the Lower Monongahela River fish community. This loss, which represents an estimated 45 acres of habitat, could have a particularly adverse impact upon suckers, walleye, and sauger which prefer this area for spawning. The U.S. Fish and Wildlife Service has designated tailwater zones as "Resource Category 2", which should be replaced in kind. When in-kind replacement is not practicable, the Service has recommended an acre-for-acre replacement with shallow water habitat or structural habitat improvements (see "V.D. Aquatic Habitat"). The No Action Alternative and Plan Nos. 4 and 4 Deferred would not result in the elimination of a tailwater habitat.

Dredging to maintain a 9-foot channel depth and 300-foot width would cause both short-term and long-term impacts to the aquatic ecosystem. Suspended solids would increase downstream during dredging, reducing light penetration for photosynthetic activity. Oils and other pollutants in the sediments would be resuspended, adversely affecting fishes and benthic communities downstream. Resuspended bottom material would increase COD and BOD and may locally reduce dissolved oxygen levels near the dredge. The natural substrate would be modified in the areas dredged by exposing subsoils and downstream by the deposition of fine sediments. Reshaping the river bottom in shallower sections of the Monongahela may shift current patterns in these reaches and accelerate deposition of finer sediments in the shore-debris zone. This would negatively impact fish reproduction and alter the benthic macroinvertebrate community in this zone. The recent collection of the mussel, *Anodonta imbecilis*, indicates that water quality may have recovered sufficiently to allow recolonization. Dredging that would alter sedimentation patterns and currents would also influence the distribution and success of reestablishing mussel populations in these areas.

With respect to wildlife impacts, Plan No. 1 generates about 595,000 cubic yards less disposal material than Plan 4 and about 668,000 cubic yards more than the No Action Alternative. All alternative plans would cause a net loss of wildlife habitat within the identified disposal areas during construction. Dredged material with low pH, low nutrient values or with little soil may not support vegetation. Therefore, special treatment of dredged material, such as liming, fertilizing or mixing topsoil over the surface, may be necessary to ensure successful revegetation. With proper planning and selection of plantings beneficial to wildlife, most of the wildlife habitat losses should be recovered over time. A similar problem exists with disposal of construction debris. This material would require burial and covering with a layer of topsoil before any vegetative plantings can be accomplished. Under Plan No. 1, any remaining wildlife losses would be more than compensated through the gains in terrestrial habitat resulting from lowering Pool 3.

All final alternatives would adversely affect fish and wildlife resources because of temporary construction and dredging impacts. Additional long term impacts would be associated with the permanent pool changes included with Plan Nos. 1, 4, and 4 Deferred. Plan No. 1 would cause the greatest impact based on the large quantity of in-stream dredging and material disposal, over 30 miles of pool changes, and the loss of one tailwater fishery. However, Plan No. 1 would also provide the greatest offset to the fishery through the 76.5-acre increase in shallow water habitat, as opposed to a 1.4-acre increase with Plan Nos. 4 and 4 Deferred, and no change under the No Action Alternative. Further details are contained in the Fish and Wildlife Service's Coordination Act Report (reference: Feasibility Report, Appendices).

G. Endangered and Threatened Species.

There are no federally listed endangered or threatened species which reside in the project impact area. Neither the transient species, the bald eagle and Kirtland's warbler, nor the peregrine falcon, which has established a residence in downtown Pittsburgh, would be affected by the project alternatives.

The re-establishment of species in the river, through natural or other means, would not be precluded by any of the alternatives for continuing river navigation. Although channelization of the river in the 1840's probably impacted aquatic species composition, factors other than channelization, such as the historically degraded water quality, were more significant to the extirpation of aquatic species. Now that water quality is no longer a limiting factor, maintaining a channelized system is preferable to restoring the river to a free flowing state which would have devastating economic, social, and biological impacts without producing conditions conducive to the re-establishment of endangered or threatened species.

H. Soils and Sediments.

1. Prime Farmland.

None of the final alternatives, Plan Nos. 1, 4 and 4 Deferred, and the No Action Alternative would affect designated prime farmland soils.

2. Hazardous and Toxic Waste Sites.

Three known hazardous and toxic waste (HTW) sites along Pools 2 and 3 have been identified which may be impacted by the final alternative plans. As listed in Appendix F, these sites include Nos. 8. USX Corp. Clairton Works and 10. Peters Creek Lagoon (considered together as one site at r.m. 21.0±), No. 12. Hercules-Picco at r.m. 23.6±, and 13. Ashland Oil at r.m. 24.0±. No known sites are located in the proposed disposal areas at Bunola or Coursin Hill.

Plan No. 1 would impact all three sites through changes in ground water elevations resulting from the lowering of Pool 3 and raising of Pool 2. The ground water changes would be minor, and potentially cause only minor impacts to the monitoring and collection facilities at each site.

Plan Nos. 4 and 4 Deferred have the potential to affect the Hercules-Picco and Ashland Oil sites, but would not impact the USX Corp. Clairton Works. The impacts would be associated with relocation of Dam 3 from r.m. 23.8 to 24.6. Construction of the new dam abutment at r.m. 24.6 left bank near the Ashland Oil site may encounter contaminated soils. At the Hercules-Picco site, the 8.2-foot pool drop between the old and new dam locations would potentially have a significant impact on the monitoring wells and interceptor trench. There could be a riverward flow of contaminants due to the lowering of the ground water table.

As with Plan No. 4, the No Action Alternative impacts to known HTW sites would be associated with Dam 3. Replacement of the dam on essentially the same alignment would encounter contaminated soil at the Hercules-Picco site. Relocation of Locks and Dam No. 3 to a new site to avoid physically impacting either the Hercules-Picco or Ashland Oil sites has the potential to affect one or both sites by an 8.2-foot lowering of the pool affecting ground water elevations. The impacts of lowering the pool would be similar to those with Plan No. 4.

3. Sediments.

A worst case analysis of the navigation channel substrate for EPA-designated priority pollutants concluded that there are no contaminant levels which would warrant special handling and disposal. From this standpoint, disturbance of contaminants would not be a concern with the final alternatives which include channel dredging (Plan Nos. 1, 4, and 4 Deferred) as opposed to the No Action Alternative which has no channel dredging requirement. All final alternatives, including the No Action Alternative, require approach dredging and excavation of in-stream materials for new lock and dam foundations. These areas would be tested prior to disturbance for the presence of priority pollutants. At present, there is no indication that these materials at Locks and Dam Nos. 2 and 4 would not meet Pennsylvania's "clean fill" designation. However, the extent of the riverward influence of the Hercules-Picco HTW site at the abutment of Dam 3 is not currently known, but would be determined by testing prior to any disturbance. The results of this testing would indicate if special handling and disposal requirements are necessary.

I. Flood Plains.

Executive Order (E.O.) 11988, Flood Plain Management, requires the consideration of alternatives to Federal actions located in flood plains to avoid or minimize adverse effects and incompatible development in the flood plains. Because there are no non-structural alternatives which would maintain safe and reliable river navigation, the structural alternatives are the only practicable alternatives consistent with the law and the E.O. Therefore, the District has designed its action to minimize potential harm within the flood plain in accordance with Section 2(a)(2) of the E.O. The public review requirement of the E.O. is being satisfied through circulation of the environmental impact statement.

The structural alternatives have been designed to cause no increases in flood elevations. The potential for an increase which, at first glance, might be expected in Plan No. 1 from the raised pool behind Dam 2 would be offset through the use of a gated dam in place of the existing fixed crest dam. In terms of frequency, the elevations of flows with a recurrence interval of ten years or less would be reduced behind the gated versus a fixed crest dam. Above the ten-year recurrence, the difference progressively lessens until at the 100-year interval, the flood elevations are nearly identical (see Figure 1).

As none of the alternatives would increase the 100-year frequency flood height, the flood boundaries published in the Flood Insurance Studies for the 42 communities located along the Monongahela River should not require any revision. Floodway boundaries, generally to the top of bank throughout the most of the study reach, should remain the same.

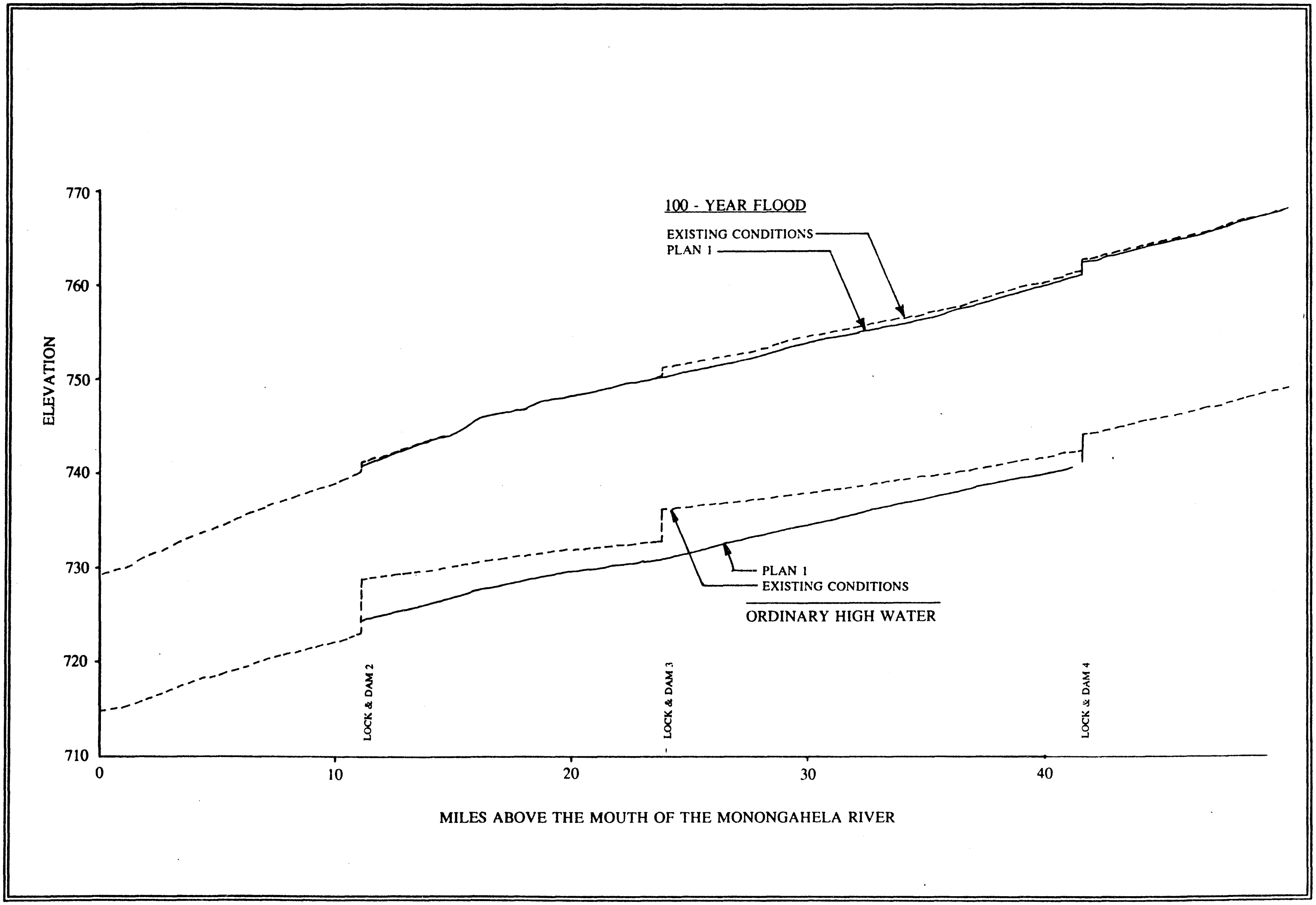

Figure 1. Flood profiles, Plan No. 1

J. Recreation.

All project alternatives including the No Action Alternative would involve construction of navigation facilities and would have impacts on recreation. Generally, the No Action Alternative, and Plan Nos. 4 and 4 Deferred would have minimal impacts that would mostly be temporary. However, the projected increase in lockage delay times by Year 2030 associated with the No Action Alternative and decreased lockage delay times associated with Plan Nos. 4 and 4 Deferred would be significant. The implementation of Plan No. 1 would have substantial impacts on a wide range of recipients. Some of these would be negative, particularly for certain affected individuals or groups, while others would be positive. Many impacts would be temporary in the sense that the conditions that they foster would constitute hardships until the appropriate adjustments can be made. Over the life of the improvements proposed in Plan No. 1, however, the net recreational impact of that plan's implementation would be positive.

During the three construction periods at the projects where rehabilitation and replacements would occur under the No Action Alternative, there would be some disruptions and delays in recreational lockages. Additional construction-related river traffic would also have a negative, although minor, impact on recreational activities. After construction, however, the impacts of maintaining the No Action Alternative would be neutral until Year 2030 when lockage delay times are expected to increase substantially.

Under Plan No. 1, Pool 2 would be raised a nominal five feet and Pool 3 would be lowered a nominal 3.2 feet. During the periods of construction and subsequent removal of Locks and Dam No. 3, the temporary impacts associated with these activities would be similar to those discussed above for the No Action Alternative. Elimination of Locks and Dam No. 3, however, would entail the permanent loss of the present tailwater fishery and recreational use of that fishery. This loss represents about 3,300 recreation days annually (1,300 days boat-based and 2,000 days shoreline-based). With no shoreline fishing opportunities at Dam 2 and no legal public access to the Dam 4 abutment, the shoreline-based tailwater fishing loss would be a permanent loss. Boaters would have the opportunity to transfer their activities to the tailwaters of Dams 2 and 4, although convenient public access launching facilities are over seven miles downstream of either tailwater.

Plan No. 1's changes in the elevations of Pools 2 and 3 would inundate or elevate impromptu bank fishing sites where casual fishing occurs. The usefulness of most such sites would be affected, but it is probable that most, if not all sites lost would be replaced by new sites that would become available. Swimming also occurs at various points along the river where conditions are favorable. Pool elevation changes would render some of these locations unsafe or unusable. New sites that are desirable and available for swimming would undoubtedly be formed through pool elevation changes, resulting in a neutral net effect.

Plan No. 1's implementation would have a widespread effect on developed public recreation areas and their facilities. Publicly owned facilities would be adjusted as relocations at Federal expense. In Pool 2 there are seven public recreation areas, and in Pool 3 there are nine public recreation areas. Disruption and inconvenience impacts to recreational use of the river would essentially be temporary. In some cases, if recreation facility modifications could be made during the off season, there would be no negative impact at all.

Unlike publicly owned facilities, private facilities would have to be modified by their owners to accommodate pool elevation changes. Two major private areas in Pool 2, a commercial marina and a boat club with docks may require only minor alterations, and their operations at the land/water interface may be enhanced. A third major facility in Pool 2, a boat club located in a relatively low-lying area, may not be rendered unusable, but may have a considerable amount of its land area inundated with implementation of Plan No. 1. Of the eight minor private recreation areas in Pool 2, seven have small boat docks and two have boat launching ramps. The ramps could require some modification to be usable after a pool raise. Many of the docks would require only changes in anchorages and dock access walkways, while some may require no modifications. There is a possibility, however, that dock sites close in elevation to the present pool elevation could be rendered unusable without a degree of alteration that would be impractical.

Pool 3 has nine major private recreation areas, seven of which are commercial marinas and two of which are boat clubs. Most of these areas have boat launching ramps. There are also 16 minor private recreation areas in the pool, two of which have boat launching ramps and 14 of which have docks for one to six boats. A reduction of the Pool 3 elevation would negatively affect most of these areas and their facilities. Facility modifications required would include replacement of concrete and timber walls and pilings of various types, adjustments to dock anchorages, relocation of docks, alteration of dock access walkways and bridges, dredging of dock areas and channels at boat launching ramps and extension of launching ramps. To some owners, the needed facility alterations would constitute a hardship. Some sites could require such extensive modifications that their continued use would be impractical. Despite the harsh impacts on some groups or individuals that could be caused by implementation of Plan No. 1, all facilities lost could be expected to eventually be replaced. Negative effects to society as a whole that are attributable to pool elevation changes would, therefore, be transitory in nature.

Implementation of Plan No. 1 would also have a significant and permanent beneficial impact on recreation. In the place of a 12.6-mile pool and a 17.7-mile pool separated by locks, there would be a single 30.3-mile pool. Offsetting some recreational fishery losses in Pool 2 caused by removal of Locks and Dam No. 3 would be the ability to access Pool 3 for boat fishing without the need to lock through from Pool 2. The greatest benefit of the longer pool, however, would be realized by those who pursue boating and water skiing. Elimination of the barrier presented by Locks and Dam No. 3 would probably stimulate the popularity of the expanded pool and a corresponding demand for additional facilities along its banks. Development of such facilities could, in turn, foster overcrowding and congestion in parts of the pool.

For those who would use the replaced Locks 4, there would be an additional positive recreational benefit associated with implementation of Plan No. 1. The larger, more efficient new lock facilities would make more rapid lockages of commercial traffic possible. This would, in turn, substantially reduce the waiting sometimes experienced by recreationists who wish to lock through.

Construction-related impacts under Plan Nos. 4 and 4 Deferred would be similar to those that would occur under the No Action Alternative and with Plan No. 1. There are no developed recreation areas or facilities of any kind along the riverbanks between the locations of the existing and proposed Locks and Dam No. 3. Impacts to organized recreation activities of the kinds associated with Plan No. 1 would, therefore, not occur under Plan Nos. 4 and 4 Deferred. A few impromptu bank fishing sites along the river between miles 23.8 and 24.6 would lose their usefulness with the reduction of pool elevation, but other substitute sites at lower elevations would probably be uncovered. The new, larger Locks 3 and 4 would reduce the time required for lockage of commercial tows, thereby making more rapid recreational lockages possible.

Under Plan No. 4 Deferred, impacts would be identical to those associated with Plan No. 4, except that the possibility of more rapid recreational lockages through Locks 4 would be delayed until after Year 2027. Although the projected average delay at Locks 4 through Year 2027 would be increased from about 0.5 hour to 1.6 hours, this amount of time is significant to recreational boaters. The additional deferred construction period at Locks 4 would have temporary negative recreational impacts.

K. Scenic Rivers.

All of the alternative plans would continue the river's historical commercial and industrial use. The recent increase in recreational usage of the river, while commercial traffic has remained relatively constant, is linked to the improvement in water quality. None of the alternative plans would directly cause significant changes in the river's water quality, shoreline development, or accessibility which might adversely affect its potential for future consideration as a Modified Recreation river.

L. Socio-Economic.

The plans that include larger locks are expected to yield positive social-economic effects in the form of increased employment and income. The area expected to be most immediately affected by the lock improvements is the coal mining region of the upper Monongahela River Basin (reference: "Feasibility Report, SOCIAL AND ECONOMIC RESOURCES APPENDIX"). The effects of navigation improvements on the project area along the lower river are likely to take longer to materialize as this area is in the process of attempting to rebuild its economy. The lock improvements would assist in this effort by making barge transportation more efficient (reference: "Feasibility Report, NAVIGATION SYSTEM ANALYSIS APPENDIX"). Plan No. 1 would be most effective in improving social-economic conditions since it provides the greatest improvement to the efficiency of the navigation system. Plan Nos. 4 and 4 Deferred would have a similar but smaller effect in this impact area. The No Action Alternative is essentially neutral in that it would help preserve existing industry and employment, but would do nothing to enhance the economic competitiveness of the area.

The project alternatives would have social-economic costs for the area as well as providing benefits. The three principal costs are in the areas of: 1) adjustments to shoreline facilities; 2) potential increases in flood damages; and 3) residential relocations due to dredge disposal. Plan No. 1 (NED plan) requires significant adjustments to shoreline facilities since it involves changes in pool elevations. The No Action Alternative does not require any shoreline facility adjustments and Plan Nos. 4 and 4 Deferred require only minor adjustments. While all of the plans increase the potential for flood damages during the construction phase, the effect is least for Plan No. 1 because it requires the construction of one cofferdam at Locks and Dam No. 2 whereas the other alternatives require cofferdams at both Locks and Dam Nos. 2 and 3. The only plan that may require residential relocations is Plan No. 1 because of the large volume of dredged material disposal. These effects are discussed in greater detail in the following paragraphs.

1. Shoreside Adjustments.

The need for shoreside adjustments is generally proportional to the change in pool elevations resulting from each alternative. Since the No Action Alternative does not change the existing pools, there are no shoreside adjustments for this alternative. Relocation of Locks and Dam No. 3 under Plan Nos. 4 and 4 Deferred would require the relocation of four commercial docks and one gas pipeline. Plan No. 1 would require the adjustment of one railroad bridge, and may require work at 36 major storm sewers, 35 commercial shoreside facilities, five water supply facilities, 25 recreational facilities, 24 submarine crossings (four publicly owned), five sanitary sewers, and two shoreside park facilities. The costs for adjustments that may be required were developed for all identified facilities although it is anticipated that many of these facilities can accommodate the relatively small proposed change in water surface elevation. A more detailed analysis of relocation requirements will be conducted during the next phase of the project referred to as the pre-construction engineering and design phase. A summary of the estimated cost of shoreside adjustments under each of the alternatives is provided in Table VI. The cost is \$175.0 million for Plan 1, \$10.3 million for Plan Nos. 4 and 4 Deferred, and zero for the No Action Alternative.

Federal costs are expenditures for relocations and adjustments that are incurred as a result of the Truman-Hobbs Act and those facility adjustments specifically authorized as Federal project costs. Basically, the Federal Government is responsible for a portion of the cost of private and public bridge adjustments (Truman-Hobbs). Specific authority is being requested to include non-Federal governmentally owned facility adjustment costs as a Federal project cost. The non-Federal sector is responsible for the cost of adjustments to privately owned facilities and part of the cost of adjusting privately owned railroad bridges.

Table VI
Shoreside Adjustment Costs
($ Millions)

Costs	No Action	Plan No. 1	Plans 4 & 4D.
Federal	0	$63.8	0
Non-Federal	0	111.2	$10.3
Total	0	$175.0	$10.3

Estimated Federal relocation costs by item are listed in Table VII. Relocation costs are zero for the No Action Alternative and Plan Nos. 4 and 4 Deferred, and $63.8 million for Plan No. 1. The railroad bridge adjustment costs of $35.0 million represent the Federal share of the total adjustment cost of $37.1 million that is the responsibility of the Federal Government under the Truman-Hobbs Act. The remaining costs of $28.8 million represent adjustments to non-Federal governmentally owned facilities.

Estimated non-Federal relocation costs are listed in Table VIII for each of the three plans. Non-Federal costs are zero for the No Action Alternative, $10.3 million for Plan Nos. 4 and 4 Deferred, and $111.2 million for Plan No. 1. Except for the railroad bridge, the non-Federal costs represent the full cost of making the adjustment to the new pool elevation, if such adjustments prove necessary. The owners of these facilities are responsible for the cost of making the adjustments.

Most of the non-Federal costs are borne by those expected to benefit most from improvements to navigation - the towing companies, the power companies, and the railroad (part of trans-modal shipment). These parties are generally supportive of Plan No. 1 because they perceive the benefits to outweigh their costs. The pipeline companies have generally taken the position that the adjustments represent a cost of doing business in the area and they have not thus far voiced opposition to the plan. The privately operated water company (Pennsylvania-American Water Company) has expressed concerns about a possible degradation in the quality of water at the point of intake (r.m. 25.3) under Plan No. 1. The marina and other recreation facility owners are also concerned about the potential cost for adjusting to a new pool, although they generally view the longer pool provided under Plan No. 1 as desirable.

Table VII
Federal Relocation Costs
($ Millions)

Facility	No Action	Plan No. 1	Plans 4 & 4D.
Railroad Bridges	0	$35.0	0
Municipal Facilities*	0	6.1	0
Major Storm Sewers	0	17.4	0
Submarine Crossings	0	5.3	0
Total	0	$63.8	0

*Includes: Sanitary sewers, water wells, parks, and launching ramps

Table VIII
Non-Federal Relocation Costs
($ Millions)

Facility	No Action	Plan No. 1	Plans 4 & 4D.
Railroad Bridges	0	$2.1	0
Commercial Facilities	0	44.4	$3.5
Water Intakes	0	22.8	0
Recreational Facilities	0	2.8	0
Major Storm Sewers	0	24.6	0
Submarine Crossings	0	14.5	6.8
Total	0	$111.2	$10.3

2. Potential Flood Damages.

None of the plans would affect flood damages over the long term but all of them would increase possible flood damages in the short term. The reason is that the plans, including the No Action Alternative, include the construction of new dams at Locks and Dam Nos. 2 (all plans) and 3 (the No Action Alternative and Plan Nos. 4 and 4 Deferred). Construction of a new dam is preceded by construction of a cofferdam to provide a safe and dry working environment. The effect of a cofferdam is to limit control of the river and increase backwater during high flows. Thus, damages are higher during high flows in the areas adjacent to the navigation pool immediately upstream of the construction site.

All dams are constructed in stages where one section is coffered and constructed with the remainder of the dam not affected. As one section is completed, the coffer is removed, a new coffer is constructed in another section, and work recommences. Because of the staged construction, the newly constructed portions of the dam are used to partially control the river while other sections are under construction. Since a gated dam provides greater control of the river, potential damages are lower than with a fixed crest dam as gates rather than fixed crest sections become available for use.

Stage frequency curves for the area were developed for the existing condition and all of the alternative conditions as represented by different types of dams and different stages of construction. The curves indicated that the cofferdams would shift the damage curve upwards so that a six-year flood would cause damages normally expected with a less frequent (ten-year) flood. Possible expected damages during construction are as high as $3 million per year. The possible damages amortized over the project life are $1 million for the No Action Alternative and Plan Nos. 4 and 4 Deferred, and $0.5 million for Plan No. 1. Plan No. 1 is lower because it involves the construction of a gated dam at Locks and Dam No. 2 and does not require the construction of a dam at Locks and Dam No. 3.

3. Residential Relocations.

Although Plan No. 1 involves raising pool elevations along the Lower Monongahela River, it would not require any relocations of shoreside residences. However, because of the large volume of material that requires disposal under Plan No. 1, disposal sites may have to be developed that could require the relocation of up to fourteen residences (five at the Bunola site and nine at the Coursin Hill site). The No Action Alternative involves less disposal but could still require the relocation of five to 14 residences, depending on the selected site(s). The residences at the Coursin Hill site are located along the roads to the disposal areas and would be severely affected by traffic hauling disposal material from the river to the site. Most of the residences at the Bunola site are located in the area that would be used for disposal. The small town of Bunola would not be relocated, but would be subject to peripheral impacts such as noise and dust during disposal operations.

4. Other Relocations.

Plan No. 1 would require the relocation of one automobile junkyard. It is uncertain whether the junkyard is still in operation. No other relocations would be necessary. The No Action Alternative and Plan Nos. 4 and 4 Deferred do not require any other relocations.

M. Cultural Resources.

The causes of adverse impacts to cultural resources associated with the project alternatives may be grouped into four categories: Alteration of existing structures, construction of new navigation structures, inundation from pool raises, and disposal of dredged or excavated materials. For the impact analysis, the following assumptions were made regarding the extent of impacts.

> Alteration of existing structures would include removal, rehabilitation, and replacement. These effects were assumed not to impact areas apart from the structures themselves.
>
> New lock and dam construction was assumed to affect a maximum area defined by linear shoreline distances of one mile on the lock side and one-quarter mile on the abutment side, with the dam at the mid-point, and landward to the existing railroad lines, a maximum distance of about one-tenth mile.
>
> Raising the navigation pool level would adversely affect sites through inundation.
>
> Lowering the navigation pool would have no impact on cultural resources.
>
> Upland disposal of dredged and excavated materials would have the potential to impact cultural resources through destruction from site preparation and direct burial.

Cultural resources impacts are discussed below in terms of known resources and presently unknown, or potential, resources. Additional studies and consultation with the Pennsylvania Bureau for Historic Preservation to determine the presence and evaluate the significance of cultural resources to comply with Section 106 of the National Historic Preservation Act would be undertaken as needed following project authorization. Estimates of the extent of surveys needed to identify and evaluate cultural resources are provided for each alternative, and the potential for finding various types of resources are given.

The District is in the process of developing a programmatic agreement with the Pennsylvania Bureau for Historic Preservation and the Advisory Council on Historic Preservation for Section 106 compliance. The programmatic agreement will address the need for additional studies to identify and evaluate resources, guidelines for development and consultation of scopes of work to conduct these studies, consultation guidelines for any new areas of impact identified after project authorization (e.g., alternative disposal sites), and guidelines for assessing effects and mitigating adverse effects to significant historic properties. In addition to participation of the above agencies, the Steel Industry Heritage Task Force has been authorized by Congress to survey the natural, cultural, recreational, and historical resources in the six county area of Southwestern Pennsylvania and to develop a plan for interpretation and conservation of these resources. The District anticipates they will be able to make a valuable contribution to our Section 106 compliance process.

1. Disposal Sites.

Disposal requirements of all final alternatives would require the development of at least two disposal sites. Archeological reconnaissances of the designated disposal areas to identify sites would be followed by survey and evaluation studies to determine historical significance. Mitigation of damages to significant historical sites may include avoidance or data recovery. Site-specific mitigation requirements would be determined through consultation with the Pennsylvania Bureau for Historic Preservation and the Advisory Council on Historic Preservation.

Neither of the potential disposal sites have any recorded prehistoric sites, although flood plain terraces are high potential areas. Extensive past surface disturbances on these terraces adjacent to Coursin Hill greatly reduces the potential for intact near-surface deposits, but deeply buried deposits may remain intact. The need for any archeological testing of this terrace would be based upon an indication that project impacts could adversely affect deeply buried deposits, if present. The flood plain terrace at Bunola is undeveloped and appears to have retained archeological potential. Due to the steep valley terrain in the Coursin Hill area, and the steep terrain and past disturbances in the Bunola area, neither of these proposed valley disposal sites is expected to have high archeological potential for significant sites.

2. No Action Alternative.

This alternative for normal operation and maintenance with major rehabilitation of the existing navigation system would impact the existing structures through construction of a new dam and rehabilitation of the locks at Locks and Dam No. 2, replacement of Locks and Dam No. 3, and rehabilitation followed by replacement of Locks 4. Excavation of a portion of the terrace (about 23.5 acres) between r.m. 24.0-25.0 to improve the lock approach would impact two known sites, Old Lock No. 3 and 36 AL 2. Impacts, and studies to assess these impacts, would be similar to those for relocation of Locks and Dam No. 3 with Plan Nos. 4 and 4 Deferred.

3. Plan No. 1.

This alternative would affect all of the existing navigation structures by the removal of Locks and Dam No. 3, the rehabilitation of Locks No. 2 and the replacement of Dam No. 2 and Locks No. 4. One bridge over 50 years of age, the C.I.S.Co. (Union RR) Railroad Bridge at r.m. 11.7, would require alteration to increase navigation clearance due to the proposed five-foot raise of Dam 2. The proposed pool raise would also affect 25.2 miles of Pool 2 shoreline (r.m. 11.2 to 23.8). This shoreline is generally steep and would confine the pool raise within the existing banks. The Pool 2 shoreline has been heavily impacted by industrial development and has little archeological potential. Of the three known prehistoric sites in this area, one has been destroyed and any remaining integrity of the other two is questionable. No specific historical resources have been identified along the shoreline but there may be archeological potential for early industrial resources in the towns of Glassport and Elizabeth.

This alternative would require a field reconnaissance of the affected shoreline giving particular attention to the locations of the known archeological sites and the towns of Glassport and Elizabeth. National Register evaluations of all identified resources (including existing Locks and Dam Nos. 2, 3, and 4) would be required, followed by a determination of effect. Appropriate mitigation for significant historic structures would likely consist of recordation, and for prehistoric sites, data recovery.

4. Plan Nos. 4 and 4 Deferred.

These alternatives would affect all existing navigation structures through the relocation of Lock and Dam No. 3, replacement of Dam No. 2 and Locks No. 4, and rehabilitation of Locks No. 2. Two known sites, Old Lock No. 3 and 36 AL 2, would be impacted by the proposed construction of the Locks and Dam No. 3 replacement structure at r.m. 24.6. There are no pool raises with this alternative.

A field reconnaissance of Old Lock No. 3 and 36 AL 2 would be required to assess their present condition and integrity. Approximately 41.5 acres could be affected by lock excavation and construction activities on the terrace where these sites are located. This terrace has been heavily disturbed by industrial/docking activities at its upstream end and by disposal of dredged material on the middle and downstream portions. Site 36 AL 2 had been subjected to extensive collecting activities prior to its burial, but the extent of disturbances from these and from subsequent disposal actions on the site's overall integrity would have to be determined. The presence of approximately 20 feet of fill over much of the terrace would greatly increase the difficulty and expense of conducting the reconnaissance. National Register evaluations of all identified resources (including existing Locks and Dam Nos. 2, 3, and 4) would be required, followed by a determination of effect. Appropriate mitigation for significant historic structures would likely consist of recordation, and for prehistoric sites, data recovery.

VI. LIST OF PREPARERS

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Ronald W. Wazenegger, landscape architect, 24 years experience.
Recreation.

Conrad E. Weiser, biologist, 12 years experience.
EIS study manager, cultural resources.

VII. PUBLIC INVOLVEMENT, REVIEW, AND CONSULTATION

A. Public Involvement Program.

Public coordination for the Lower Monongahela River Navigation System Study began in the 1960's, and earlier as part of the modernization studies for the overall Monongahela River Navigation System. Input received from public meetings, informal get-togethers, letters, reports, and public notices was reflected in the District's *Reconnaissance Report on the Monongahela River Navigation System*, dated January 1981. During the subsequent Feasibility Phase study for the Lower Monongahela River Navigation System, the District held numerous meetings with waterway users groups, local governments and authorities, and regional planning commissions. Local industries, marinas, and marine operators were also contacted. This coordination provided public input on the alternative plans for modernization, and on the economic costs to affected parties.

Scoping for the environmental impact statement to define issues and the need for studies has been a continuing process. The District had extensive experience addressing environmental issues along the Monongahela River through preparation of the *Monongahela River, Final Environmental Statement on the Operation and Maintenance of the Navigation System*, October 1975, and in monitoring water quality along the river. Early coordination meetings with the U.S. Fish and Wildlife Service and Pennsylvania Fish Commission, as well as the public involvement mentioned above, provided contemporary input for the Lower Monongahela River Study. The District filed a Notice of Intent to prepare an environmental impact statement with the U.S. Environmental Protection Agency in June 1988. Ongoing coordination through the study period with state and Federal agencies, local communities, and industry has provided additional feedback on studies addressing the previously identified issues.

Issues defined from the scoping process included impacts to commercial and recreational waterway users, shoreside facilities relocations, water quality including ground water, fish and wildlife, wetlands, flood plains, upland disposal sites, hazardous and toxic waste sites, and cultural resources. No specific response to the Notice of Intent was received.

The District distributed the Draft Feasibility Report and Draft Environmental Impact Statement for public review by September 27, 1991, and held public workshops and a formal public meeting in October 1991. Based on comments received during the public meeting, the District held additional public workshops with the residents and officials of Bunola, Forward Township, and Coursin Hollow, Lincoln Borough to discuss disposal site selection, development, and anticipated real estate procedures.

B. Required Coordination.

Required coordination with the U.S. Fish and Wildlife Service for compliance with the Fish and Wildlife Coordination Act and the Endangered Species Act produced a series of Planning Aid Reports and the Fish and Wildlife Coordination Act Section 2b Report which has been reviewed by the Pennsylvania Fish Commission and Pennsylvania Game Commission. The Pennsylvania Department of Environmental Resources Bureau of Water Quality Management was involved in the selection of testing sites for the navigation channel dredged material analysis and in review of the study results. Under Section 106 of the National Historic Preservation Act, the Pennsylvania Bureau for Historic Preservation provided input on the presence of known historic sites and on the need for studies to locate sites. Coordination with the Bureau for Historic Preservation and the Advisory Council on Historic Preservation will continue through the Section 106 process as studies and evaluations are completed.

The Council on Environmental Quality's *Regulations For Implementing The Procedural Provisions Of The National Environmental Policy Act* (40 CFR Parts 1500-1508) provide for the public review of the draft environmental impact statement. The Draft Environmental Impact Statement was made available for public review for about 45 days beginning with the notice in the Federal Register on September 27, 1991 (F.R. Vol. 56, No. 188, p. 49182) through November 12, 1991. A number of comments received from the end of the review period through early December 1991 were also accepted and included in Appendix J of the Final Environmental Impact Statement. The study's formal public meeting was held near Elizabeth, PA on October 22, 1991. Two public information workshops were held prior to the public meeting in Monongahela and McKeesport, and additional workshops were held following the public meeting in Bunola and Lincoln Borough.

The project, having met all review and consultation requirements, is in full compliance with the following applicable Federal laws, executive orders, and memoranda: Archeological and Historic Preservation Act, Clean Water Act (an exemption is being sought under Section 404(r)), Endangered Species Act, Fish and Wildlife Coordination Act, E.O. 11988 on floodplain management, E.O. 11990 on wetlands protection, and CEQ Memorandum dated

August 11, 1980 on prime farmland. The project at this stage is in partial compliance with Section 106 of the National Historic Preservation Act until a programmatic agreement is executed. A programmatic agreement is being developed and will be executed prior to signature of the Record of Decision.

C. Public Views and Responses.

The Lower Monongahela River is subject to a number of interrelated and often competing demands by local industries, municipalities, and residents. The major categories of waterway users include transportation industry, manufacturing industry (e.g. coke and electric power generation), water supply, and recreation. Resource protection agencies, such as the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the Pennsylvania Fish Commission, and the Pennsylvania Department of Environmental Resources, also have a vested interest in use of the river as it affects resources under their jurisdiction. The views of each affected group were identified in the process of scoping for the study.

Studies to address the economic benefits and costs of alternative impacts were conducted to provide information for development and selection of the National Economic Development (NED) Plan. The waterway interests (shoreside facility owners) were requested to provide input as to expected facility adjustment costs with various plans incorporating a pool elevation change. These costs were utilized in the study as a part of the total project cost considered in the alternatives' economic analysis. Resource agency concerns which could not easily be quantified in economic terms, such as potential impacts to water quality, fishery, aquatic habitat, and wetlands, were evaluated separately to determine the level of impact and need for mitigation.

The District received a number of letters and petitions during the public review period. Copies of these comments and the District's responses are included in "Appendix J, Public Review Letters of Comment and District Responses."

None of the commentors opposed the modernization of the Lower Monongahela River Navigation System. Several commentors favored the recommended "two-for-three" plan, and several commentors expressed preference for the "three-for-three" alternative, Plan No. 1. Opposition was expressed to the recommended disposal sites. Many of the comments related to anticipated real estate practices for disposal site development and to the identification of shoreside facilities which would be affected by the project.

D. List of Recipients.

The following agencies, special interest groups, and individuals will receive a copy of the Final Feasibility Report and Final Environmental Impact Statement:

Federal Elected Representatives

Senator Harris Wofford
Senator Arlen Specter
Congressman Austin J. Murphy
Congressman Rick Santorum

Federal Offices

Advisory Council on Historic Preservation
America's Industrial Heritage Commission
Appalachian Regional Commission
U.S. Department of Agriculture (Forest Service, State Conservationist)
U.S. Department of Housing and Urban Development
U.S. Department of Interior
- Bureau of Mines
- Fish and Wildlife Service
- Geological Survey
- National Park Service

U.S. Department of Transportation
- Coast Guard
- Federal Highway Administration

U.S. Environmental Protection Agency

State Offices

PA Department of Community Affairs
PA Department of Environmental Resources
PA Department of Transportation
PA Fish Commission
PA Game Commission
PA Historical and Museum Commission
PA Turnpike Commission
PA Intergovernmental Council
Southwest Pennsylvania Regional Planning Commission

Ohio River Valley Water Sanitation Commission

Local Interests

Allegheny County Department of Development
Allegheny County Sanitary Authority (ALCOSAN)

PA County Commissioners

Allegheny, Washington, and Westmoreland

Office of Mayor/Administrator

Braddock
Charleroi
Clairton
Donora
Dravosburg
Duquesne
Elizabeth
Glassport
Jefferson
Lincoln
McKeesport
Monessen
Monongahela
North Charleroi
West Elizabeth
West Mifflin

Board of Supervisors

Carroll Township
Elizabeth Township
Fallowfield Township
Forward Township
North Versailles Township
Rostraver Township
Union Township

Libraries

Bevier Engineering Library, University of Pittsburgh
Braddock Carnegie Library
Carnegie Library of Pittsburgh
Carnegie Free Library of McKeesport
Clairton Public Library
Donora Public Library
John K. Tener Library, Charleroi
Monessen Public Library
Monongahela Area Library
Samuel A. Weiss Community Library, Glassport

Newspapers

Daily Herald/Observer Reporter (Monongahela)
Greensburg Tribune Review
McKeesport Daily News
Pittsburgh Post-Gazette
Pittsburgh Press
Uniontown Herald Standard
Valley Independent (Monessen)
Washington Observer-Reporter

Groups and Individuals

Audubon Society of Western Pennsylvania
Sierra Club, Allegheny Group
Western Pennsylvania Conservancy

Duquesne Light Company
Pennsylvania American Water Company
West Penn Power Company
CONRAIL
DINAMO
U.S. Steel Corporation
Regional Industrial Development Corp. of Southwestern PA
Monongahela Area Chamber of Commerce
Mon Valley Initiative
Crain Brothers, Inc.

Donora Historical Society
Historical Society of Western Pennsylvania
Monongahela Area Historical Society
Monongahela River Buff's Association
Pittsburgh History and Landmarks Foundation
Washington County Historical Society
Washington County History and Landmarks Foundation
Mon Valley Historical & Ethnographic Survey

Dr. Fred Pohland
Toni Grygo
W. H. Thomas
Beverly Homa
Adam Damico
Rick King, John T. Boyd Co.

Christine Davis Consultants
Kathy Lopresto, Law Firm of Clifford & Warnke
W. R. Stewart
Walter L. Kalina, Terrestrial Environmental Specialists, Inc.
Dave Mayhew, EA Engineering Science & Technology
Jo DeBolt
Berdon Lawrence, Hollywood Marine, Inc.

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APPENDICES

APPENDIX A

Water Quality of the Lower Monongahela River

Water Quality of the
Lower Monongahela River

Table of Contents

Water Quality of the Lower Monongahela River

I. INTRODUCTION

A. Water Quality Trends.

The water quality of the Lower Monongahela River has changed dramatically during the last twenty years and is still probably in a state of transition. The Lower Monongahela River has been degraded by acid drainage from bituminous coal mines, domestic pollution, thermal discharges, and wastes from steel, coke, and electrical manufacturing industries.

As recently as the 1960s, the entire 113.1 mile-long reach of the river upstream of the mouth of the Youghiogheny River at river mile (r.m.) 15.6 was so severely degraded by acid mine drainage that it could not support fish or other significant forms of aquatic life. As demonstrated in References 4 and 5, a few fish first began showing up in Ohio River Valley Water Sanitation Commission (ORSANCO) lock chamber fish sampling surveys in the late 1960s. By the mid-1970s, acid mine drainage pollution had been abated to a degree that a viable sport fishery was restored along most of the river.

The lower 15± mile-long reach downstream of the confluence of the Youghiogheny River was never as severely affected by acid pollution. In spite of mine drainage contributions, and gross local industrial and domestic pollution, this reach always supported some pollution-tolerant species of fish. Youghiogheny River Lake is operated to regulate flows for water quality control along the Youghiogheny, Lower Monongahela and Upper Ohio rivers (Ref 9). Low flow augmentation from Youghiogheny River Lake and alkaline mill slag leachates along the densely urbanized and industrialized reaches of the Lower Monongahela River were responsible for moderation of pollution in this reach, and permitted the existence of at least some aquatic life resources (Ref 11). In addition, backwater from the Allegheny River could have periodically contributed to moderation of water quality problems in the reach of the Lower Monongahela River downstream of Locks and Dam (L&D) No. 2 (r.m. 11.2). The hydrology of the entire length of the Monongahela River is also significantly influenced, and its water quality benefitted, by low flow augmentation from Tygart River Lake (Ref 7). As of 1990, the river began receiving low flow augmentation from Stonewall Jackson Lake.

Massive shutdowns during the 1970s and 1980s of electrical manufacturing plants in the Turtle Creek Valley, and of steel mills in the Lower Monongahela River Valley, had tragic economic consequences. However, the plant closures, along with more efficient waste treatment at remaining industries, has nonetheless resulted in highly improved water quality along the Lower Monongahela River.

B. Principal Project-Related Water Quality Concerns.

The most significant potential water quality consequences of modernization of the Lower Monongahela River Navigation System are likely to be related to changes in gas exchange processes along the lower 40 miles of the river. In particular, modernization could influence the concentration of dissolved oxygen (DO) in the river by eliminating turbulent reaeration at L&D No. 3 (r.m. 23.8) and creating one continuous pool between r.m. 11.2 and 41.5.

A decrease in the DO of the river would diminish its waste assimilative capacity, have a negative influence on its fishery composition and diversity, retard fish reproduction and growth, and degrade the recreational value of the river. The importance of gas exchange processes and reaeration at local navigation dams was recently highlighted and examined in an environmental impact statement (EIS) on cumulative impacts of stacked hydropower development in the Upper Ohio River drainage basin, published by the Federal Energy Regulatory Commission (FERC) in 1988 (Ref 1). All agencies which reviewed this document, including the U.S. Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service (FWS), the Pennsylvania Department of Environmental Resources (PaDER), the Pennsylvania Fish Commission (PFC), and ORSANCO, confirmed the value of reaeration at the navigation dams and expressed concerns about effects that changes to the structures might have on DO. Another potentially important, but less understood, benefit of turbulent gas exchange at local navigation dams recognized in the FERC EIS, and by agency reviewers, is that the dams strip volatile organic compound (VOC) pollutants from river water.

Besides DO and VOCs, the Pennsylvania-American Water Company (PAWC) has also expressed interest related to the effects of modernization of the Lower Monongahela River on thermal pollution, transparency, siltation, and phytoplankton. The PAWC services a population of 750,000 persons with two water supply intakes on the Monongahela River, one at Beck's Run (r.m. 4.5) and the other at Elrama (r.m. 25.5). They are concerned that loss of reaeration due to the removal of L&D No. 3 could result in increased VOC and decreased DO concentrations at their Beck's Run intake. Also, since the Monongahela River in the vicinity of their Elrama intake experiences thermal pollution and taste and odor-causing algae blooms during summer low flow periods, the PAWC is concerned that problems with these parameters may be aggravated as a result of the modernization program, increasing their treatment costs.

Two electrical utilities, Duquesne Light and West Penn Power, have also expressed concern about the effects of the modernization on the thermal plumes from their once-through cooling, coal-fired power plant discharges into Pool 3. These power plants have National Pollution Discharge Elimination System (NPDES) permits with thermal variances under Section 316a of the Clean Water Act which allows them to exceed Pennsylvania water temperature standards under prescribed conditions. They are concerned that either modernization Plan Nos. 1, 4, 4 Deferred, or the No Action Alternative may alter the river conditions under which the thermal variances were granted. Both electrical utilities anticipate that thermal modeling would be required to evaluate the situation. For reasons discussed below, such modeling is also favored by the PAWC.

The discharge structures of Duquesne Light and West Penn Power in Pool 3 are regulated by Department of the Army permit under Section 10 of the Rivers and Harbors Act of 1899. This permit authorizes the placement of structures in navigable waters of the United States, but does not guarantee the pool's existence or imply any rights to use of the pool. The discharges from these structures are regulated by the Commonwealth of Pennsylvania under the PaDER NPDES program. The existing 316a thermal variances were granted following extensive and costly water quality modeling by the utilities. The PaDER renews these variances on a five-year interval based on evidence of compliance.

While the improvements for navigation under Plan No. 1 may affect the generating stations' operations, under the terms of the Section 10 permit the Federal Government is not liable for any damages or injury to the permitted structures. Consequently, the requirement for and costs of water quality modeling which may be imposed by the PaDER for thermal variance renewal would be the responsibility of the electric utilities.

The following discussion focuses on the above identified water quality parameters. An analysis of priority pollutants in the water and sediments of the Monongahela River in the study reach is discussed separately in the EIS.

C. Sources of Data.

The primary source of the data used in this report to characterize the water quality of the lower 40-mile long study reach of the Monongahela River is from 12 summer season surveys conducted by the District during low to moderate flow conditions since 1975.

During the 12 surveys, flows at Maxwell L&D (r.m. 61.2) ranged from 660 to 11,000 cfs and averaged 2,855 cfs. At the mouth of the Monongahela River, the range of flows was from 1,410 to 10,500 cfs and the average flow was 3,865 cfs. The surveys are scheduled for the warmer, drier portion of the year because water quality, and in particular dissolved oxygen, problems are most likely to develop at this time. These surveys involve sampling at a total of 45 stations placed immediately above and below navigation dams, mid-length in navigation pools, and above and below major tributaries and other points of interest along the 128.7 mile length of the river. For the purpose of this discussion, however, it will only be necessary to examine data from the lower third of the river, and only the mid-channel portions of transect data is presented. At each station, vertical measurements of water temperature, dissolved oxygen, and conductivity were taken at the surface, three feet, and five feet below the surface, and then at five-foot depth intervals to the bottom. Phytoplankton samples were collected only at three-foot depths. Water samples for all other parameters were collected three feet below the surface and approximately three feet from the bottom.

Other sources of data utilized include the output of a continuously recording thermistor located on the upper river wall of L&D No. 3 (on the right bank at r.m. 23.8) and miscellaneous volatile organic chemical data.

II. EXISTING WATER QUALITY CONDITIONS

A. Water Temperature and Dissolved Oxygen.

Maximum, minimum, and mean water temperature and dissolved oxygen values at 14 locations along the Lower Monongahela River during 12 summer surveys are tabulated in TABLE 1, and graphically presented in PLATES 1 and 2, respectively.

A prominent feature of PLATE 1 is the rapid increase in water temperature that results from the discharge of cooling waters from two fossil fuel power plants into the lower portion of the pool of L&D No. 3. These two plants are West Penn Power's Mitchell Plant with 453 MGD intakes at r.m. 29.0, and Duquesne Light's Elrama Plant with 535 MGD intakes at r.m. 25.1. Each of these plants can discharge billions of Btu/hr of waste heat to the river. For instance, at full load, Mitchell can reject 2.4 billion Btu/hr of heat at is disposal point, and the average annual heat rejection (1970) is nearly two billion Btu/hr from Elrama.

The average observed summer season increase in water temperature from the upper to the lower end of the pool of L&D No. 3 was 3.1°C or 6.1°F (from 24.7° to 27.8°C), and maximum values increased 5.7°C or 10.3°F (from 28.3° to 34.0°C). Except for a sharp drop in maximum values which occurs below L&D No. 3 (from 34.0° to 32.0°C), elevated water temperatures persist downstream to the confluence of the Youghiogheny River. The mean water temperature measured in the lower slackwater embayment at the mouth of the Youghiogheny River was 24.0°C, and the influence of cool augmented Youghiogheny River flows effectively moderates water temperature below its confluence with the Monongahela River. Between r.m. 16.7 and 15.1, the average water temperature of the Monongahela River decreased by 1.7°C or 3.1°F. A second, but minor rise in water temperature, occurs near Monongahela River L&D No. 2, in the vicinity of the U.S.S. Edgar Thompson Works.

As is apparent in PLATE 2, in the reach of the Monongahela River between r.m. 30.0 and 16.7, from the station upstream of the first power plant downstream to the last station before the confluence of the Youghiogheny River, the mean dissolved oxygen concentrations of the river declined by 1.6 mg/l (from 8.2 to 6.6 mg/l). Because local population density increases along this reach, with subsequent increases in domestic waste and organic urban runoff contributions to the river, a progressive decrease in DO concentrations would be anticipated. In addition, since the solubility of oxygen in water is inversely proportional to water temperature, the heating of the river would be expected to aggravate the effects of organic waste loading. For instance, the average 3.1°C increase in water temperature observed along the length of the pool of L&D No. 3 would depress the mean DO saturation of the river by 0.5 mg/l. Therefore, the 0.5 mg/l decrease in the mean DO of the river in this pool evident in

TABLE 1

WATER TEMPERATURE AND DISSOLVED OXYGEN CONCENTRATIONS
ALONG THE LOWER MONONGAHELA RIVER
MAXIMUM, MINIMUM, AND MEAN VALUES FROM
ALL PROFILE DEPTHS FOR TWELVE SUMMER SURVEYS
BETWEEN 1975 and 1990

Station Code	Monongahela River Mile	Station Location	Water Temperature ° C			Dissolved Oxygen (mg/l)		
			MAX	MIN	MEAN	MAX	MIN	MEAN
4 MON 3004	4.5	Monongahela River at mouth of Becks Run	31.0	22.9	26.3	10.6	5.6	7.0
4 BDP 1 1201	10.9	Below L&D 2	31.0	23.1	26.2	7.8	6.0	7.1
4 BDP 1 1002	11.4	Above L&D 2	30.0	24.7	25.9	9.5	5.3	6.9
4 BDP 1 1004	15.1	Below mouth of Youghiogheny River @ APC National Tube Division	30.8	21.1	26.0	8.7	6.1	7.1
4 BDP 1 1008	16.7	Above Youghiogheny River @ Mansfield Bridge	32.0	23.8	27.7	7.6	4.5	6.6
4 ELP 1 1201	23.7	Below L&D 3	32.0	21.1	27.5	8.2	6.3	7.4
4 ELP 1 1002	23.9	Above L&D 3	34.0	20.8	27.8	8.7	6.0	7.6
4 ELP 1 1004	30.0	Above the mouth of Mingo Creek @ New Eagle, PA	30.0	22.1	25.5	9.4	7.0	8.2
4 ELP 1 1006	34.2	At aerial crossing above the mouth of Sunfish Creek	28.8	22.2	25.2	9.2	7.0	8.0
4 CHP 1 1201	41.4	Below L&D 4	28.3	21.0	24.7	9.1	6.5	8.1
4 CHP 1 1002	41.6	Above L&D 4	29.0	20.8	24.9	9.0	5.7	7.5
4 CHP 1 1004	46.0	Fayette City, PA	28.1	22.3	25.0	10.0	6.1	7.5
4 CHP 1 1006	51.1	Newell, PA	28.2	22.0	25.1	9.2	3.3	7.3
4 CHP 1 1008	56.2	Brownsville, PA	28.1	22.6	25.2	11.0	6.1	7.9

PLATE 2 could be totally a consequence of the thermal loading it receives without taking any organic loading into account. The progressive decline in DO is abruptly terminated at the confluence of the Youghiogheny River where mean and minimum DO values increase 0.5 and 1.6 mg/l, respectively.

The influence of the three navigation dams in the study reach is also shown in PLATE 2. On the average, reaeration from L&D Nos. 4 and 2 appears to contribute about 0.6 mg/l and 0.2 mg/l DO to the river, respectively. Below L&D No. 3, however, there was a decline of 0.2 mg/l DO. As demonstrated by the maximum DO values in PLATE 2, turbulent gas exchange at these projects tends to bring DO concentrations towards water temperature-dependent DO saturation values. This can involve not only aeration of DO deficient waters, but also degassing of oxygen supersaturated waters. Therefore, at times, L&D No. 3 might have a negative impact on DO by rapidly degassing the river towards the lower DO saturation equilibrium levels established as a result of local thermal pollution and rapidly increasing water temperature.

The reduction of water temperature and DO data to mid-channel maximums, minimums, and means, in many respects, is an oversimplification that obscures significant vertical and horizontal variations in these parameters along the study reach. Some vertical variations observed during two representative Monongahela River surveys are illustrated in PLATES 3A&B and 4A&B. PLATES 3A and 3B, respectively, show mid-channel vertical variations in water temperature and DO data collected during a 25-26 August 1983 survey (1,645 to 1,925 cfs flows), and PLATES 4A and 4B show vertical variations for a 27-29 July 1988 survey (1,350 to 1,800 cfs flows).

The density of water (above 4°C) is inversely proportional, and its viscosity directly proportional, to water temperature. Therefore, as seen in PLATES 3A and 4A, the thermal discharges to Pool 3 do not totally mix, and the temperature of the surface waters in the pool tend to be higher than that of deeper waters. Conversely, the cooler Youghiogheny River tends to underflow the lower portion of Pool 2. These patterns of vertical thermal stratification are for the most part broken up, and surface extremes moderated, by the mixing of discharged water at the dams. From PLATES 1, 3A, and 4A, some moderate reverse flow, upstream surface movement, of the thermal plumes in Pool 3 appears to occur. Such reverse flows are a concern to the PAWC, which feels that reverse flows of the thermal plumes may have indirectly contributed to severe taste and odor problems which they encountered at their Elrama intake during the 1988 summer drought. As discussed in the following analyses of phytoplankton, District data supports these PAWC suspicions.

Water temperature isopleths in excess of 30°C, and DO isopleths below 6.5 mg/l are highlighted in PLATES 3A&B and 4A&B to show existing areas of special water quality concern. The 6.5 mg/l DO level was selected because of recent U.S. EPA studies that established a minimum of 6.5 mg/l as a no adverse impact to warmwater fisheries DO concentration. Current Pennsylvania minimum DO water quality criteria applicable to the

Monongahela River is still 5.0 mg/l. However, to be consistent with the antidegradation policy of the Clean Water Act, the District's goal is to meet the 6.5 mg/l level, or if possible, provide additional water quality benefits beyond this level, in the modernization of navigation structures on the Lower Monongahela River. By way of precedent, FERC (Ref 1) has also recently chosen the 6.5 mg/l criteria in their plan for hydropower development of the Upper Ohio River basin. As shown in PLATES 3B and 4B, the most DO sensitive areas of the study reach appear to be Pool 2 and the Monongahela River Arm of the Emsworth Pool.

Finally, it should be emphasized that the available data sets used in this characterization of existing water temperature and dissolved oxygen conditions represent only 12 survey snapshots of summer season water quality along the study reach. Some limitations of this information base are obvious from the water temperature data collected from the continuously recording thermistor located on the right bank of the Monongahela River at r.m. 23.8. Data reported from this station for the summers of 1988 and 1990 are graphically presented in PLATES 5 and 6, respectively.

The summer of 1988 was very warm and dry. Besides the direct effects of low flows and high air temperatures, record electrical power demands for air conditioning increased thermal loading from the two power plants on the left bank of Pool 3 during 1988. As a result, water temperatures equaled or exceeded 30°C for more than 60 days and maximums of up to 37.8°C (100°F) were observed at the r.m. 23.8 right bank station. The July 27-29, 1988 survey condition, shown in PLATES 4A&B, occurred after a brief period of precipitation, and temporary relief from the heat and drought, when maximum water temperatures at the r.m. 23.8 thermistor station fell below 30°C. Therefore, it would seem that none of the 12 survey data windows used in this discussion captured potential worst case water quality conditions that can develop on the Lower Monongahela River. On the other hand, in contrast to 1988, the summer of 1990 was cool and very wet, and water temperatures at the recording thermistor station only barely exceeded 30°C for a few days. Comparison of the 1988 and 1990 data in PLATES 5 and 6 clearly demonstrates a very strong relationship between hydrometeorologic and water quality conditions along the Lower Monongahela River.

In view of local utilization of the river as a source of drinking water, and the intense level of primary/secondary water contact recreation that occurs along the Lower Monongahela River Navigation System, it should be mentioned that there are some potential, albeit remote, public health implications to the temperature levels observed in Pool 3. For instance, it has been suggested that exotoxins of the algae, *Schizothrix calcicola*, which dominated the most thermally degraded portion of the river, might have been responsible for the 1976 Sewickley, PA water supply system epidemic. Also, artificial elevation of water temperatures in temperate regions to about 100 degrees Fahrenheit, in the presence of organic materials, provides conditions favorable to the thermophilic, free-living, pathogenic ameba, *Naegleria fowleri*. This organism can infect recreation users (e.g., swimmers and water skiers) through contact with their nasal passages, producing a heretofore lethal condition known as primary amebic meningoencephalitis (PAM).

B. Phytoplankton And Related Parameters

Phytoplankton cells have been identified, enumerated, and cell volumes calculated from samples collected from the Lower Monongahela River for ten surveys conducted between 1975 and 1988. Samples collected during the 1989 and 1990 surveys have not yet been analyzed. Chlorophyll data are also available. Prior to 1978, sonic cell disruption, rather than tissue grinding, was used to prepare samples. Therefore, the pre-1978 chlorophyll data are not considered to be reliable and will not be considered in this discussion. Summaries of these expressions of algal abundance, and of the numerical percentage of cells which were cyanophyta (blue-green algae), are tabulated in TABLES 2 and 3, and are plotted in PLATES 7 and 8. All expressions of algal abundance examined indicate that there is a significant and generally consistent trend towards increasing concentrations of phytoplankton between the upstream and downstream ends of the study reach.

As shown in PLATE 7, except for sharp localized depressions downstream of each navigation dam, the mean calculated cell volume concentration of three-foot depth samples rapidly increased from 0.82 micron^3 x 10^6/ml at r.m. 61.1 to 10.55 micron^3 x 10^6/ml at r.m. 0.8 (an increase of 1,300 percent). On the average, cell volume decreases of 55.2 percent were noted below Maxwell L&D. The average depressions below L&D Nos. 4, 3, and 2 were 13.5 percent, 20.1 percent, and 26.8 percent, respectively. The localized declines were possibly the result of the mixing at the dams of higher surface water algal concentrations with the lower algal concentrations of deeper waters.

Mean phytoplankton cell counts increased from 1,898 to 7,916 cells/ml (a 400 percent increase) between r.m. 61.1 and 0.8, with a peak mean cell count of 12,901 cells/ml in the lower portion of Pool 3 at r.m. 23.9. The apparent differences in mean cell count versus cell volume peak distributions is likely due in large part to changes in the composition of phytoplankton community that occur along the study reach. Specifically, pollution-tolerant and thermophilic blue-green algae tend to be most numerous in the L&D No. 3 reach of the river that is most affected by industrial waste heat discharges. The dominant cyanophytes found in this reach were *Schizothrix calcicola, Aphanizomenon flos-aquae, Oscillatoria* sp., *Anabaena* sp., *Coelosphaerium Naegelianum, Merismopedia elegans, Aphanocapsa delicatissima*, and *Microcystes aeruginosa*. These organisms, and especially the *Schizothrix calcicola* which usually was the most numerous single species in the samples, all tend to be small. Therefore, the elevated cell counts where blue-green algae were dominant need not correspond exactly with peaks in cell volume.

Trends in the chlorophyll *a* data shown in PLATE 8 confirm the general trends towards rapidly increasing primary biological productivity from the upstream to the downstream end of the study reach, which was apparent from the phytoplankton identification and enumeration data presented in PLATE 7. Between r.m. 61.1 and 0.8, mean chlorophyll *a* concentrations increased from 1.98 to 9.08 mg/m^3 (an increase of 460 percent), with a peak concentration of 10.84 mg/m^3 at r.m. 10.9. As an indicator parameter, chlorophyll does not appear to be as

TABLE 2

PHYTOPLANKTON CELL COUNTS AND VOLUMES
MAXIMUM, MINIMUM, AND MEAN VALUES
THREE-FOOT DEPTH SAMPLES
TEN SUMMER SURVEYS BETWEEN 1975 AND 1988

Station Code	River Mile	Phytoplankton Cell Counts (cells/ml)			Phytoplankton Cell Volumes (microns^3 x 10^6/ml)		
		Maximum	Minimum	Mean	Maximum	Minimum	Mean
4 MON 1 3001	0.8	12,655	547	7,916	41.35	0.46	10.55
4 BDP 1 1201	10.9	23,240	462	8,676	18.08	0.49	6.53
4 BDP 1 1002	11.4	23,614	1,307	9,776	25.98	1.14	8.92
4 ELP 1 1201	23.7	34,220	569	10,686	7.86	0.27	4.14
4 ELP 1 1002	23.9	44,309	1,815	12,901	11.39	1.11	5.18
4 CHP 1 1201	41.4	30,751	401	5,894	8.67	0.34	2.56
4 CHP 1 1002	41.6	25,709	184	5,432	6.94	0.15	2.96
4 MLP 1 1201	61.1	5,652	72	1,898	1.95	0.04	0.82
4 MLP 1 1002	61.3	6,857	118	2,196	4.64	0.09	1.83

TABLE 3

CHLOROPHYLL *a* CONCENTRATIONS
AND NUMERICAL PERCENTAGE OF
CYANOPHYTA CELLS

Station Code	River Mile	Chlorophyll *a* (mg/m^3) 8 Surveys Between 1978 and 1989			Numerical Percentage Cyanophyta, 10 Surveys Between 1975 and 1988		
		Maximum	Minimum	Mean	Maximum	Minimum	Mean
4 MON 1 3001	0.8	14.16	2.95	9.08	53.5	7.2	28.1
4 BDP 1 1201	10.9	28.98	2.45	10.84	57.5	8.0	37.0
4 BDP 1 1002	11.4	17.46	1.68	9.94	64.0	9.5	38.4
4 ELP 1 1201	23.7	14.74	2.23	7.30	88.5	0.0	37.7
4 ELP 1 1002	23.9	12.66	2.98	7.14	81.5	14.5	48.0
4 CHP 1 1201	41.4	5.94	1.05	3.20	63.0	0.0	33.9
4 CHP 1 1002	41.6	6.56	0.97	3.49	87.4	0.0	24.6
4 MLP 1 1201	61.1	4.18	0.75	1.98	82.7	0.0	36.4
4 MLP 1 1002	61.3	2.88	0.42	1.62	69.6	0.0	25.3

sensitive as the phytoplankton identification and enumeration data to the effects of navigation dams and industrial discharges.

Algal concentrations are probably elevated in the lower portion of the study reach because this area is more densely populated and contributes more nutrients to the river. As shown in PLATE 9, for instance, nitrate-nitrite nitrogen concentrations tend to be highest in the reach between L&D No. 2 and the mouth of the river. The influence of waste industrial heat could also be expected to stimulate algal growth, and, as previously discussed, may selectively encourage the more thermophilic blue-green algae.

Blue-green algae blooms are frequently associated with taste and odor problems in domestic water supplies, so it is possible that thermal discharges into Pool 3 may indirectly contribute to taste and odor problems that have been experienced by the PAWC at their r.m. 25.5 Elrama intake during low flow periods. Therefore, reverse flow of thermal plumes in Pool 3 could significantly influence the distribution, abundance, and composition of algae in this pool, and the quality of the PAWC water supply source.

C. Transparency and Turbidity.

Transparency is another parameter that is closely linked to both algal concentrations and turbidity, which are of interest to the PAWC. Maximum, minimum, and mean summer season Secchi disc transparency values along the Lower Monongahela River are tabulated in TABLE 4 and plotted in PLATE 10. Secchi disc transparency depths represent the approximate limit of penetration of light, or its extinction to roughly five percent of incident light levels. At depths below this level, photosynthetic activity and algal growth decline significantly. Low transparencies in lakes are usually indicative of high phytoplankton concentrations. In rivers, however, interference with light penetration is typically caused by the presence of suspended inorganic materials in the water. Considering the distribution pattern and levels of phytoplankton abundance along the Lower Monongahela River, it could be assumed that the decline in Secchi disc transparency depths that occurs between r.m. 56.2 and 0.8 (from a mean of 6.4 to 3.4 feet) would be caused by both organic and inorganic suspended materials. Organics such as phytoplankton would be more important during lower flow periods, and inorganics such as clay and silt particles would be more important during higher flows.

In addition, it is probably significant that the clearer reaches of the Monongahela River are controlled by gated dams, which can be operated to moderate rapid fluctuations in water levels. The most turbid reaches with the lowest transparency, on the other hand, are within the pools of fixed crest dams, where pool elevation fluctuations cannot be controlled. The source of at least some of the suspended solids in these more turbid areas then might be from bank wash. Boat traffic is also very heavy along the more turbid lower reaches of the study area, and prop scour of the channel and boat wake wash of the banks might contribute to the higher turbidity of the lower river.

TABLE 4

SECCHI DISC TRANSPARENCY (feet)
MAXIMUM, MINIMUM, AND MEAN VALUES
EIGHT SUMMER SURVEYS BETWEEN 1983 AND 1990

Station Code	River Mile	Station Location	MAX	MIN	MEAN
4 EMP 1 1012		Ohio River one mile below the confluence of the Allegheny and Monongahela Rivers	4.6	2.0	3.2
4 MON 1 3001	0.8	Monongahela River at Smithfield Street Bridge, Pittsburgh, PA	4.5	2.0	3.4
4 MON 1 3004	4.5	Monongahela River at mouth of Becks Run	4.0	2.0	3.1
4 BDP 1 1201	10.9	Below L&D 2	3.0	2.0	2.4
4 BDP 1 1002	11.4	Above L&D 2	4.0	2.0	2.6
4 BDP 1 1004	15.1	Below mouth of Youghiogheny River @ APC National Tube Division	4.5	2.0	3.0
4 BDP 1 1008	16.7	Above Youghiogheny River @ Mansfield Bridge	3.5	2.0	2.8
4 ELP 1 1201	23.7	Below L&D 3	5.0	1.5	3.4
4 ELP 1 1002	23.9	Above L&D 3	5.0	2.0	3.7
4 ELP 1 1004	30.0	Above the mouth of Mingo Creek @ New Eagle, PA	5.0	2.0	4.2
4 ELP 1 1006	34.2	At aerial crossing above the mouth of Sunfish Creek	5.5	2.5	4.3
4 CHP 1 1201	41.4	Below L&D 4	7.0	3.5	5.2
4 CHP 1 1002	41.6	Above L&D 4	7.5	4.0	5.0
4 CHP 1 1004	46.0	Fayette City, PA	7.5	4.0	5.8
4 CHP 1 1006	51.1	Newell, PA	6.5	3.0	5.2
4 CHP 1 1008	56.2	Brownsville, PA	12.0	2.0	6.4
4 MLP 1 1201	61.1	Below Maxwell L&D	9.0	1.5	4.6

Erosion control plans would be implemented for all navigation modernization-related construction activities. However, even with such protective measures, short-term (construction-related) decreases in transparency and increases in turbidity would be unavoidable.

D. Volatile Organic Compounds.

There is very little data available to assess the effectiveness of volatile organic compound (VOC) stripping at navigation dams on the Lower Monongahela River. The only known existing information on this topic is Corps of Engineers aromatic VOC analyses of waters immediately upstream and downstream of Monongahela River L&D Nos. 3 and 2 during the January 1988 Ashland Oil Spill. These data are presented in TABLE 5, and indicate that some reduction in xylene and toluene concentrations occurred at L&D No. 3, and of toluene at L&D No. 2. While the stripping of VOCs from the water to the atmosphere appears to be significant, the data base is much too limited to develop any firm conclusions about this aspect of the project.

There is a large BTX (benzene, toluene, and xylene) production facility located at the U.S.S. Clairton Works within the pool of L&D No. 2. In the past this plant has been the source of serious aromatic VOC spills, and of ORSANCO Organics Detection System detections of benzene in the Ohio River at West View (Ref 3). Also, as recently as July-August 1990, ORSANCO has reported 10-6 Cancer Risk Level (CRL) criterion exceedances at Becks Run (Hays Mine) on the Monongahela River for methylene chloride, tetrachloroethylene, and chloroform. The 10-6 CRL criterion for chloroform was exceeded in 93 percent of the samples analyzed at the Becks Run-Hays Mine station. Therefore the question of VOC stripping is especially pertinent to the design of the replacement structure for L&D No. 2. The close proximity of the Becks Run water supply intake on the Lower Monongahela River, as well as the West View and other intakes along the Upper Ohio River, also adds weight to the need for efficient turbulent gas exchange at the L&D No. 2 replacement structure.

TABLE 5

VOLATILE ORGANIC CHEMICAL ANALYSES
UPSTREAM AND DOWNSTREAM OF
MONONGAHELA RIVER DAM NOS. 3 AND 2
DURING THE ASHLAND OIL SPILL OF JANUARY 1988

Monongahela River at L&D 3 Elizabeth, PA 1988 on 7 January 1988					
Volatile Aromatics (μg/l)	Above Dam at 1415 hrs. Station 4 ELP 11002			Below Dam at 1500 hrs. Station 4 ELP 11201	
	Water @ 3-foot Depth	Water @ 5-foot Depth	Water @ 10-Foot Depth	Water @ 3-Foot Depth	Water @ 10-Foot Depth
Benzene	Neg.	Neg.	Neg.	Neg.	Neg.
Toluene	1.8	1.7	1.2	1.0	1.1
Ethylbenzene	Neg.	Neg.	Neg.	Neg.	Neg.
Xylenes	1.1	1.8	Neg.	Neg.	Neg.

Monongahela River at L&D 2 Braddock, PA on 7 January 1988					
Volatile Aromatics (μg/l)	Above Dam at 1100 hrs. Station 4 BDP 11002			Below Dam at 1130 hrs. Station 4 BDP 11201	
	Water @ 3-foot Depth	Water @ 5-foot Depth	Water @ 10-Foot Depth	Water @ 3-Foot Depth	Water @ 10-Foot Depth
Benzene	Neg.	Neg.	Neg.	1.0	Neg.
Toluene	Neg.	1.9	1.0	1.1	1.0
Ethylbenzene	Neg.	Neg.	Neg.	Neg.	Neg.
Xylenes	Neg.	Neg.	Neg.	Neg.	Neg.

Neg. = Below detection limit of 1.0 μg/l

III. WATER QUALITY IMPACTS OF ALTERNATIVE PLANS

A. Plan No. 1.

Modernization of the Lower Monongahela River Navigation System according to Plan No. 1, the recommended two-for-three plan, would involve:

The replacement of locks at L&D No. 4 (normal pool elevation 743.5 feet).

Total removal of L&D No. 3 (normal pool elevation 726.9 feet).

Replacement of the existing low head, fixed crest dam at L&D No. 2 (normal pool elevation 718.7 feet) with a higher lift gated dam (normal pool elevation 723.7 feet).

Dredging to deepen the navigation channel in parts of L&D No. 3 Pool.

Sediment quality, and dredging and spoil disposal impacts, are examined separately in EIS Sections IV & V. Except to note here that all construction activities can be expected to result in temporary and unavoidable increases in turbidity, discussion of this topic is deferred to EIS Sections IV & V. The impacts of Plan No. 1 on other water quality parameters of concern identified in Section I.B. of this appendix, are examined in the following paragraphs.

As demonstrated previously, Monongahela River L&D No. 4 provides moderate reaeration benefits to the river downstream of r.m. 41.5, a mean summer DO increase of 0.6 mg/l. FERC recognized this benefit and, in Reference 1, recommended that the license for any retrofit hydropower development at this dam include a provision for a continuous 500 cfs spillage discharge to assure continued reaeration below r.m. 41.5. Only the locks at L&D No. 4 would be replaced under Plan No. 1. Except for the elimination of an existing 43-foot wide fixed weir at elevation 742.5 feet, the existing gated dam would remain in place. There would be no water quality impacts upstream of r.m. 41.5. However, since the gate sills at L&D No. 4 (elevation 724 feet) are moderately submersed in the tailwaters (elevation 726.9 feet), it is suspected that a significant portion of the low flow reaeration benefits observed at the project are achieved by spillage over the fixed weir section. Elimination of this weir would be expected to have negative downstream impacts.

The new L&D No. 2 replacement dam pool level would cause the normal and average tailwater elevations at L&D No. 4 to fall from elevation 726.9 to 723.7 and 730 to 726 feet, respectively. This would increase the normal lift at L&D No. 4 from 16.6 to 19.8 feet. The increased head and decreased gate sill submergence would both tend to augment the reaeration potential of L&D No. 4. The resulting positive water quality impact should offset the loss of the fixed weir section.

In addition, since during low flow conditions a significant portion of the total flow of the Monongahela River at L&D No. 4 can be used for lockage rather than spillage, an opportunity exists to further improve water quality benefits below L&D No. 4 by designing the new lock valves and discharge outlets to entrain air. The District is investigating methods to exercise this option, and would construct the locks at L&D No. 4 to optimize lock discharge aeration at this site.

The data presented in Section II of this appendix suggest that Monongahela River L&D No. 3 does not provide a large degree of reaeration benefits to the river. In fact, the mean summer DO of the tailwaters of the dam was actually 0.2 mg/l lower than the mean DO immediately upstream of the dam. Similarly, FERC (Ref 1) assigned the dam a negative aeration constant, and ranked the aeration constant for L&D No. 3 last among 27 structures which they examined in the Upper Ohio River drainage basin. The low head (8.2 feet of lift), gentle plunge angle, and fairly smooth flow over the weir of L&D No. 3 are not conducive to efficient turbulent gas exchange. However, it is contraintuitive that the project would not provide at least some minimal level of reaeration, and it is assumed that attempts to document the benefits have been obscured by rapid water temperature change interferences from the heated effluents discharged upstream of the dam. Therefore, it is likely that a loss of reaeration and VOC stripping would occur in the reach downstream of r.m. 23.8 from the removal of L&D No. 3. Also, mixing of heated surface waters with cooler deeper waters would no longer occur abruptly at r.m. 23.8.

Normal lift at Monongahela River L&D No. 2 is 8.7 feet, and it is similar in design to L&D No. 3. While the observed summer season increase in DO below L&D No. 2 was only 0.2 mg/l, it is possible that attempts to quantify its reaeration capacity have also been obscured and its effectiveness underestimated by interference from thermal discharges and local water temperature increases. Even though the amount of aeration from L&D No. 2 appears to be modest, it is strategically located in a very DO sensitive portion of the navigation system. Because of its location at the upstream end of the Emsworth Pool, the importance of its contributions to the water quality of the Lower Monongahela and Upper Ohio rivers have been acknowledged in References 1, 2 and 6. Also, as mentioned in Section II.C., L&D No. 2 is located downstream of a major potential source of VOCs and upstream of important domestic water supply intakes. Therefore, efficient gas exchange at the L&D No. 2 replacement structure should be a high priority consideration of the navigation modernization program. The potential for accruing substantial water quality benefits below L&D No. 2 was recognized as early as 1976 (Ref 6), when recommendations were first made to incorporate hydraulic reaeration devices into the structure.

Initial efforts to pursue these recommendations at L&D No. 2 appeared to be frustrated by the very high discharge capacity criteria for the replacement dam. Compliance with these criteria mandates depression of the elevation of the gate sills to a level below the normal elevation of the L&D No. 2 tailwater (elev. 710.0), and experience has demonstrated submerged gate sill dams to be poor aerators. However, an innovative concept and dam design has been developed which is expected to meet both discharge criteria and water quality objectives for the project.

This proposed dam design calls for four gates 110 feet in width with inverts at elevation 696.7 feet (13.3 feet submergence), an 87.5-foot fixed weir adjacent to the locks, and next to the weir, a water quality gate, 110 feet wide, with a sill elevation of 714.0 feet. A water quality gate sill configuration has been developed which would permit a steep plunge angle which would create turbulence and maximize entrained bubble contact time in the tailwater. The discharge capacity of the water quality gate (10,000 cfs) would be sufficient to provide water quality benefits throughout low to moderate flow periods which are of principal concern from a water quality perspective, and would aerate a significant portion of the river during higher flow regimes. Refinements to the concept and the design of the water quality gate and weir section to optimize gas exchange benefits were made in consultation with the Hydraulic Laboratory of the Waterways Experiment Station, Vicksburg, Mississippi.

The most significant impacts of Plan No. 1 on phytoplankton and related parameters would likely occur within the extended pool of the Monongahela River L&D No. 2 replacement dam. Some clarification of the reach of river impounded by this proposed gated dam might occur as a consequence of a longer retention time, and a tendency towards more stable pool levels. In particular, water level fluctuations that now occur during low flows from Cheat River/Lake Lynn peaking power hydroelectric generation waves, as they are translated through the pools of the fixed-crest dams, would be substantially moderated.

Under most circumstances, water level fluctuation control and turbidity reductions would be considered very welcomed benefits. However, the PAWC has anticipated increased transparencies in the L&D No. 2 replacement dam pool, and expressed concern that this might lead to increased primary biological production and algae taste and odor problems at their Elrama intake. In addition, and as discussed previously, any aspect of the project that could contribute to the tendency for reverse flows of heated effluent discharge plumes near their Elrama intake, and stimulation of blue-green algae blooms, would be considered a threat to the quality of their intake waters.

These are legitimate issues which challenge the District with some extraordinary and complicated biological and hydraulic questions. We do not have definitive answers to these questions, and are not aware of any modeling techniques which would be sensitive enough to reliably predict the results of the subtle engineering, physical and biological interactions involved. However, it would seem likely that the water quality response of the new enlarged pool would not be uniform. Most of the clarification would probably occur in the lower 12.6-mile reach where pool elevation, cross sections, storage, and retention time would be increased and velocity decreased. Conversely, along the upper 17.7-mile reach of the pool which is of interest to the PAWC, the average pool elevation would be decreased from 730 to 726 feet and velocities would be increased. Higher velocities in this area would locally discourage sedimentation and turbidity reduction processes, and probably reduce the degree, extent, and frequency of flow reversal events.

In summary, in relation to dissolved oxygen and volatile organic compounds, Plan No. 1 would have no water quality impact on the Monongahela River in the 19.7-mile reach of the study area between r.m. 61.2 and 41.5. The plan would likely have a negative water quality impact between r.m. 23.8 and 11.2 from the removal of L&D No. 3. This loss, however, would be at least partially offset by benefits realized between r.m. 41.5 and 23.8, and a more substantial positive impact is anticipated from r.m. 11.2 to the mouth of the Monongahela River, and 6.2 miles downstream the Ohio River to Emsworth L&D. It is notable that there are no active domestic water supply intakes along the 12.6 miles of river which could be negatively influenced by implementation of Plan No. 1. In contrast, there are three major active intakes, serving a population of approximately one million persons, along the 35.1 miles of river that would likely experience positive water quality impacts from the recommended Plan No. 1 alternative.

Another aspect of Plan No. 1 is that the L&D No. 2 replacement dam water quality gate could serve as a demonstration project that might lead to water quality improvements at other new or replacement navigation dams at other locations in the District or nation.

Finally, the District plans to continue its surveillance of the water quality of the Lower Monongahela River Navigation System. If Plan No. 1 is implemented, monitoring of phytoplankton and related parameters in the Elrama reach would be intensified to address concerns and questions of the PAWC.

B. Plan Nos. 4 and 4 Deferred.

Plan Nos. 4 and 4 Deferred would involve larger locks at Monongahela River L&D Nos. 3 and 4, and in-kind replacement of the fixed crest dam at L&D Nos. 2 and 3. The location of L&D No. 3 would be changed from r.m. 23.8 to 24.6. The distinction between Plan Nos. 4 and 4 Deferred is the latter's 25-year deferral of the replacement of Locks 4 from Year 2002 to 2027.

The relocation of L&D No. 3, effectively shortening Pool 3, would have consequences which are of serious concern to the electric and water utilities operating in this pool. The PAWC has expressed concern that moving L&D No. 3 0.8 mile upstream closer to their r.m. 25.5 intakes could increase the likelihood of petrochemical spill impacts from an Ashland Oil tank farm located directly downstream of the PAWC. A failure of a storage tank at this Ashland Oil facility in January 1988, incidently, created what was possibly the most disasterous inland oil spill which has ever occurred. An additional concern of the PAWC with Plan No. 4 is that moving the dam further upstream might aggravate thermal degradation and taste and odor problems in the vicinity of their intake. As mentioned in Section I.B. of this Appendix, this thermal degradation concern with Plan No. 4 is also shared by Duquesne Light and West Penn

Power. With these possible exceptions, Plan No. 4 would result in water quality conditions essentially identical to those described previously for existing conditions. Plan No. 4 Deferred has the potential for increased localized turbidity impacts at L&D No. 4. The projected lockage delays at Locks 4 would increase fleeting and shuttle boat activities in the lock vicinity, increasing scour and turbidity. This impact would end with lock replacement by Year 2027.

There would be an opportunity to make modest gas exchange capacity improvements to the low head, fixed-crest L&D No. 3 replacement weir, and to the lock emptying apparatus at L&D No. 3 and L&D No. 4. These improvements would make a small, but significant, contribution to water quality in Pools 2 and 3.

C. No Action Alternative.

Under the No Action Alternative, water quality conditions in the Lower Monongahela River should continue to show a gradual improvement, although not as dramatic an improvement as over the past 30 years. Construction-related impacts at Locks 2 and Locks and Dam No. 3 by Year 2002, and at Locks 4 by Year 2022 would cause temporary elevated turbidity levels, but this would not pose a significant problem. Maintaining the present lock sizes is projected to result in significant queuing at Locks 3 and 4 which could increase scour and turbidity levels in these areas due to fleeting and shuttle boat operations. This could also increase turbidity and sedimentation in the lower river, having localized impacts on water users and the fishery.

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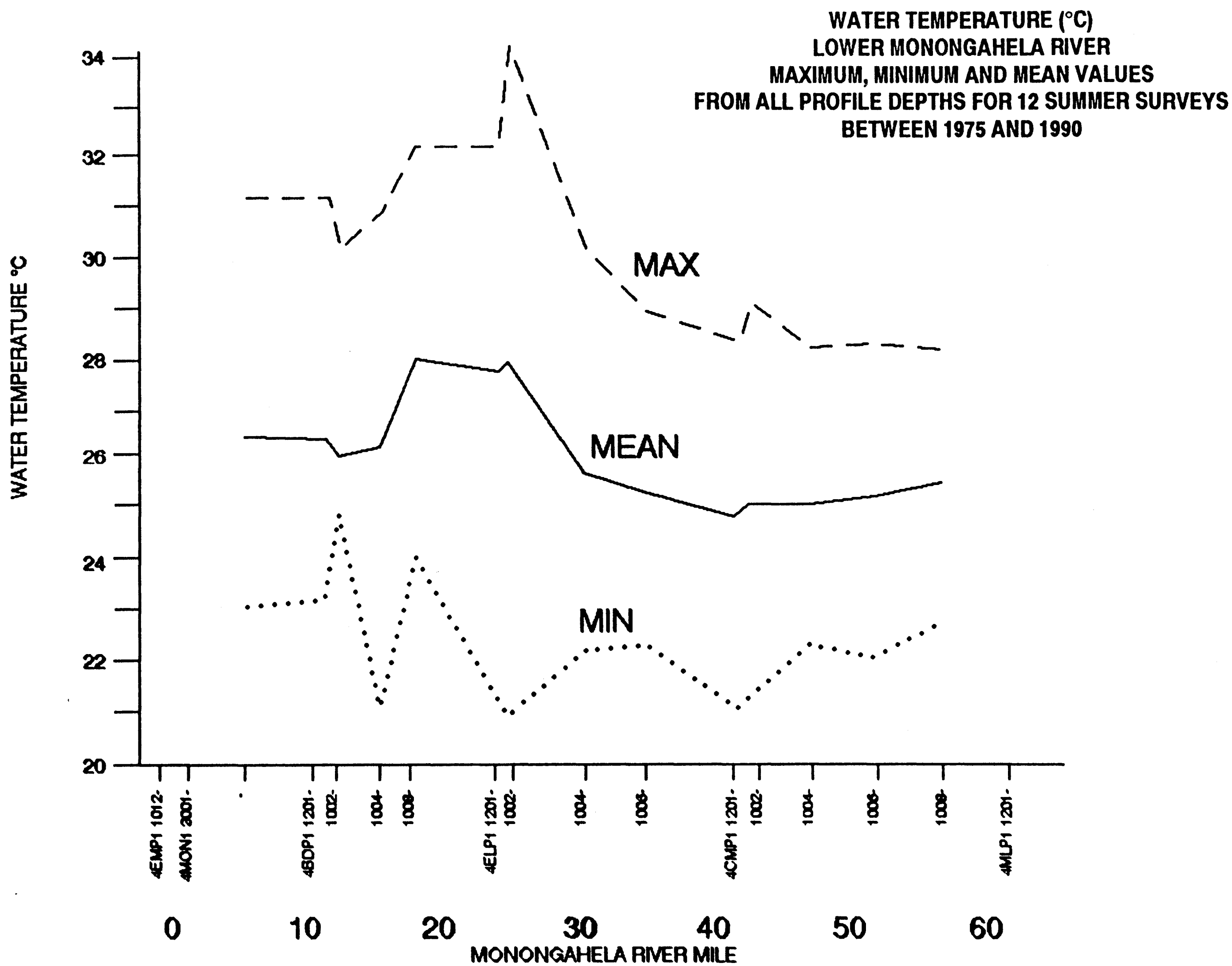
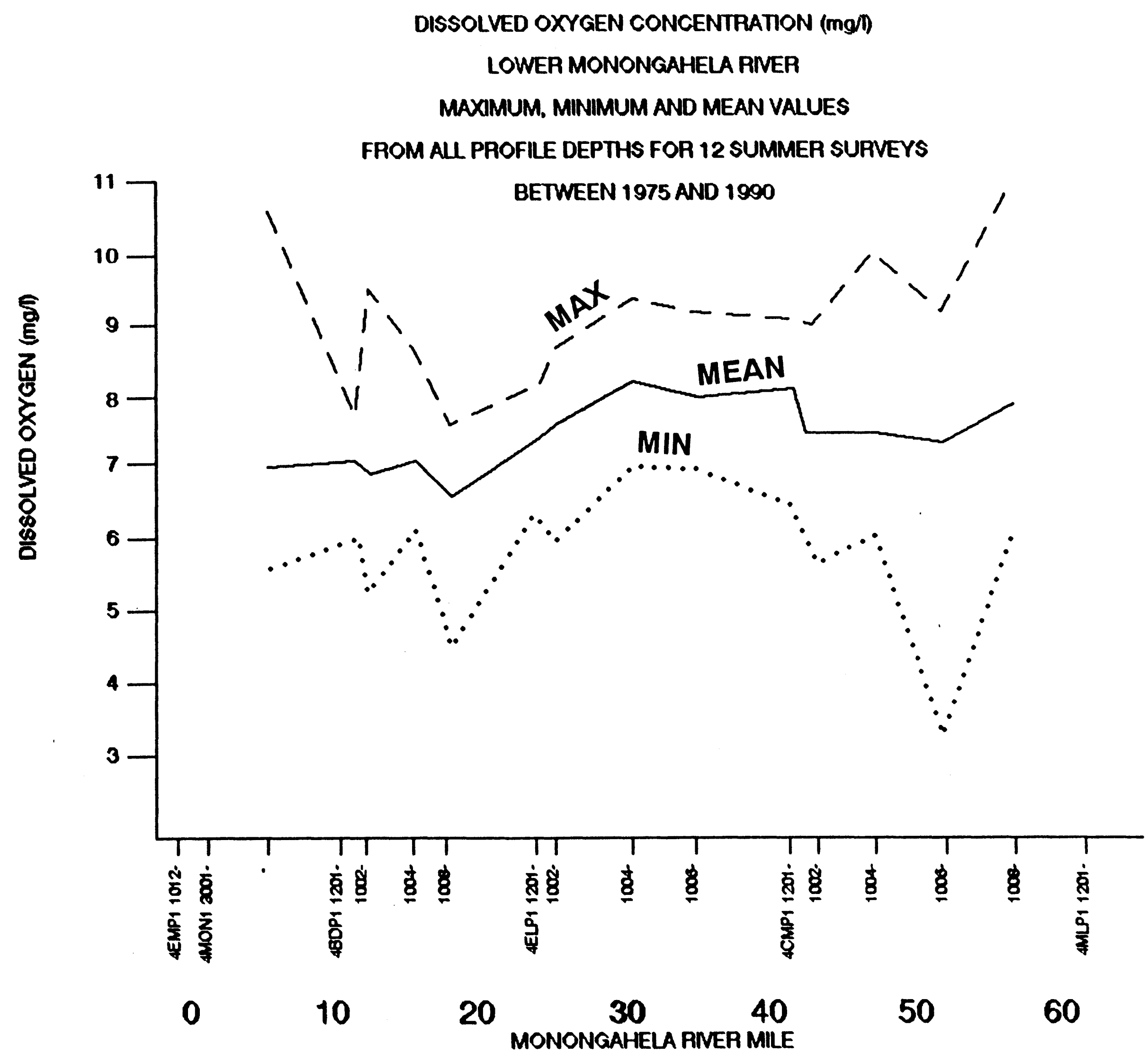
PLATES


WATER TEMPERATURE (°C)
LOWER MONONGAHELA RIVER
MAXIMUM, MINIMUM AND MEAN VALUES
FROM ALL PROFILE DEPTHS FOR 12 SUMMER SURVEYS
BETWEEN 1975 AND 1990
WATER TEMPERATURE °C
34
32
30
28
26
24
22
20
MAX
MEAN
MIN
4EMP1 1012-
4MON1 2001-
4BDP1 1201-
1002-
1004-
1008-
4ELP1 1201-
1002-
1004-
1008-
4CMP1 1201-
1002-
1004-
1006-
1008-
4MLP1 1201-
0
10
20
30
40
50
60
MONONGAHELA RIVER MILE

PLATE


DISSOLVED OXYGEN CONCENTRATION (mg/l)
LOWER MONONGAHELA RIVER
MAXIMUM, MINIMUM AND MEAN VALUES
FROM ALL PROFILE DEPTHS FOR 12 SUMMER SURVEYS
BETWEEN 1975 AND 1990
DISSOLVED OXYGEN (mg/l)
11
10
9
8
7
6
5
4
3
MAX
MEAN
MIN
4EMP1 1012-
4MON1 2001-
4BDP1 1201-
1002-
1004-
1008-
4ELP1 1201-
1002-
1004-
1008-
4CMP1 1201-
1002-
1004-
1008-
1008-
4MLP1 1201-
0
10
20
30
40
50
60
MONONGAHELA RIVER MILE

PLATE

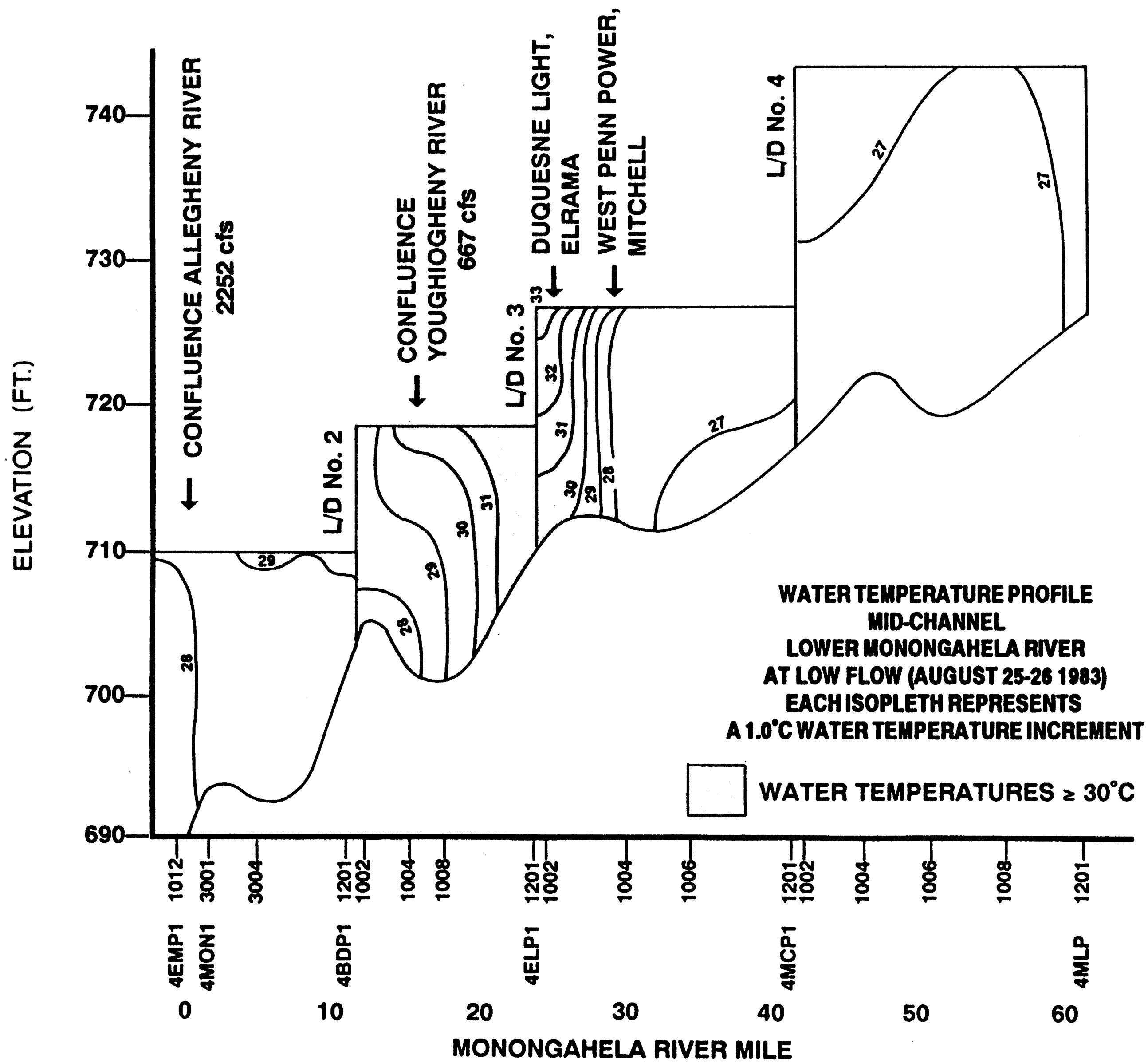

ELEVATION (FT.)
740
730
720
710
700
690
CONFLUENCE ALLEGHENY RIVER
2252 cfs
L/D No. 2
CONFLUENCE
YOUGHIOGHENY RIVER
667 cfs
L/D No. 3
DUQUESNE LIGHT,
ELRAMA
WEST PENN POWER,
MITCHELL
L/D No. 4
27
28
29
30
31
32
33
WATER TEMPERATURE PROFILE
MID-CHANNEL
LOWER MONONGAHELA RIVER
AT LOW FLOW (AUGUST 25-26 1983)
EACH ISOPLETH REPRESENTS
A 1.0°C WATER TEMPERATURE INCREMENT
WATER TEMPERATURES ≥ 30°C
1012
3001
3004
1201
1002
1004
1008
1201
1002
1004
1006
1201
1002
1004
1006
1008
1201
4EMP1
4MON1
4BDP1
4ELP1
4MCP1
4MLP
0
10
20
30
40
50
60
MONONGAHELA RIVER MILE

PLATE 3A

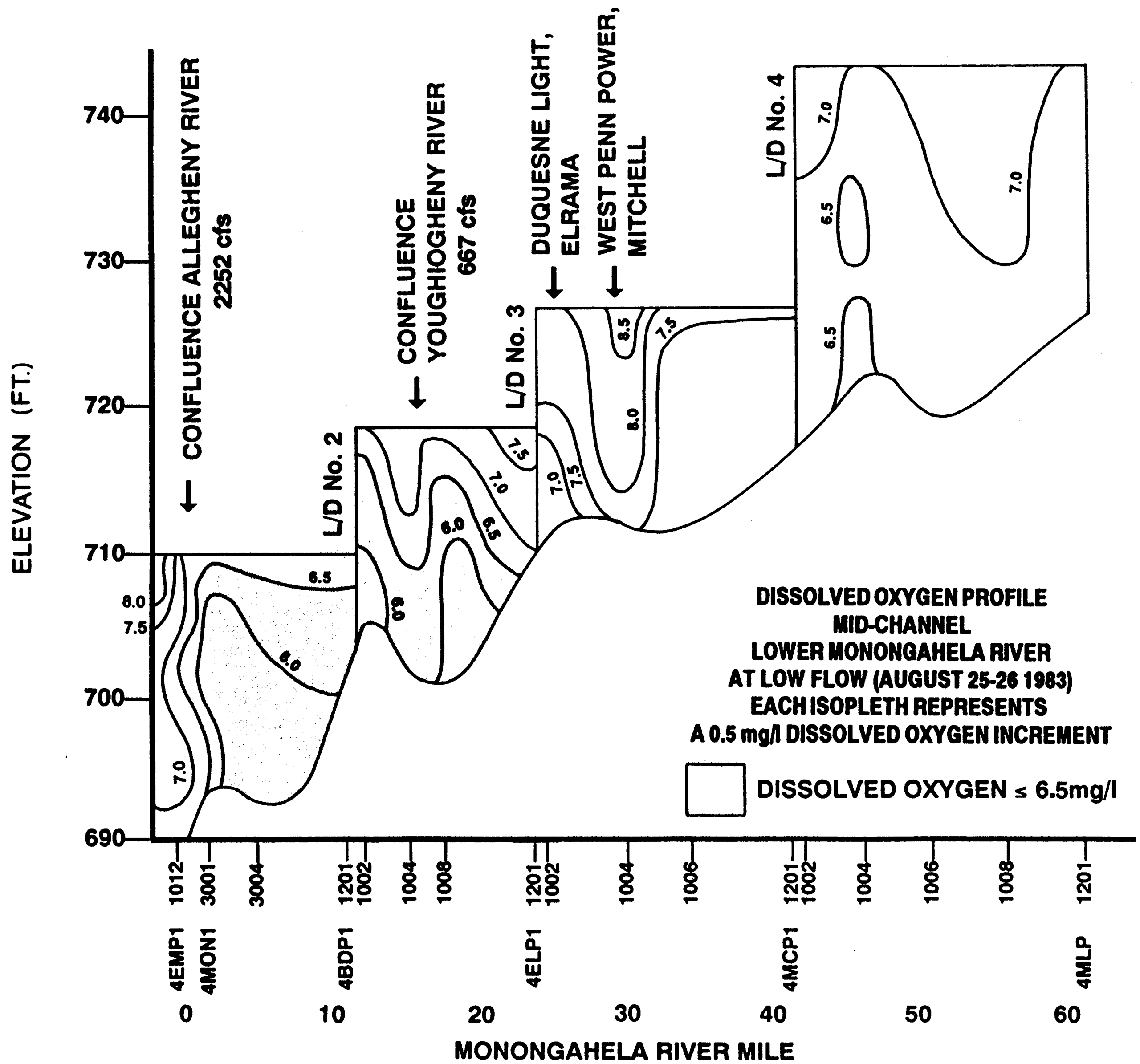
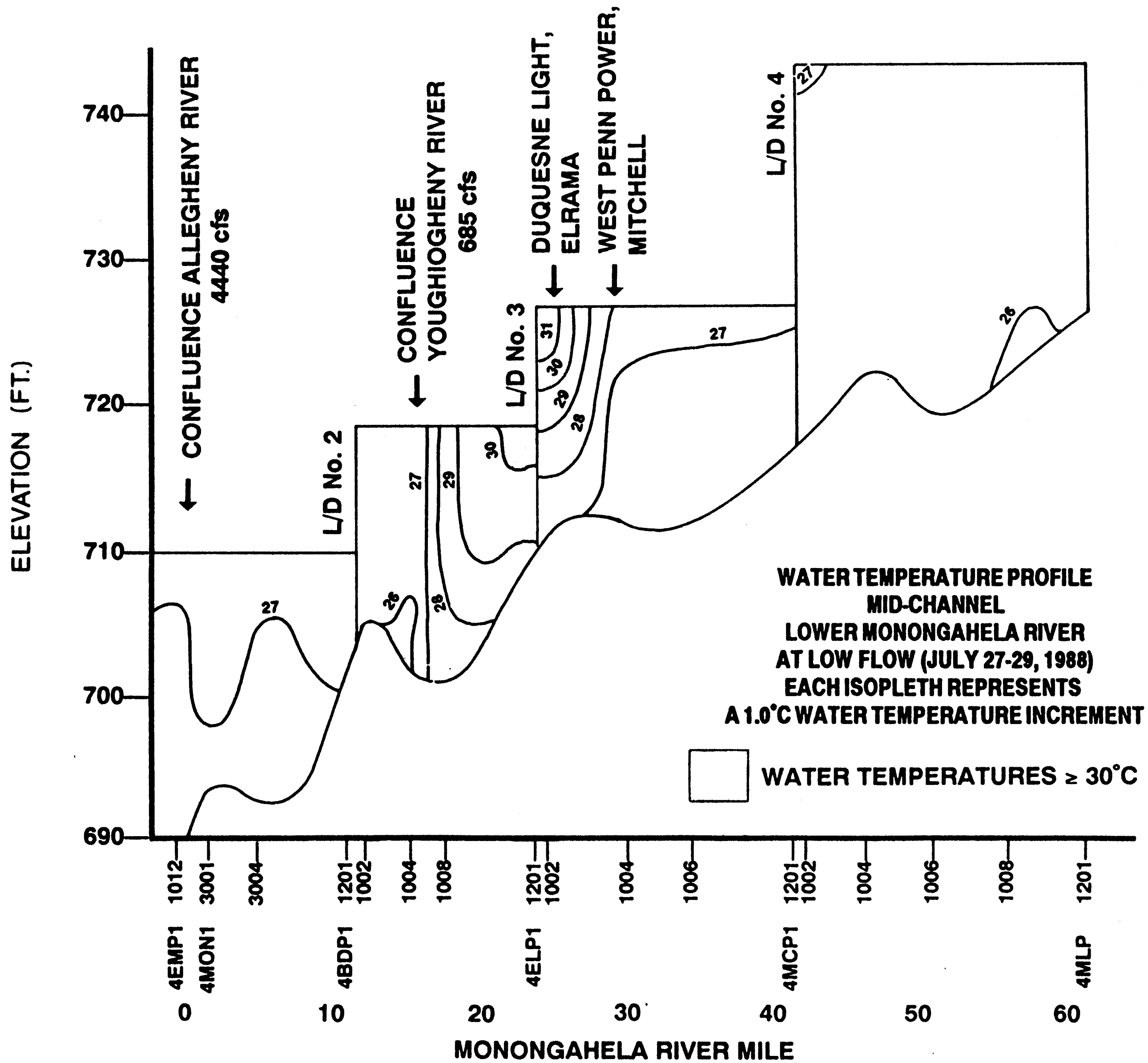

ELEVATION (FT.)
740
730
720
710
700
690
CONFLUENCE ALLEGHENY RIVER
2252 cfs
CONFLUENCE
YOUGHIOGHENY RIVER
667 cfs
DUQUESNE LIGHT,
ELRAMA
WEST PENN POWER,
MITCHELL
L/D No. 2
L/D No. 3
L/D No. 4
8.0
7.5
7.0
6.5
6.0
8.5
1012
3001
3004
1201
1002
1004
1008
1006
4EMP1
4MON1
4BDP1
4ELP1
4MCP1
4MLP
0
10
20
30
40
50
60
MONONGAHELA RIVER MILE
DISSOLVED OXYGEN PROFILE
MID-CHANNEL
LOWER MONONGAHELA RIVER
AT LOW FLOW (AUGUST 25-26 1983)
EACH ISOPLETH REPRESENTS
A 0.5 mg/l DISSOLVED OXYGEN INCREMENT
DISSOLVED OXYGEN ≤ 6.5mg/l

PLATE 3B



WATER TEMPERATURE PROFILE
MID-CHANNEL
LOWER MONONGAHELA RIVER
AT LOW FLOW (JULY 27-29, 1988)
EACH ISOPLETH REPRESENTS
A 1.0°C WATER TEMPERATURE INCREMENT
WATER TEMPERATURES ≥ 30°C
ELEVATION (FT.)
MONONGAHELA RIVER MILE
CONFLUENCE ALLEGHENY RIVER 4440 cfs
CONFLUENCE YOUGHIOGHENY RIVER 685 cfs
DUQUESNE LIGHT, ELRAMA
WEST PENN POWER, MITCHELL
L/D No. 2
L/D No. 3
L/D No. 4
4EMP1
4MON1
4BDP1
4ELP1
4MCP1
4MLP

PLATE 4A

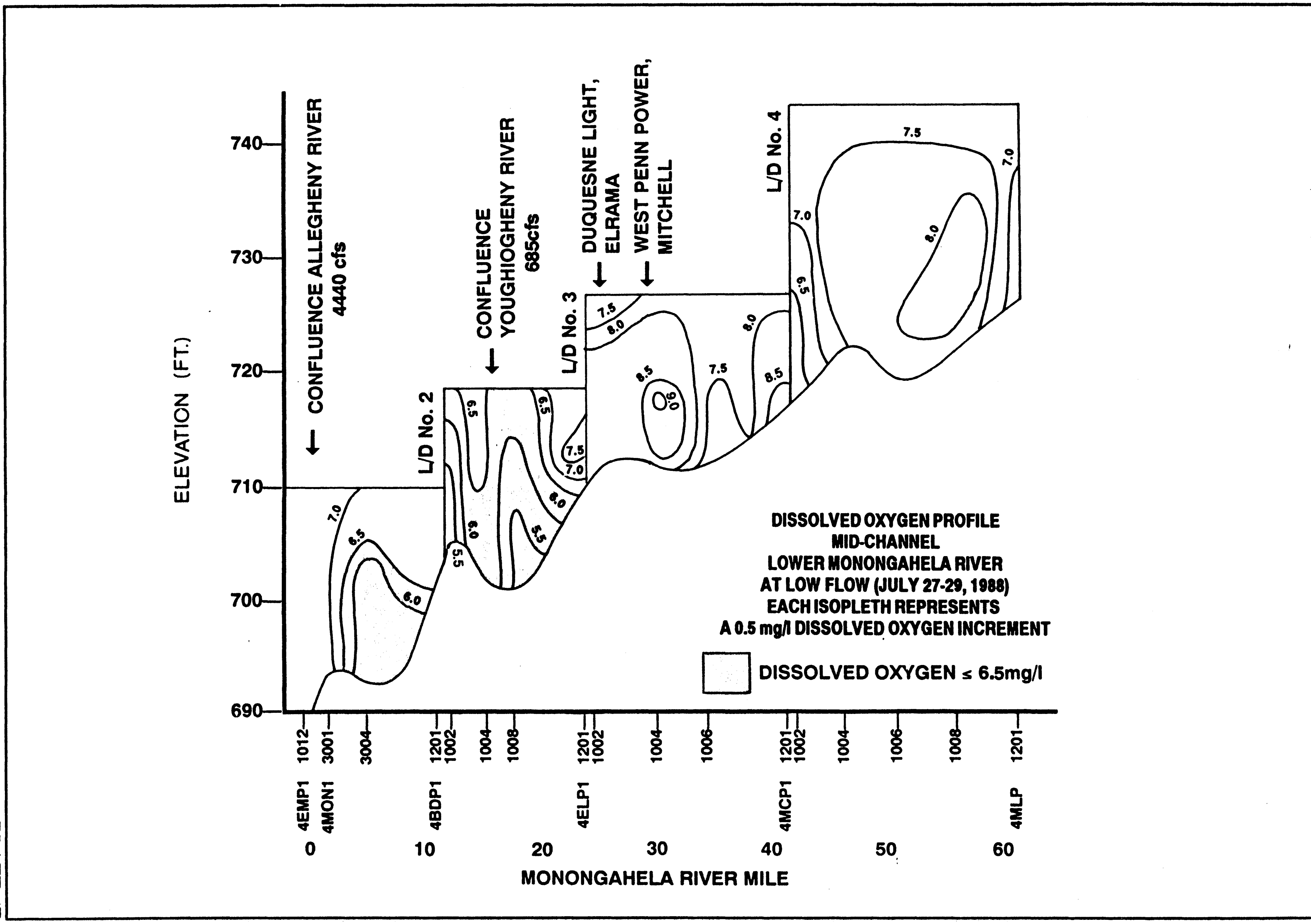

DISSOLVED OXYGEN PROFILE
MID-CHANNEL
LOWER MONONGAHELA RIVER
AT LOW FLOW (JULY 27-29, 1988)
EACH ISOPLETH REPRESENTS
A 0.5 mg/l DISSOLVED OXYGEN INCREMENT
DISSOLVED OXYGEN ≤ 6.5mg/l
ELEVATION (FT.)
MONONGAHELA RIVER MILE
CONFLUENCE ALLEGHENY RIVER
4440 cfs
CONFLUENCE
YOUGHIOGHENY RIVER
685cfs
DUQUESNE LIGHT,
ELRAMA
WEST PENN POWER,
MITCHELL
L/D No. 2
L/D No. 3
L/D No. 4
740
730
720
710
700
690
0
10
20
30
40
50
60
4EMP1
4MON1
4BDP1
4ELP1
4MCP1
4MLP
1012
3001
3004
1201
1002
1004
1008
1201
1002
1004
1006
1201
1002
1004
1006
1008
1201
7.0
6.5
6.0
5.5
7.5
8.0
8.5
9.0

PLATE 4B

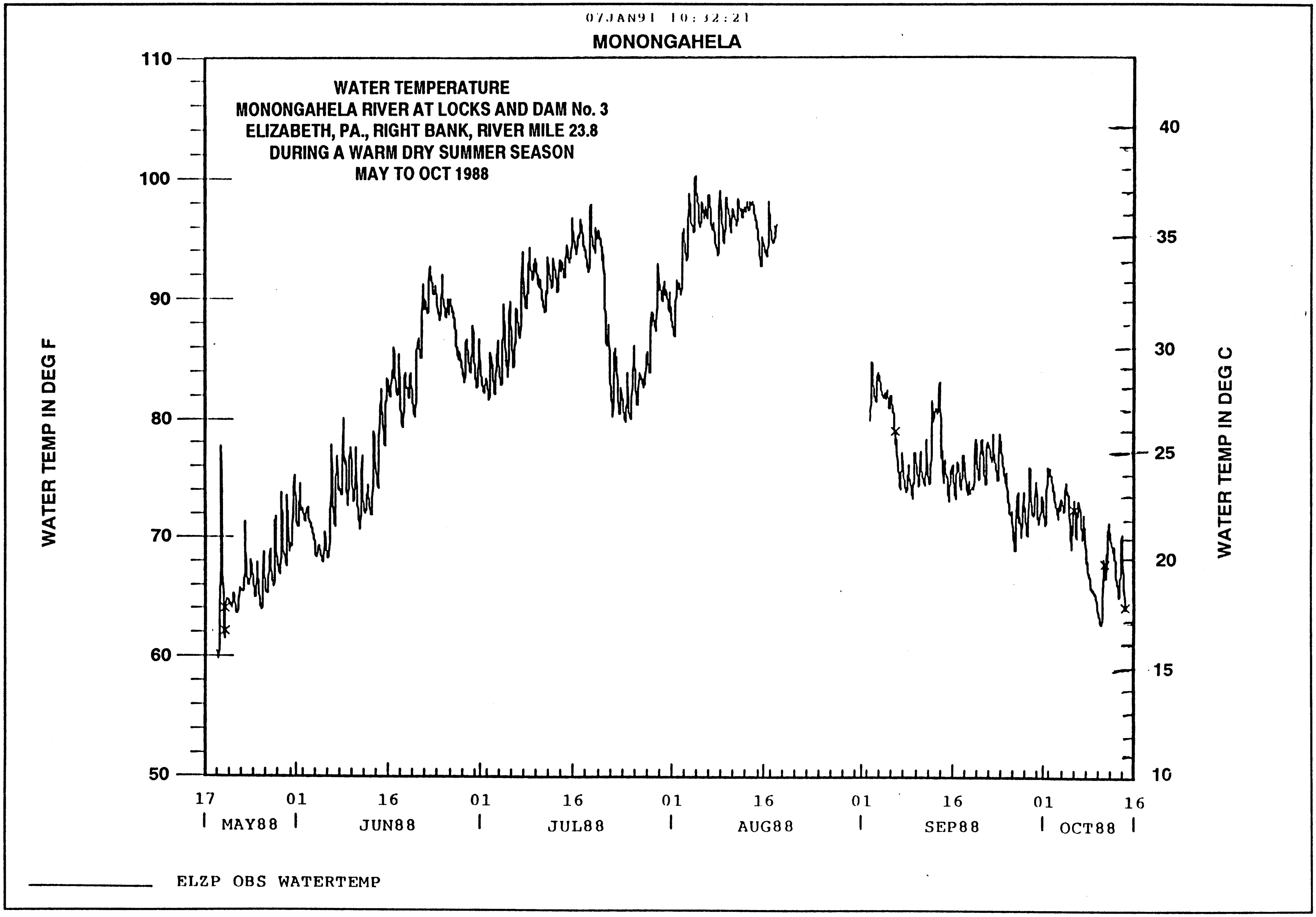
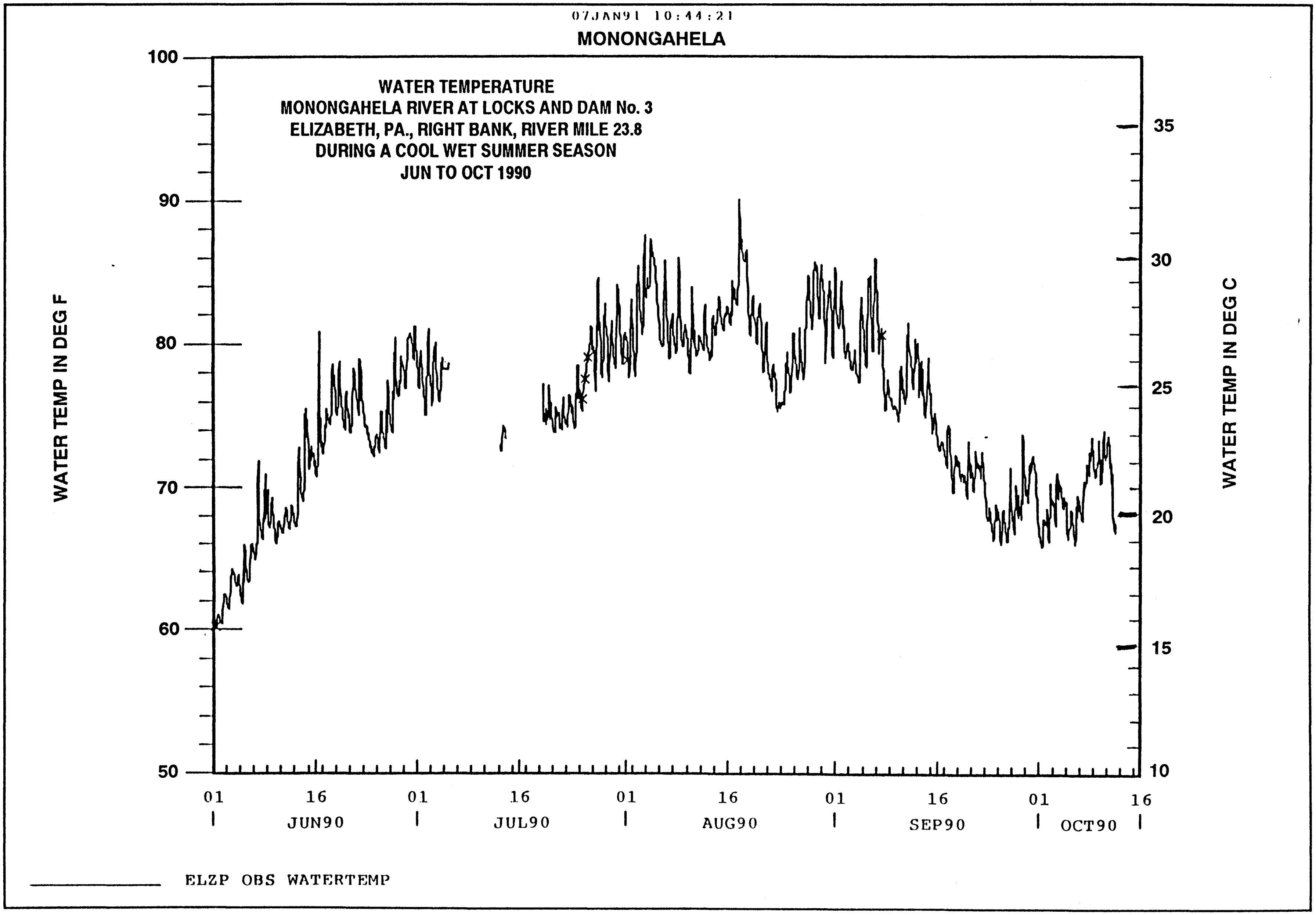

07JAN91 10:32:21
MONONGAHELA
WATER TEMPERATURE
MONONGAHELA RIVER AT LOCKS AND DAM No. 3
ELIZABETH, PA., RIGHT BANK, RIVER MILE 23.8
DURING A WARM DRY SUMMER SEASON
MAY TO OCT 1988
WATER TEMP IN DEG F
WATER TEMP IN DEG C
110
100
90
80
70
60
50
40
35
30
25
20
15
10
17
01
16
01
16
01
16
01
16
01
16
MAY88
JUN88
JUL88
AUG88
SEP88
OCT88
ELZP OBS WATERTEMP

PLATE 5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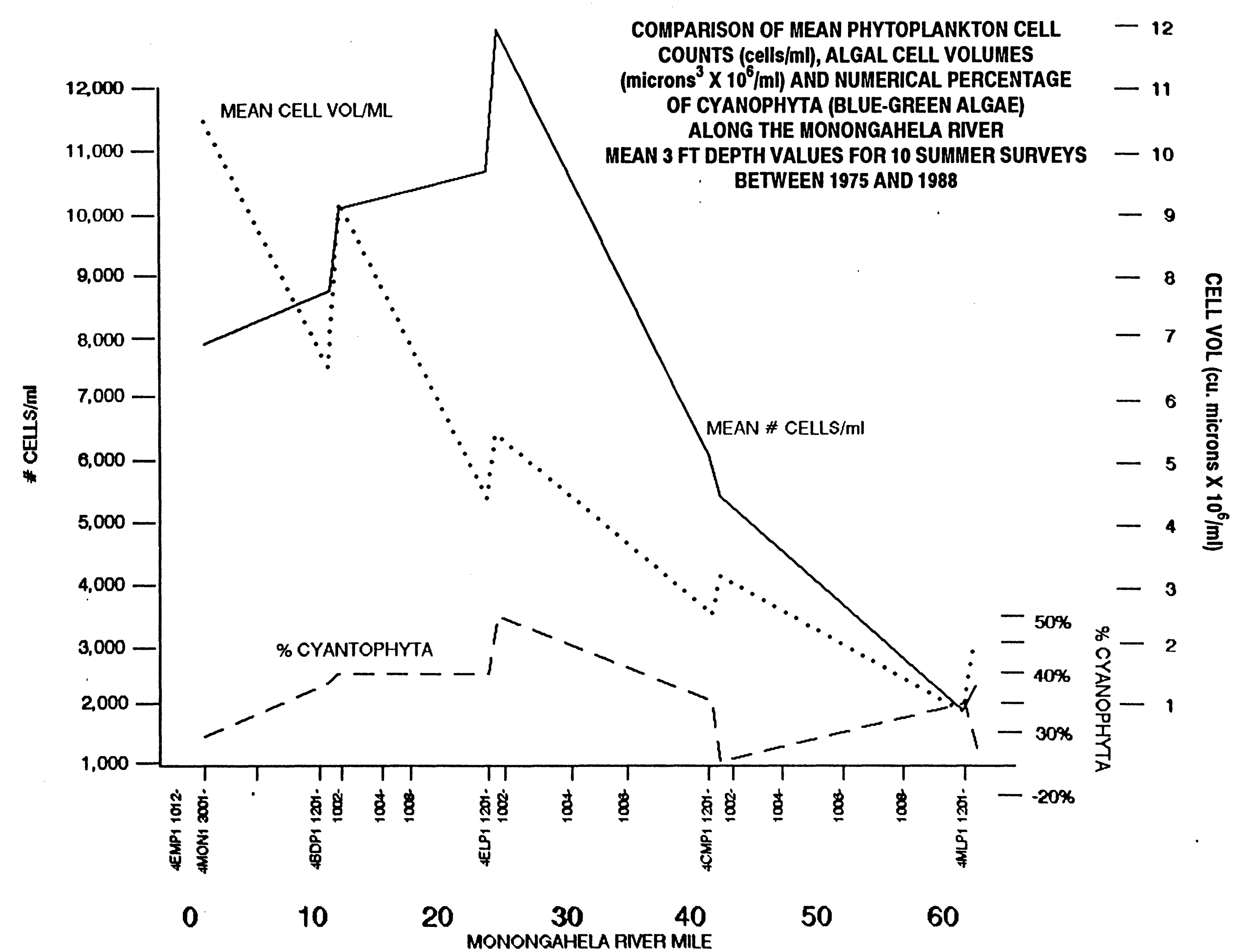
MONONGAHELA
WATER TEMPERATURE
MONONGAHELA RIVER AT LOCKS AND DAM No. 3
ELIZABETH, PA., RIGHT BANK, RIVER MILE 23.8
DURING A COOL WET SUMMER SEASON
JUN TO OCT 1990
WATER TEMP IN DEG F
WATER TEMP IN DEG C
100
90
80
70
60
50
35
30
25
20
15
10
01
16
01
16
01
16
01
16
01
16
JUN90
JUL90
AUG90
SEP90
OCT90
ELZP OBS WATERTEMP

PLATE 6


COMPARISON OF MEAN PHYTOPLANKTON CELL COUNTS (cells/ml), ALGAL CELL VOLUMES (microns³ X 10⁶/ml) AND NUMERICAL PERCENTAGE OF CYANOPHYTA (BLUE-GREEN ALGAE) ALONG THE MONONGAHELA RIVER MEAN 3 FT DEPTH VALUES FOR 10 SUMMER SURVEYS BETWEEN 1975 AND 1988
MEAN CELL VOL/ML
MEAN # CELLS/ml
% CYANTOPHYTA
# CELLS/ml
CELL VOL (cu. microns X 10⁶/ml)
% CYANOPHYTA
MONONGAHELA RIVER MILE
4EMP1 1012-
4MON1 3001-
4BDP1 1201-
4ELP1 1201-
4CMP1 1201-
4MLP1 1201-
0
10
20
30
40
50
60
PLATE 7

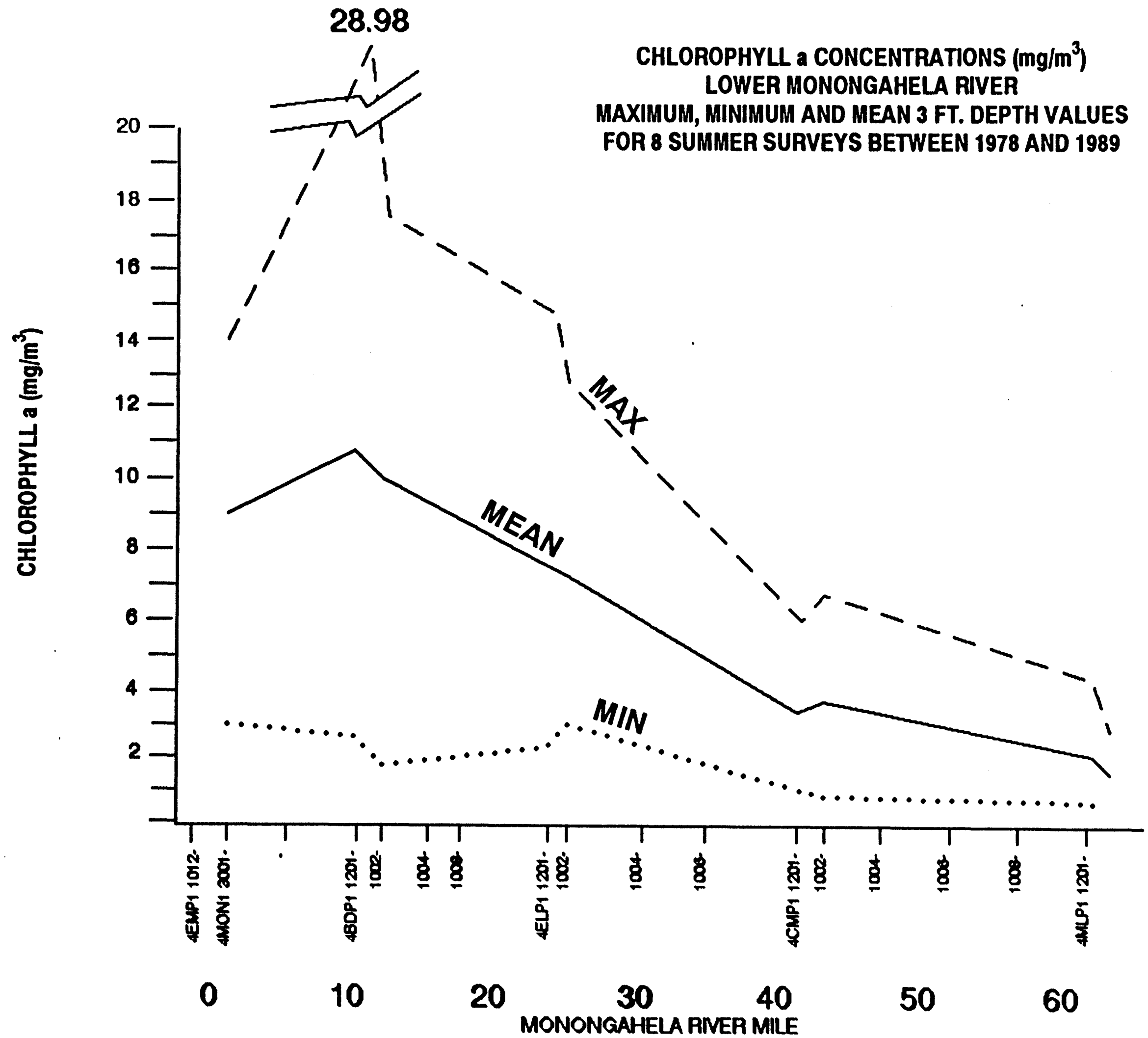

CHLOROPHYLL a CONCENTRATIONS (mg/m3)
LOWER MONONGAHELA RIVER
MAXIMUM, MINIMUM AND MEAN 3 FT. DEPTH VALUES
FOR 8 SUMMER SURVEYS BETWEEN 1978 AND 1989
28.98
MAX
MEAN
MIN
CHLOROPHYLL a (mg/m3)
20
18
16
14
12
10
8
6
4
2
4EMP1 1012-
4MON1 3001-
4BDP1 1201-
1002-
1004-
1008-
4ELP1 1201-
1002-
1004-
1008-
4CMP1 1201-
1002-
1004-
1008-
1008-
4MLP1 1201-
0
10
20
30
40
50
60
MONONGAHELA RIVER MILE

PLATE 8

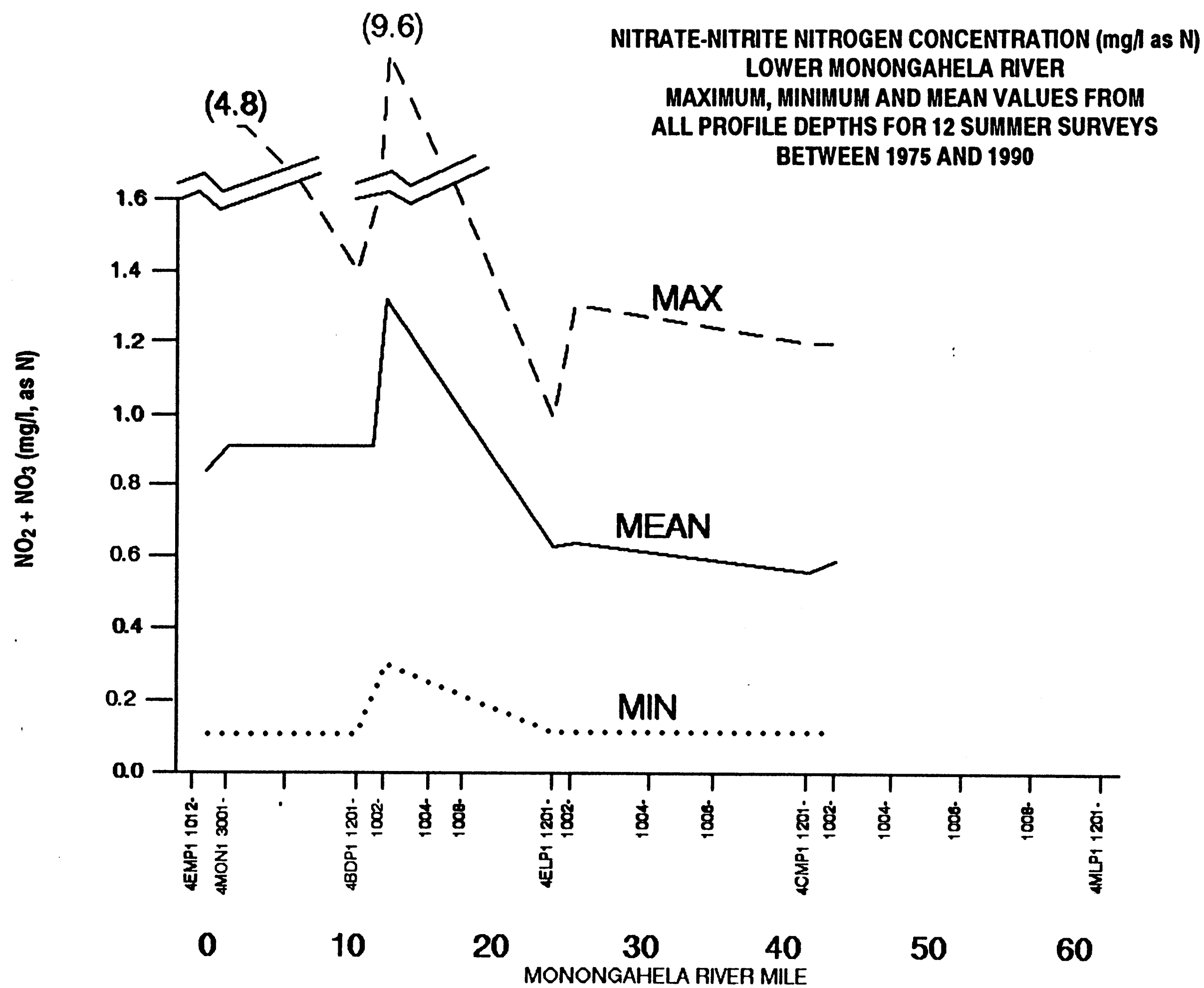
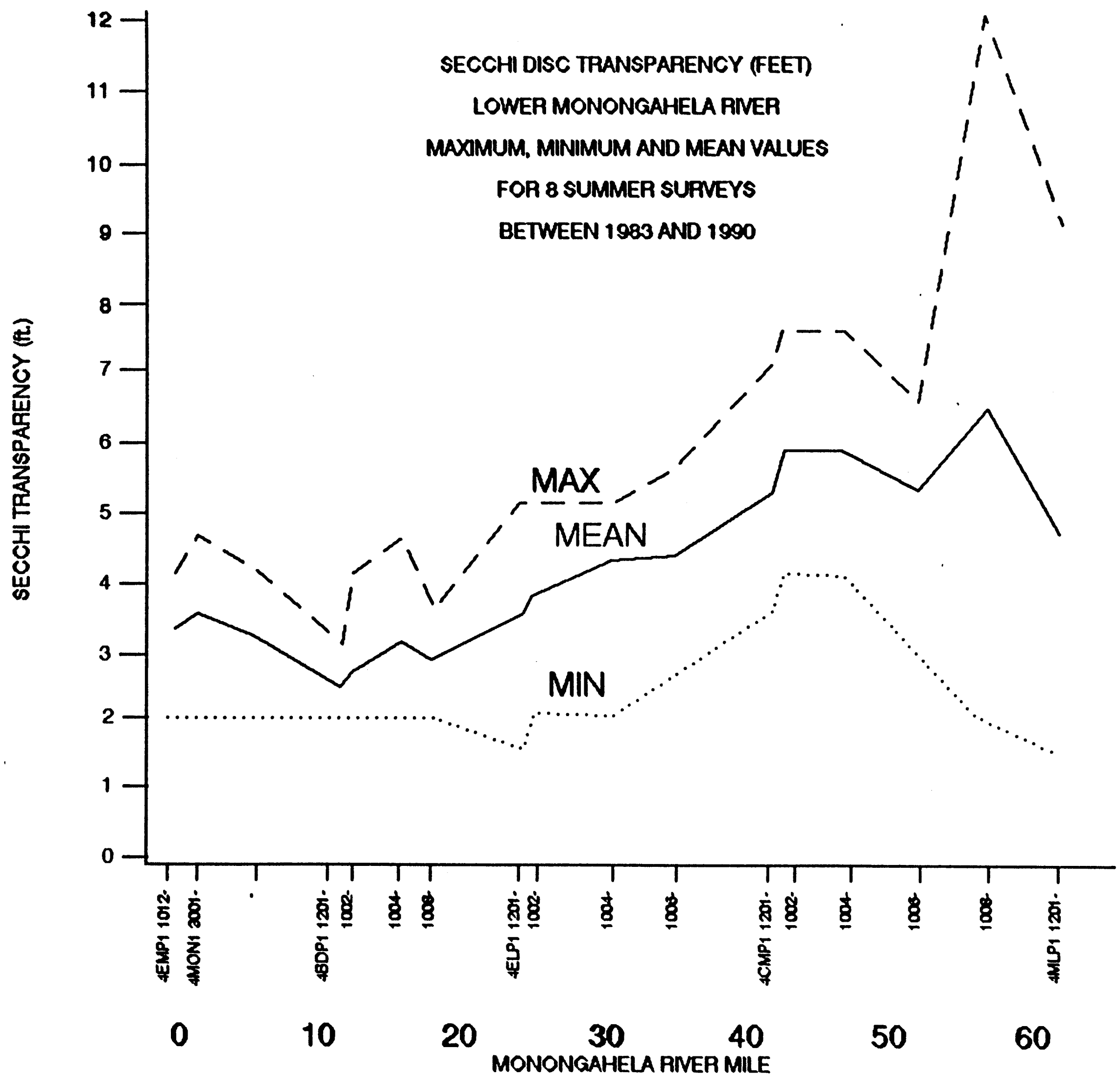

NITRATE-NITRITE NITROGEN CONCENTRATION (mg/l as N)
LOWER MONONGAHELA RIVER
MAXIMUM, MINIMUM AND MEAN VALUES FROM
ALL PROFILE DEPTHS FOR 12 SUMMER SURVEYS
BETWEEN 1975 AND 1990
(9.6)
(4.8)
MAX
MEAN
MIN
NO2 + NO3 (mg/l, as N)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
4EMP1 1012-
4MON1 3001-
4BDP1 1201-
1002-
1004-
1006-
4ELP1 1201-
1002-
1004-
1006-
4CMP1 1201-
1002-
1004-
1006-
1008-
4MLP1 1201-
0
10
20
30
40
50
60
MONONGAHELA RIVER MILE

PLATE 9

PLATE 10


SECCHI DISC TRANSPARENCY (FEET)
LOWER MONONGAHELA RIVER
MAXIMUM, MINIMUM AND MEAN VALUES
FOR 8 SUMMER SURVEYS
BETWEEN 1983 AND 1990
MAX
MEAN
MIN
SECCHI TRANSPARENCY (ft.)
0
1
2
3
4
5
6
7
8
9
10
11
12
4EMP1 1012-
4MON1 3001-
4BDP1 1201-
1002-
1004-
1008-
4ELP1 1201-
1002-
1004-
1008-
4CMP1 1201-
1002-
1004-
1008-
1008-
4MLP1 1201-
0
10
20
30
40
50
60
MONONGAHELA RIVER MILE

APPENDIX B

Wetlands and Riparian Vegetation
of the Lower Monongahela River

Wetlands and Riparian Vegetation
of the
Lower Monongahela River

Table of Contents

I. INTRODUCTION

The Pittsburgh District has recorded general observations on the wetlands and riparian vegetation of the Monongahela River as a part of water quality surveys conducted since 1979. The data recorded from Pools 2 and 3 (r.m. 11.2 - 41.5) are presented below under "II. HISTORICAL OBSERVATIONS." Specifically for the Lower Monongahela River Navigation System Study, the wetlands in Pools 2 and 3, and in the proposed disposal sites were delineated in May 1991 using the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands*. The results of this study are discussed below under "III. WETLANDS DELINEATIONS."

II. HISTORICAL OBSERVATIONS

A. Methodology.

The aquatic and riparian vegetation of the entire lengths of Monongahela River Pools 2 and 3 were examined from a boat using binoculars in conjunction with four water quality surveys conducted by the Pittsburgh District during the summers of 1979, 1983, 1987, and 1990. Maps of the pools were color coded, using visual estimates, to indicate the location and extent of basic vegetation types. In addition, conspicuous species of each vegetation type and characteristics particular to each pool were noted. At two sites in Pool 3, which appeared to have extensive and diverse aquatic plant communities, thorough botanical analyses and collections were made.

B. Existing Conditions.

The vegetated border along both sides of the river creates a narrow basically undeveloped corridor through a very urbanized and industrialized area. These borders, averaging only about 60 feet wide in Pool 2 and 100 feet wide in Pool 3, are usually bound on the upstream side by railroad tracks. Succession in the study area likely proceeds from disturbed land through early oldfield, late oldfield, immature bottomland hardwoods, to mature bottomland hardwood. To facilitate mapping, vegetation was generalized into three basic types: **wooded areas**, including mature and immature bottomland hardwoods; **disturbed areas**, such as railroad grades, coal spoil piles, and slag fills consisting primarily of introduced herbaceous species, as well as recovering disturbed areas with a higher percentage of immature woody vegetation; and **wetland areas** dominated by aquatic vascular plants. These vegetation types are characterized in Tables 1, 2, and 3, respectively. Table 4 displays the estimated relative abundance of each type.

The vegetation of the **disturbed areas** was similar throughout both pools. Introduced perennial and annual herbs, staghorn sumac, and black locust dominate with an abundance of slippery elm, young silver maple, and young sycamore. Disturbed areas in Pool 3 however, were slightly more diverse than those in Pool 2, having more aquatic species such as buttonbush, silky cornel, alder, common monkey-flower, and arrowhead. Approximately 25.9 percent of Pool 2 and 25.6 percent of Pool 3 shorelines were determined to be disturbed.

Approximately 44 percent and 41 percent of the riparian zone in Pool 2 and Pool 3, respectively, were determined to be **wooded areas**. Most of these bottomland hardwoods were immature or young second growth. Black willows and silver maple and, to a lesser extent, sycamore and boxelder dominated. Major subdominants were black locust, slippery elm, and wild black cherry. The understory was dominated by spicebush, silky cornel, garlic mustard, wingstem, white snakeroot, and spotted touch-me-not. In more urban areas, Japanese knotweed was the understory dominant. At least 5.5 percent of the shoreline in Pool 2, and one percent of the shoreline in Pool 3 was Japanese knotweed dominated.

Wetlands were defined as those areas seasonally flooded and saturated which were dominated by aquatic vascular plants. Since there are no islands or backchannels, and few embayments in the study area, most wetlands were confined to the shorelines, to sandbars associated with river tributaries, or to shallow shoreline waters. The only wetland systems represented were riverine and palustrine, predominantly riverine aquatic bed, riverine emergent, and riverine unconsolidated shore. Due to the typically steep river banks, the palustrine shrub-scrub and forested wetlands in the riparian zone are not well developed.

The Monongahela River supports almost all of the aquatic beds of submerged aquatic vascular plants found in the navigable waters of the Pittsburgh District which include the lower 72 miles of the Allegheny River and the upper 126 miles of the Ohio River. Aquatic beds line approximately nine percent of Monongahela River shorelines, most of which are found in Maxwell and Lock and Dam No. 7 pools upriver of the study area. Although there are no aquatic beds in Pool 2, 5.7 percent of the shoreline in Pool 3 supports aquatic beds. Watermilfoil and the submerged form of burreed were the dominant species.

Emergent wetlands in the study area were dominated by silky cornel, sandbar willow, common rush, false nettle, arrowhead, marsh purslane, and spikerush. Eighteen percent of the littoral zone of Pool 3 supports persistent and non-persistent emergent wetlands but only about 4.1 percent of Pool 2 shoreline is emergent wetland. This translates to approximately six miles, or about 15 percent, of the Monongahela River's 39.5 miles of emergent wetlands occurring in Pool 3. Only Pool 7 with 11.6 miles of emergents, and Opekiska Pool with 13.3 miles of emergents, exceed Pool 3.

Riverine unconsolidated shores, which are seasonally scoured, include newly exposed sandbars, shorelines, and mudflats which support non-aquatic weedy pioneer herbaceous plants. These areas are dominated by such species as horsenettle, black nightshade, common evening-primrose, and smartweed. Since unconsolidated shore describes most shoreline edges in the study area, percentages of shoreline dominated by this wetland type were not calculated.

To characterize the study area (Pools 2 and 3) as of 1990, 42 percent of the shoreline was estimated to be wooded, 26 percent disturbed, 12 percent emergent wetland, and 23 percent either non-vegetated disturbed or developed. Three percent of the shoreline was lined with submerged aquatic beds. Overlapping of the different vegetation types is responsible for the sum exceeding 100 percent.

C. Historical Conditions and Trends.

The riparian vegetation of Pools 2 and 3 remained fairly stable throughout the study period, with a few exceptions. For instance, reaches of the river in the vicinity of abandoned steel complexes are in a state of transition between disturbed areas and immature bottomland hardwoods. Also, there has been a significant reduction in burreed-dominated aquatic beds, as well as extensive stands of emergent arrowhead, which were documented in the early 1980s. This reduction may be attributed to the scouring action of the November 1985 flood. Lastly, Japanese knotweed, an aggressive introduced invader, has become more abundant with each consecutive survey, both in disturbed areas and in the woodland understory, particularly in more urbanized sections of the study area.

D. Conclusions.

Relative to the total wetland resources of the District's navigable rivers and the Monongahela River in particular, the wetlands of Pool 3 are significant. Also, while the riparian vegetation of Pool 2 is limited mostly to fragmented, thin, and extensively disturbed bands, it is important not to underestimate the aesthetic and wildlife habitat value of these thin, green corridors within the urban-industrialized landscape of this pool.

III. WETLANDS DELINEATION

A. Objective.

The objective of this effort was to identify and delineate jurisdictional wetlands in the Lower Monongahela River Navigation System Study area. Wetlands are subject to regulation under Section 404 of the Clean Water Act. With respect to the Regulatory Program of the Corps of Engineers, wetlands are defined as: "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas" (page 37128, *Federal Register*, Vol. 42, No. 138-July 19, 1977).

In addition, the U.S. Fish and Wildlife Service, in cooperation with other agencies, developed the following wetlands definition for the National Wetlands Inventory: "Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes, (2) the substrate is predominantly undrained hydric soil, or (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year" (*Federal Manual for Identifying and Delineating Jurisdictional Wetlands*, para. 1.12, page 3).

B. Methodology.

A wetland delineation was performed for Monongahela River Pools 2 and 3, river miles 11.2 to 41.5, and for three proposed upland disposal sites in the vicinity of Pools 2, 3, and 4. The delineation was performed using the routine on-site determination method described in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands*, published in January 1989. In accordance with this method, dominant vegetation was determined, soils examined and hydrology established. A hand soil auger, Munsell Soil Color Charts, and plant key were used in performing the delineation.

Because of the size of the study area (30.3 miles of river, 60.6 miles of shoreline), the wetlands determination was based on a three-parameter evaluation of 20 separate sites which, according to available information, had a high probability of containing wetlands. Sources consulted included U.S. Geological Survey maps (scale: 1"=2,000'), 1986 aerial photos of the Monongahela River, the National Wetlands Inventory, County Soils Reports, Pittsburgh District Navigation Charts of the Monongahela River, and a Pittsburgh District draft report entitled, *Wetlands and Riparian Vegetation of the Lower Monongahela River.*

The County Soil Report maps did not show hydric soils along the shoreline because these areas were too narrow to show up on the survey maps (scale: 1"=1,320'). Soil maps did not normally show areas less than 100 feet wide or less than one acre in area. Therefore, the wetland determination was based on map interpretations correlated with ground truthing.

C. Results and Discussion.

1. Monongahela River.

The field investigations revealed that, in general, along the relatively undisturbed portions of the shoreline, a wetland band covered the area between the normal pool level and the ordinary high water line. This zone averaged 40 to 60 feet in width. Typical soil profiles were a mix of fine-textured silty sediments interspersed with fine-sandy materials. Typical Munsell surface colors were 10 YR 3/3 (usually less than 1" thick) underlain by strongly reduced, 10 YR 5/1 subsoil, occasionally with reddish-brown, 5 YR 5/8 mottles. These soils are clearly hydric. Other indicators of wetland hydrology are water marks and drift lines above the wetland upper edge. Typical plant communities in these areas were a mix of wetland obligate, facultative wet and facultative species as would be expected along frequently inundated floodplain areas.

Dominant vegetation typically included an overstory of black willow and red maple; and the shrub layer included dogwoods, elderberry, and shrub-sized river birch and sycamore. The understory (herb layer) frequently included soft rush, sedges, reed canary-grass, jewelweed and goldenrod. Species dominance and distribution varied with frequency and recency of inundation. Some areas recently exposed after high water levels in April were dominated by willows, with little invasion by herbaceous species. This was the case along r.m. 38 and 39. The lower 30 to 40 feet of shoreline was primarily exposed mudflat, but the upper edge was developing a cover of jewelweed and Joe-pyeweed, with some wingstem, meadowrue, false nettle, goldenrod, and boneset. Occasionally elderberry, soft rush and other less common species were also found.

At the time this evaluation was made (April 23 to May 8, 1991), no submergent plants were visible. Only spike-rushes (*Eleocharis spp.*) were found along the lower edges of the shoreline and in river shallows in certain areas. Spike-rushes were found downstream of Wylie Run, r.m. 22.2; near Hayden Run, r.m. 23; and Perry Mill Run, r.m. 25. Stands of spikerushes were also developing along the shore near Bunola at r.m. 27.1, just downstream from a recreational boat dock. In addition to the off-shore shallows, wetlands along this reach were 40 to 50 feet in width, extending to the base of the high right bank. Approximately 1,000 feet upstream at Bunola Park, r.m. 27.3, dense stands of spike-rush were developing on the uneroded portions of the mudflats, with the spike-rushes growing along and into the water's edge. These observations were made on May 8, 1991, just downstream of the Sloan Carousel Marina. The wetland was 50 feet wide from the water's edge to the steep, eroded upper bank. All three parameters, soils, hydrology and vegetation, verified the presence of wetland along this shoreline area. In addition to reduced soils, evidence of surface flooding and saturation, dominant plant species included willow, box elder, river birch, red maple, cherry, elm, and spikerushes; growing in clumps were soft rush, sensitive fern, and reed canary-grass. Also, Joe-pyeweed, sphagnum moss, deer tongue and blackberry were present. The above site is fairly typical and descriptive of the wetlands along Pool 3.

Another area containing emergents in the shallows and along the shoreline, specifically spikerushes (*Eleocharis spp.*), was r.m. 30.2, across from New Eagle, PA. The spikerushes formed a fairly dense growth in this area and extended downstream along the shoreline. The riparian band of wetland in this area averaged 50 feet in width from the water's edge shoreward. Similar wetland plant communities as previously described occupied the site (see wetland plant species list, Table 3). This site was viewed on May 7, 1991.

Along the shoreline of the left bank from r.m. 32.2-33.0, both south and north of the new Monongahela Highway Bridge, ten separate areas adjacent to the river's edge were vegetated with spikerushes. Again, most of these vegetated areas were above normal pool, with some of the plants growing into the shallows along the shoreline.

Near r.m. 34.2, at the Sunnyside Riverfront Park, Sunfish Run discharges severely degraded mine-acid waters into the river. A bar of gravel and cobbles at the mouth was devoid of vegetation. However, both up and downstream of the mouth of Sunfish Run, spikerush dominated the edge of the Monongahela River. The area immediately in front of the park lacks shrubby vegetation and is dominated by clusters of soft rush and sedge, with some swamp dock. The upper edge of the wetland is dominated by reed canary-grass, goldenrod, deer tongue, jewelweed, false nettle and boneset, with willow and red maple seedlings. Downstream, the plant community shifts into a shrub wetland, dominated by willows. Typical wetland soils are found in the 40-feet wide zone from the water's edge upward (10 YR 5/1 subsoil with 5 YR 5/8 mottle).

Near the mouth of Kelly's Run, r.m. 26, a substantial gravel bar deposit extends into the river about 170 feet from the bank. The bar extends approximately 300 feet along the shoreline of the Monongahela. Again, scattered stands of *Eleocharis* occupied depressional portions of the bar. Scattered willow shrubs were dominant, with various grasses (unidentified), occasional soft rush, swamp dock, red maple and other species also present. Most of these species were just beginning their spring growth. A considerable increase in vegetation density in the herb layers will likely occur throughout the summer. As flooding of the shoreline wetlands lessens over the summer, further invasion by upland annuals and other facultative species will occur. At disturbed sites, where sunlight is adequate, increased invasion by Japanese knotweed will occur. During the spring the knotweed tended to be restricted to the upper banks, with only scattered growth beginning to take root below the ordinary high-water line. The knotweed does not yet appear to have become as significant a problem in Pool 3 as is the case in Pool 2.

The above site descriptions constitute a general overall view of characteristic wetlands of Pool 3, and of Wylie Run and Hayden Run (r.m. 22 to 23) which are located in Pool 2. Based on a review of available information, examination of aerial photos, navigation charts, and the site visits, it has been determined that there are approximately 165 acres of riparian wetlands in Pool 3 (r.m. 23.8 to 41.5). This calculation is based not only on those areas supporting a prevalence of vegetation, but also includes mudflats which were becoming seasonally vegetated, and the portion of the shallows adjacent to the shoreline where submergent and emergent species will become established over the summer. No submerged aquatic beds were evident between April 20 and May 8, 1991, when this study was made. *Eleocharis* was the only visible species found within the river shallows. It is likely that a significant increase in shallow water emergents and submergents will occur over the summer within Pool 3. The acreage estimation includes all riparian shoreline wetlands and adjacent emergent shallow water habitat.

The banks along the Monongahela River average 20 feet to 40 feet and more in elevation above the shoreline. Dominant plant species in the undisturbed woodlands typically include black cherry, locust, various oaks, blackberry, elderberry, goldenrod, jewelweed, violets, bedstraw, Queen-Anne's lace, deer tongue, raspberry, honeysuckle, various ferns, wild onion, and burdock. Soil colors below the horizon are typically a bright, oxidized 10 YR 6/4, 10 YR 4/3 or 10 YR 5/4 (yellowish-brown). No evidence of wetland hydrology exists in these areas. The Soils Survey Reports for Allegheny and Westmoreland Counties only list the soils along the upper banks of the river. In the undisturbed non-urban areas, these soils were: Allegheny variants, Rainesboro, Gilpin, Upshur, Monongahela and Weikert. All the above are upland soils and none are listed in the "National List of Hydric Soils of the United States." The only above-bank wetlands mapped during this study (April 17, 1991 to May 8, 1991) were at the Dunlevy and Bunola, PA, proposed disposal sites. No wetlands were present in any of the other above-bank areas observed during this study.

The results obtained by the methods described in this report indicate that the 165-acre estimate for Pool 3 is reasonably accurate for the intent and purpose of this preliminary survey. The estimate would likely be modified slightly downward with a more in-depth field study.

The wetlands along Pool 2, r.m. 11.2 to 23.8, were delineated by the same method as Pool 3 with the resulting estimate of 80 acres of wetlands along the pool. In general, significantly more human development has occurred in Pool 2 than in Pool 3. In addition, the area is much more urbanized with fewer natural adjacent areas and riparian wetlands, particularly between Locks and Dam No. 2 and Clairton, PA (r.m. 11.2-22.0). Wetlands along Pool 2 followed narrow bands along the shoreline between high water and normal pool, as did the wetlands in Pool 3. Soils (substrate) were similar, consisting of silts and fine sands. A typical Pool 2 wetland was observed at the mouth of the Youghiogheny River (r.m. 15.6) on May 6, 1991. Because of recent high water, few herbaceous species had invaded the shoreline above normal pool.

Dominant species adjacent to the high-water line included black willow, silver maple, box elder and red maple. Occasional elm and sycamore were also found. The shrub layer had elderberry and shrubby growth of the above tree species. The herb layer predominantly consisted of jewelweed, wingstem, various grasses, burdock, false nettle and goldenrod. Japanese knotweed was also invading the area. Japanese knotweed is one of the dominant herb/shrub species in Pool 2, occupying disturbed areas, riverbanks and many open areas along the shoreline where adequate sunlight is available.

The Youghiogheny River, a Pool 2 tributary, is the largest single drainage source entering the Monongahela River study area. Backwater effects at the mouth of the Youghiogheny are indicated by the buildup of silts along the shoreline and the heavy driftline at the high-water mark.

Wetlands are not found along the lower segment of Turtle Creek, which enters the Monongahela River at r.m. 11.5. Turtle Creek has been channelized and stabilized with concrete walls and side slopes up to Wall Borough. The upper reach from Wall to Trafford and upstream to its confluence with Brush Creek has been excavated and widened. This area is not conducive to wetland development.

2. Disposal Sites.

Coursin Hill.

The Coursin Hill site consists of two separate areas. One is the narrow stream valley extending approximately 4,000 feet northeastward above the Monongahela River on the right bank, r.m. 19.5. The other site occupies an area above the riverbank approximately 400 feet wide and extends 2,800 feet along the river upstream from the Glassport Highway bridge.

The southeastern end of the site adjacent to the river is currently used as a salt storage yard and has been paved over. To the northwest (downstream), the railroad sidings are adjacent to a large coal storage yard. The entire site has been severely degraded and does not support any significant wildlife habitat. Plant species observed on the riverbank below the site included boxelder, red maple, and sycamore. Along the upper portion of the bank and along the edges of the railroad track, sumac, ailanthus, goldenrod, teazel, Virginia creeper, evening primrose, wild carrot, cherry, and other species were noted. Most of the area was unvegetated as a result of the presence of salt and coal, and is shown as URB or Urban land - Rainesboro complex in the USDA Soil Conservation Service's *Soil Survey of Allegheny County, PA.*

The upstream reach of the Coursin Hill stream valley forms a narrow, steep-walled hollow approximately 200 feet deep with a roadway, the stream, and a few homes. The stream is a headwaters tributary with a watershed of less than one square mile. The stream and its floodplain are too narrow to support any functional wetland habitat. The upstream portion did contain narrow sand and gravel bars and low terraces which were vegetated, but these were considered to be part of the watercourse and were not mapped as wetland. This valley is included as part of the proposed disposal area. Dominant plant species in the valley consisted of cherry, various oaks, locust, and occasional sycamore, honeysuckle, elderberry, jewelweed, goldenrod, violets, May-apple, and bedstraw. Along the roadway, goldenrod, burdock, teasel, colt's foot, and garlic-mustard were found. These upstream slopes are shown in the above *Soil Survey* as GQF, Gilpin-Upshur complex.

Bunola.

The proposed disposal area is located along the right bank of the Monongahela River, r.m. 27, at Bunola, PA. The site occupies an area of high riverbank approximately 350 feet x 1,000 feet between the Pittsburgh and Lake Erie Railroad track and the river. The proposed disposal area then follows the floodplain of Bunola Run upstream approximately 5,000 feet southward before branching into three tributaries.

At the location of the proposed disposal site above the riverbank, the area is upland habitat. This upland area is dominated by black cherry, locust, blackberry, elderberry, goldenrod, jewelweed, violets, bedstraw, wild carrot, deer tongue, raspberry, various ferns, wild onion, and burdock. The soil is a moderately well-drained silt loam, with subsoil colors of 10 YR 6/4 on the Munsell Soil Color Charts, or yellowish-brown. Soils in this area are listed as RaA, URB, URC or Rainesboro and Urban land - Rainesboro complex in the *Allegheny County Soil Survey Report*, and are non-hydric.

North of the railroad tracks and adjacent to Bunola Run, a small wetland area was identified. The small wetland averages 50 feet wide and is 235 feet long. The dominant plant species included box elder, willow, elm, elderberry, wingstem, bedstraw, and jewelweed. The soils were hydric (10 YR 4/2 - 3/2) with evidence of wetland hydrology shown by buttressed roots, scour marks, sand deposits, and drift lines.

South of the main road through Bunola another wetland was found, which extended upstream from the road approximately 855 feet and averaged 158 feet wide, for a total of 3.1 acres. Dominant plant species included elm, box elder, cherry, sycamore, jewelweed, violets, bedstraw, elderberry, red maple, horsetail and other species. The soil is a fine-silty, low-chroma type (10 YR 3/2 - 3/1), indicative of a reducing environment from long periods of saturation. The water table was 8 to 10 inches below the surface. Water-stained leaves, scour areas, buttressed tree trunks, and detritus lines were further evidence of wetland hydrology. The plant species were predominantly hydric (over 51 percent), identifying the area as wetland by the presence of all three parameters: hydric soils, hydrophytic vegetation and wetland hydrology.

Except for the above two sites, no evidence of wetland was found elsewhere. Soils were generally of the moderately well-drained to well-drained and oxidized upland type (10 YR 5/4 - 5/6). Plant species were generally upland, facultative upland, or facultative. The upper slopes above Bunola Run were typically dominated by red maple, elm, sycamore, black oak, grape, violets, jewelweed, trillium and May-apple.

Bunola Run was generally a clear running stream on this date, with a cobble and gravel bottom and gravel bars. Aquatic invertebrates were found upstream. However, 0.4 mile upstream of where Bunola Road crosses the stream, an acid mine seep with severely degraded discharge entered Bunola Run. Except for the previously listed three-acre wetland, the upstream reaches of Bunola Run have relatively steep banks and a narrow channel with no wetlands.

The above-described wetlands along Bunola Run contribute to natural flood storage capacity, sediment retention, filtration, and dilution. These sites also provide a source of organic detritus which helps support the aquatic food web of the Monongahela River. Since water quality is marginal at this time, the proposed Bunola Run disposal area does not provide good fish or waterfowl habitat. Primary use would be by songbirds. Significant use by small furbearers is not likely because of an apparent lack of stream life such as crayfish, shellfish, or other forage species.

<u>Dunlevy.</u>

The proposed disposal area is located along the left bank of the Monongahela River, r.m. 45, just upstream of the Dunlevy Park at the Haney Barge Line, Inc. property. The site occupies an area between the riverbank to the north and the Conrail tracks to the south and extends to approximately 3,600 feet north of the park.

The flood plain and wetlands immediately adjacent to the Monongahela River shoreline would not be affected. The wetlands on the proposed project area were delineated from April 23 to May 3, 1991. Ten "Routine On-site Determination Method" data forms were completed for the proposed disposal area. A separate sheet was completed at each location where either a change in the wetland plant community occurred or wherever an isolated wetland pocket was found surrounded by uplands. The mapped wetlands are outlined on a copy of an aerial photo of the area taken on August 30, 1986 (scale: 1"=400'). The wetlands were mapped by determining the wetland boundaries, pacing off the width and length of the area and plotting the wetland on the photocopy. Photographic tone was used for preliminary identification of possible wetland sites and to place the boundaries on the photo.

A soil survey of this area, which is located in Washington County, PA, was not available. Consultation of a soil survey, although useful, was not essential in this case. None of the ten identified sites exhibited all three wetland parameters of soils, hydrology, and vegetation. The one site which had '3' chroma soils (2 chroma usually indicate hydric conditions) was saturated to or above the surface, with a continual flow of water out of the site. The dominant plant species were obligate hydrophytes, which together with the hydrology, verified that the site is functioning wetland habitat.

The wetlands found on site range from shrub-scrub (PSSIA) to emergent marsh (PEMIY). The largest interconnected complex of wetlands occupied approximately 7.0 acres. This complex provides valuable wetland habitat in terms of diversity, foraging areas and cover for various birds, deer, and small mammals. Species observed on-site included the goldfinch, brown thrasher, cardinal, robin, various sparrows, white-tailed deer, cottontail rabbit, and woodchuck.

Most of the proposed disposal area is occupied by upland woods, which extend from the Dunlevy Park at the downstream end of the property to the upstream end, approximately 3,600 feet southward. The woodland follows the riverbank, covering approximately 36 acres of the site. The dominant vegetation in the woodland is comprised of cherry, ash, elm, blackberry, multi-flora rose, honeysuckle, dogwood, elderberry, gill-o'-the-ground, wood nettle, bedstraw, various grasses, jewelweed, and other species.

The remainder of the site is occupied old fill (slag) near the north end, adjacent to the railroad track, with old field and baseball diamonds in the southern half. Scattered across the site are six small pockets of wetland (data sheets #1, #3, #4, #5, #10, and #11). These wetlands total approximately 1.9 acres, and provide little functional value in terms of diversity, wildlife habitat, water quality, or other important wetland values.

Of the areas comprising the 70-acre site, the breakdown is as follows:

Woodlands:	36 acres
Wetlands:	9 acres
Old fill, ball fields, etc.:	25 acres

The site provides good quality wildlife habitat. The wetlands are fed by culverts which discharge from other wetlands above the railroad tracks and roadway forming the western boundary of the site. Water flow was relatively continuous through small streams which crossed the site.

D. Conclusions.

1. Wetland Values.

Because of the frequency of water level fluctuation, and relative uniformity of the plant communities, riparian wetlands do not have the values or functions normally associated with typical Palustrine emergent, scrub-shrub and/or forested wetlands found in headwater areas or adjacent to lakes or ponds. The river shallows may produce some emergent and submergent vegetation and support spawning areas, shellfish and waterfowl habitat. Relative to the size of the adjacent waterway, the wetlands form a very narrow ribbon along either margin. However, because of the absence of relatively large wetlands in the area, these adjacent wetlands take on a greater functional significance.

2. Impact Analysis, Plan No. 1.

Among the impacts associated with the raising of Dam 2 would be the inundation of the present shorelines of Monongahela River Pool 2 as well as those upstream on the Youghiogheny River. This flooding would eliminate the riparian wetlands which currently exist along the shoreline in Pool 2. There are no known submergent beds in Pool 2 to be affected. It is not known whether submergent or emergent vegetation would develop in the new littoral zone which would be established behind an elevated Dam 2. Because of the relative narrowness of wetland bands along Pool 2 and the many steep-walled areas along commercial docks, railroad embankments, and slag dumps, the increase in elevation of Pool 2 may eliminate the estimated 80 acres of wetlands believed to exist in this reach. Increased siltation could create wetlands in backwater areas such as that observed near the Mansfield Bridge at r.m. 16.7, just downstream of the Ingram Barge mooring facilities. The flood plain/wetland area is only from 10 to 20 feet wide at this site, and is somewhat representative of other littoral wetlands along the heavy-use portion of the waterway.

In Pool 3, the proposed elimination of Locks and Dam No. 3 would result in the de-watering of the adjacent wetlands and the re-creation of wetland further riverward. From this preliminary study, it is estimated that as many as 165 acres of riparian wetland exist in Pool 3. The elimination of Locks and Dam No. 3 would drop the yearly average pool elevation by approximately five feet. New wetlands would likely form considerably riverward, perhaps 20 to 30 feet from the present shoreline. The riparian wetlands and shallow water habitat will reform following the pool changes. With a lowered Pool 3, and the creation of an additional 76.5 acres of shallow water habitat, there is the potential for more new wetlands to be created than now exist. It is our determination that impacts from pool changes along the Monongahela River Pools 2 and 3 would result in no net loss of wetland habitat.

Pool 3 currently supports many fish, waterfowl and wildlife species. Ducks, geese, and other waterfowl, songbirds, and fish were observed in both pools. Pool 3 had breeding populations of mallards and Canada geese. A species of gull (unidentified) also frequents Pool 3 and was seen along the shallows and sand and gravel bars. The lowering of Pool 3 would have the resultant impact of temporarily reducing available fish and waterfowl habitat. Additional impacts would result from the need to dispose of considerable amounts of dredged and excavated material.

Use of the lower portion of the Bunola site adjacent to the river would not result in any wetland or waterway impacts. The area currently has good secondary woodland growth. Other than upland impacts, no net wetland loss or impacts to the aquatic ecosystem are anticipated for this site. Disposal in the upstream reaches of Bunola Run, particularly south of the Bunola Road (across from the church parking lot), would affect less than one acre of the 2.1-acre flood plain wetland at that site. There are no wetlands at the Coursin Hill site to be impacted. The nine acres of wetlands at the Dunlevy site cannot be avoided without significantly reducing its capacity to accept disposal material, and consequently the District eliminated this site from further consideration as a potential disposal area.

Table 1

Lower Monongahela River
Vegetation of Wooded Riparian Areas

Scientific Name	Common Name
Smilax sp.	Greenbriar
Urtica sp.	Wild Nettle
Trovaria virginiana L.	Virginia Knotweed
Polygonum cuspidatum Sieb. & Zucc.	Japanese Knotweed
Ranunculus sp.	Buttercup
Thalictrum sp.	Meadowrue
Alliaria officinalis Andrz.	Garlic Mustard
Rubus sp.	Raspberry
Rubus odoratus L.	Flowering Raspberry
Rosa multiflora Thunb.	Rambler Rose
Wisteria frutescens (L.) Poir.	Wisteria
Rhus radicans L.	Poison Ivy
Partherosissus quinquefolia L. Planch.	Virginia Creeper
Vitis sp.	Wild Grape
Vitis riparia Michx.	Riverbank Grape
Convolvulus sepium L.	Hedge Bindweed
Galium sp.	Bedstraw
Lonicera sp.	Honeysuckle
Eupatorium rugosum Houtt.	White Snakeroot
Eupatorium fistulosum Barratt	Common Joe-pye Weed
Helianthus sp.	Wild Sunflower
Verbesina alternifolia (L.) Britton ex. Kearney	Wing-stem
Bidens sp.	Beggar-tick
Lindera benzoin (L.) Blume	Spicebush
Hydrangea arborescens L.	Wild Hydrangea
Cornus sp.	Dogwood
Cornus amomum Mill.	Silky Cornel
Sambucus canadensis L.	Common Elder
Salix nigra Marsh.	Black Willow
Populus tremuloides Michx.	Quaking Aspen
Populus deltoides Marsh.	Cottonwood
Alnus sp.	Alder
Ulmus rubra Muhl.	Slippery Elm
Ulmus americana L.	American Elm
Celtus occidentalis L.	Hackberry
Maclura pomifera (Raf.) Schneider	Osage Orange
Morus alba L.	White Mulberry
Morus rubra L.	Red Mulberry

Table 1, cont'd.

Scientific Name	Common Name
Sassafras albidum (Nutt.) Nees.	White Sassafras
Hamamelis virginiana L.	Witch-hazel
Plantanus occidentalis L.	Sycamore
Physocarpus opulifolius (L.) Maxim.	Ninebark
Prunus serotina Ehrh.	Wild Black Cherry
Robinia pseudo-acacia L.	Black Locust
Ailanthus altissima (Mill.) Swingle	Tree-of-heaven
Rhus typhina L.	Staghorn Sumac
Acer sp.	Maple
Acer saccharinum L.	Silver Maple
Acer rubrum L.	Red Maple
Acer negundo L.	Boxelder
Tilia americana L.	American Linden
Fraxinus americana L.	White Ash
Catalpa bignonioides Walt.	Common Catalpa

Table 2

Lower Monongahela River
Vegetation of Disturbed Areas

Scientific Name	Common Name
Equisetum sp.	Horsetail
Polygonum cuspidatum Sieb. & Zucc.	Japanese Knotweed
Amaranthus sp.	Pigweed
Phytolacca americana L.	Pokeweed
Saponaria officionalis L.	Soapwort
Allaria officinalis Andruz.	Garlic Mustard
Rubus odoratus L.	Flowering Raspberry
Rhus radicans L.	Poison Ivy
Impatients capensis Meerb.	Spotted Touch-me-not
Parthenocissus quinquefolia (L.)Planch.	Virginia Creeper
Oenothera biennis L.	Common Evening-primrose
Umbelliferae G. sp.	Parsley Family
Daucus carota L.	Queen Ann's Lace
Asclepias syriaca L.	Common Milkweed
Convolvulus sepium L.	Hedge Bindweed
Vervascum thapsus L.	Great Mullen
Linaria vulgaris Hill.	Butter-and-eggs
Dipsacus sylvestris Huds.	Common Teasel
Vernonia noveboracensis (L.) Michx.	New York Ironweed
Solidago sp.	Goldenrod
Aster sp.	Aster
Ambrosia trifida L.	Giant Ragweed
Verbesina alternifolia (L.) Britton ex. Kearney	Wing-stem
Chrysanthemum leucanthemum L.	Ox-eye Daisy
Artmisia vulgaris L.	Common Mugwort
Tussilago farfara L.	Coltsfoot
Achillea ptarmica L.	Yarrow
Arctium minus (Hill) Berhn.	Common Burdock
Physocarpus opulifolious (L.) Maxim.	Ninebark
Sambucus canadensis L.	Common Elder
Cornus sp.	Dogwood
Almus rubra Muhl.	Slippery Elm
Sassafras albidum (Nutt.) Nees.	White Sassafras
Platanus occidentalis L.	Sycamore (immature)
Prunus serotina Ehrh.	Wild Black Cherry
Robinia pseudo-acacia L.	Black Locust
Rhus typhina L.	Staghorn Sumac
Acer saccharinum L.	Silver Maple
Acer negundo L.	Boxelder

Table 3

Lower Monongahela River
Vegetation of Wetland Sites

Scientific Name	Common Name
Nitella flexilis L.	Stonewort
Equisetum sp.	Horsetail
Onoclea sensibilis L.	Sensitive Fern
Typha latifolia L.	Broad-leaved Cattail
Sparganium sp.	Burreed (predominantly emergent)
Alisma sp.	Water Plantain
Sagittaria latifolia Willd.	Wapato (terres. & emerg. forms)
Panicum sp.	Panic Grass
Panicum agrostoides Spreng.	Redtop Panic Grass
Panicum virgatum L.	Switch Grass (probably)
Echinochloa sp.	Barnyard Grass
Graminea G. sp.	Grasses
Setaria sp.	Foxtail
Leersia oryzoides (L.) Sw.	Rice Cutgrass
Phalaris arundinacea L.	Reed Canary Grass
Eragrostis hypnoides (Lam.) BSP.	Creeping Lovegrass
Elymus virginicus L.	Virginia Wild Rye
Cyperus sp.	Umbrella Sedge
Cyperus strigosus L.	Galingale
Eleocharis acicularis (L.) R.& S.	Needle Rush (terrestrial, emergent, and submerged forms)
Eleocharis sp.	Spikerush
Eleocharis obtusa (Willd.) Schultes	Spikerush
Eleocharis calva Torr.	Spikerush
Scirpus validus Vahl.	Great Bulrush
Scirpus sp.	Woolgrass
Scirpus cyperinus (L.) Kunth	Woolgrass
Carex sp.	Sedge
Juncus sp.	Rush
Juncus tenuis Willd.	Yard Rush
Juncus effusus L.	Common Rush
Juncus acuminatus Michx.	Rush
Iris sp.	Iris
Boehmeria cylindrica (L.) Sw.	False Nettle
Urtica gracilis Ait.	Wild Nettle
Amaranthus sp.	Pigweed
Rumex sp.	Dock
Rumex crispus L.	Curly Dock
Polygonum sp.	Knotweed
Polygonum lapathifolium L.	Dock-leaved Smartweed
Polygonum sagittatum L.	Arrowleaf Tearthumb
Polygonum cuspidatum Sieb.&Zucc.	Japanese Knotweed

Table 3, cont'd.

Scientific Name	Common Name
Chenopodium album L.	Lamb's Quarters
Crucifera G. sp.	Mustard
Rorippa islandica (Older) Barbas	Marsh Yellow Cress
Penthorum sedoides L.	Ditch Stonecrop
Apios americana Medic.	Groundnut
Rhus radicans L.	Poison Ivy
Impatiens capensis Meerb.	Spotted Touch-me-not
Vitis sp.	Wild Grape
Hibiscus moscheutos L.	Swamp Rose Mallow
Hypericum sp.	St. John's Wort
Hypericum mutilum L.	Small-flowered St. John's Wort
Lythrum salicaria L.	Spiked Loosestrife
Ludwigia alternifolia L.	Seedbox
Ludwigia palustris (L.) Ell.	Marsh Purslane
Oenothera biennis L.	Common Evening-primrose
Myriophyllum sp.	Water-milfoil
Lysimachia terrestris (L.) B.S.P.	Swamp Candle
Lysimachia vulgaris L.	Garden Loosestrife
Convolvulus sepium L.	Hedge Bindweed
Cuscuta sp.	Dodder
Myosotis scorpiodes L.	Forget-me-not
Verbena hastata L.	Blue Vervain
Solanum carolinense L.	Horse-nettle
Mimulus ringens L.	Common Monkey-flower
Justicia americana (L.) Vahl	Water-willow
Eupatorium fistulosum Barratt	Common Joe-pye Weed
Eupatorium perfoliatum L.	Boneset
Xanthium sp.	Cocklebur
Artemisia vulgaris L.	Common Mugwort
Helianthus sp.	Wild Sunflower
Biden sp.	Beggar-tick
Salix nigra Marsh.	Black Willow
Salix interior Rowlee	Sandbar Willow
Alnus serrulata (Ait.) Willd.	Smooth Alder
Lindera benzoin (L.) Blume	Spicebush
Platanus occidentalis L.	Sycamore
Physocarpus opulifolius (L.) Maxim.	Ninebark
Acer saccharinum L.	Silver Maple
Cornus sp.	Dogwood
Cornus amomum Mill.	Silky Cornel
Cephalanthus occidentalis L.	Buttonbush

Table 4

Lower Monongahela River
Estimated Shoreline Miles and Percentages
of Riparian Vegetation Types (1990)

Vegetation Type	Pool 2 23.2 Total Shoreline Miles		Pool 3 34.0 Total Shoreline Miles		Total Study Area 57.2 Total Shoreline Miles	
	Miles of Vegetation	Percent of Pool	Miles of Vegetation	Percent of Pool	Miles of Vegetation	Percent of Pool
Wooded	10.1	43.7	14.0	41.2	24.1	42.1
Disturbed	6.0	25.9	8.7	25.6	14.7	25.7
Emergent Wetland	1.0	4.1	6.1	17.9	7.0	12.3
Submerged Wetland	0	0	2.0	5.7	2.0	3.4
Japanese Knotweed	1.3	5.5	0.4	1.1	1.7	2.9
Non-vegetated	6.8	29.3	6.2	18.2	13.0	22.7

APPENDIX C

Endangered and Threatened Species

Pennsylvania Fish and Wildlife Data Base
Endangered, Threatened, and Special Concern Species List
(Includes Accidental and Migrant Species)
** Lower Monogahela River EIS **
03 OCT 1990

Note: The following list includes species occurring in your project area as well as species which may accidentally occur but do not nest or rear young at or near your project site.

Common Name................	Scientific Name...........	Status................
EAGLE, BALD	HALIAEETUS LEUCOCEPHALUS	PA / Fed Endangered
FALCON, PEREGRINE	FALCO PEREGRINUS TUNDRIUS	PA / Fed Endangered
MASSASAUGA	SISTRURUS CATENATUS	PA Endangered
SOFTSHELL, MIDLAND SMOOTH	TRIONYX MUTICUS	PA Endangered
OWL, SHORT-EARED	ASIO FLAMMEUS	PA Endangered
RAIL, KING	RALLUS ELEGANS	PA Endangered
TERN, BLACK	CHLIDONIAS NIGER	PA Endangered
SHREW, LEAST	CRYPTOTIS PARVA	PA Endangered
BULLHEAD, ROUGH	PLETHOBASUS STRIATUS	Federal Endangered
PIGTOE, ROUGH	PLEUROBEMA PLENUM	Federal Endangered
SHELL, ORB, OHIO	LAMPSILIS ABRUPTA	Federal Endangered
BITTERN, AMERICAN	BOTAURUS LENTIGINOSUS	PA Threatened
BITTERN, LEAST	IXOBRYCHUS EXILIS	PA Threatened
EGRET, GREAT	CASMERODIUS ALBUS EGRETTA	PA Threatened
FLYCATCHER, YELLOW-BELLIED	EMPIDONAX FLAVIVENTRIS	PA Threatened
HERON, YELLOW-CROWNED NIGHT	NYCTICORAX VIOLACEUS	PA Threatened
SANDPIPER, UPLAND	BATRAMIA LONGICAUDA	PA Threatened
WOODRAT, EASTERN	NEOTOMA FLORIDANA	PA Threatened
BLUEBIRD, EASTERN	SIALIA SIALIS	Special Concern Species
BOBWHITE, NORTHERN	COLINUS VIRGINIANUS	Special Concern Species
HARRIER, NORTHERN	CIRCUS CYANEUS	Special Concern Species
HAWK, COOPER'S	ACCIPITER COOPERII	Special Concern Species
HAWK, RED-SHOULDERED	BUTEO LINEATUS	Special Concern Species
HERON, GREAT BLUE	ARDEA HERODIAS	Special Concern Species
MARTIN, PURPLE	PROGNE SUBIS	Special Concern Species
OWL, COMMON BARN	TYTO ALBA	Special Concern Species
SPARROW, GRASSHOPPER	AMMODRAMUS SAVANNARUM	Special Concern Species
SPARROW, HENSLOW'S	AMMODRAMUS HENSLOWII	Special Concern Species
SPARROW, VESPER	POOECETES GRAMINEUS	Special Concern Species
WOODPECKER, RED-HEADED	MELANERPES ERYTHROCEPHALUS	Special Concern Species
BOBCAT	FELIS RUFUS	Special Concern Species
MYOTIS, KEEN'S	MYOTIS KEENII	Special Concern Species

Pennsylvania Fish and Wildlife Data Base
Endangered, Threatened, and Special Concern Species List
** Lower Monogahela River EIS **
12 OCT 1990

Note: The following list includes species likely to occur in or near your project area. These species may nest or rear young at or near your site.

Common Name.................	Scientific Name............	Status.................
MASSASAUGA	SISTRURUS CATENATUS	PA Endangered
SOFTSHELL, MIDLAND SMOOTH	TRIONYX MUTICUS	PA Endangered
RAIL, KING	RALLUS ELEGANS	PA Endangered
SHREW, LEAST	CRYPTOTIS PARVA	PA Endangered
BITTERN, AMERICAN	BOTAURUS LENTIGINOSUS	PA Threatened
EGRET, GREAT	CASMERODIUS ALBUS EGRETTA	PA Threatened
HERON, YELLOW-CROWNED NIGHT	NYCTICORAX VIOLACEUS	PA Threatened
SANDPIPER, UPLAND	BATRAMIA LONGICAUDA	PA Threatened
WOODRAT, EASTERN	NEOTOMA FLORIDANA	PA Threatened
BLUEBIRD, EASTERN	SIALIA SIALIS	Special Concern Species
BOBWHITE, NORTHERN	COLINUS VIRGINIANUS	Special Concern Species
HAWK, COOPER'S	ACCIPITER COOPERII	Special Concern Species
HAWK, RED-SHOULDERED	BUTEO LINEATUS	Special Concern Species
HERON, GREAT BLUE	ARDEA HERODIAS	Special Concern Species
MARTIN, PURPLE	PROGNE SUBIS	Special Concern Species
OWL, COMMON BARN	TYTO ALBA	Special Concern Species
SPARROW, GRASSHOPPER	AMMODRAMUS SAVANNARUM	Special Concern Species
SPARROW, HENSLOW'S	AMMODRAMUS HENSLOWII	Special Concern Species
SPARROW, VESPER	POOECETES GRAMINEUS	Special Concern Species
WOODPECKER, RED-HEADED	MELANERPES ERYTHROCEPHALUS	Special Concern Species
BOBCAT	FELIS RUFUS	Special Concern Species
MYOTIS, KEEN'S	MYOTIS KEENII	Special Concern Species

APPENDIX D

Recreation on the Lower Monongahela River

Recreation on the
Lower Monongahela River

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I. INTRODUCTION

In studying the recreational use and related aspects of the Lower Monongahela River study area, the 61.2 mile long reach of river between the "Point" in Pittsburgh (the apex of land where the Monongahela and Allegheny Rivers converge to form the Ohio River) and Maxwell Locks and Dam were considered. Unquestionably, the primary recreational impacts associated with the plans set forth in the feasibility report would occur in the segment currently known as Pools 2 and 3. However, despite the formidable obstacle to casual recreational use presented by the locks, the facilities downstream of Locks and Dam 2 and upstream of Locks and Dam 4 would have some degree of inseparable influence on that 30.3-mile segment which separates them. It is for this reason that the entire 61.2-mile reach has been studied.

Recreational use of the Lower Monongahela River has been influenced principally by five major factors. These are topography, water quality, industrialization of the flood plains, coal mining and occupation of the river's banks by railroads. Topographically, the Monongahela River valley is regularly characterized by steep banks on both sides of the river. These banks have impeded access from riparian sites that would, otherwise, be useful for water dependent recreation. Water quality, has, of course, been seriously affected by industrialization and mining for over a century. These two activities also helped to stimulate the development of the last factor, railroads, which have deprived recreationists of access to the river.

Beginning in the 1960's, the Lower Monongahela River's water quality has gradually improved. Earlier improvement can be attributed primarily to environmental regulation. Reclamation of both old and new mining sites also has had a positive effect, as has more stringent regulation of modern mining activities. The sharp decline of heavy industry in the Monongahela River Valley over the past fifteen years has also benefitted the quality of the river's water considerably.

Although the river itself has improved over time, access to it has lagged somewhat behind. The industrial decline of the valley has seemed to increase the number of areas available for recreational access as the locations of former factories are cleared. However, some of these sites have been proposed for redevelopment of industrial or commercial facilities, while others are still separated from the river by railroad tracks. Some areas, too, functioned well above the river's high banks as industrial areas, but, as recreation areas, they lack the necessary access to the river.

Railroad tracks following the river's banks, many of which have been reconstructed in recent years, are no longer required for the inactive flood plain industrial areas. They are, however, still needed as main lines and to serve active customers. The railroads are reluctant to permit even those who are able to pay for expensive crossing facilities to have access across their tracks because of the potential liability exposure that would result. This is often the greatest dilemma facing those who attempt to provide recreational access to the Lower Monongahela River.

II. EXISTING RECREATION FACILITIES IN STUDY AREA

There are several readily available Corps of Engineers sources of information regarding recreation facilities in the study area including "Navigation Charts" published by the Pittsburgh District, a publication of the Ohio River Division entitled "Ohio River and Tributaries, Small Boat Harbors, Ramps, Landings, Etc.", regulatory permit files and aerial photographs used for regulatory surveillance purposes. Table 1 is an inventory of the study area's recreation facilities generated from the four sources mentioned above.

The problem, however, is that all of these references were prepared at different times, and even sources as seemingly reliable as permit files contain information on facilities that were permitted, but never constructed or that were permitted, constructed, used and subsequently abandoned. While many public and private recreational facilities represent stable enterprises, some of which have been in place since the 1950s, a significant number (particularly of private facilities) last only for a few years. It is, therefore, nearly impossible to obtain a highly accurate inventory of recreational facilities along the Lower Monongahela River except by field reconnaissance during the height of the recreation season. Even an inventory developed by such means would be likely to have a high degree of accuracy only for the duration of that recreation season.

Generally, the Monongahela River from its mouth upstream to Locks and Dam 2 is poorly served by recreational access facilities. The situation between Locks and Dams 2 and 3 is somewhat better, particularly regarding private facilities. These two segments are historically the most industrialized of those making up the the lower river. They are, however, also the most urbanized, and the provision of access to them could produce the most substantial aggregate recreational benefits to their corresponding large adjacent populations.

Above Locks and Dam 3, both public and private access to the river is much more adequate than below the project. There is ample evidence of recent substantial growth in the number of private recreational facilities in Pool 3. Pool 4 is also reasonably well served by access facilities. Mining and industrial installations are scattered throughout these pools which are typically marked by small towns rather than the dense urbanization that is prevalent further downstream.

The 11.2-mile reach of the Emsworth Pool between the "Point" and Monongahela River Locks and Dam 2 at North Braddock is served by three public and one private boat launching ramps. Two of these are on the right bank and two, including the only modern and well-designed facility, are on the left bank. As shown on Table 1, two of them are located near the

Table 1
Lower Monongahela River Navigation Study
List of Recreation Facilities From "Point" to Maxwell Locks and Dam

Waterway/ Pool	River Mile	Bank	Public/ Private	Description
Mon. R./ Emsworth	0.7	R	Public (charge)	Monongahela Parking Wharf Launching Ramp (City of Pittsburgh)
Mon. R./ Emsworth	2.2	L	Public	South Side Launching Ramp, foot of S. 18th Street off E. Carson Street; PA Fish Commission, City of Pittsburgh)
Mon. R./ Emsworth	6.1	L	Private	Launching Ramp
Mon. R./ Emsworth	10.8	R	Public	Braddock Public Launching Ramp (foot of 11th Street, limited parking)
Yough. R./ Mon. 2	0.2 15.5	L R	Public	McKeesport Launching Ramp (foot of Atlantic Avenue; PFC, City of McKeesport)
Yough. R./ Mon. 2	0.3 15.5	R R	Public	Riverfront park (small boat dock; City of McKeesport)
Yough. R./ Mon. 2	0.4 15.5	L R	Private	Dock (individual)
Yough. R./ Mon. 2	0.5 15.5	L R	Private	Dock (individual)
Yough. R./ Mon. 2	0.5 15.5	L R	Private	Dock (individual)
Yough. R./ Mon. 2	1.0 15.5	L R	Private	Berties Landing
Yough. R./ Mon. 2	3.4 15.5	L R	Public	Boston Park Launching Ramp (under Boston Bridge, shallow draft launching; PFC)
Mon. R./2	16.0	R	Private	Mon Valley Speedboat Club
Mon. R./2	16.3	R	Private	Dock (individual)
Mon. R./2	16.3	R	Private	Dock (individual)
Mon. R./2	16.4	R	Private	Dock (individual)
Mon. R./2	16.5	L	Public	Launching Ramp
Mon. R./2	17.3	L	Public	Launching Ramp
Mon. R./2	18.5	L	Private	Launching Ramp
Mon. R./2	22.4	R	Private	Swift Homes, Inc. Dock and Launching Ramp
Mon. R./2	22.8	R	Private	Elizabeth Boat Club

Table 1 (Continued)
Lower Monongahela River Navigation Study
List of Recreation Facilities From "Point" to Maxwell Locks and Dam

Waterway/ Pool	River Mile	Bank	Public/ Private	Description
Mon. R./2	23.0	R	Public	Borough of Elizabeth Riverfront Park (foot of Market Street, possible future launching ramp)
Mon. R./3	26.3	R	Private	Pine Run Outboard Club (launching ramp and camping)
Mon. R./3	26.6	R	Private	Evan Ford Marina (on Bunola Road, launching ramp)
Mon. R./3	27.5	R	Private	Sloan's Carousel Marina (launching ramp)
Mon. R./3	29.0	R	Private	Molnar's Marina (concrete launching ramp and camping)
Mon. R./3	30.0	L	Public	New Eagle Borough Launching Ramp (off Pa. Routes 88 and 837 at Howard Street)
Mon. R./3	30.9	L	Private	Beach Club Marina (launching ramp)
Mon. R./3	31.4	L	Private	Dock (individual)
Mon. R./3	31.8	L	Private	Monongahela Mariners Boat Club
Mon. R./3	31.9	L	Public	Monongahela City Aquatorium
Mon. R./3	32.0	L	Public	Monongahela Launching Ramp (off Pa. Route 88 on 2nd Street, shallow draft launching)
Mon. R./3	32.1	R	Private	Marina One Corporation (launching ramp)
Mon. R./3	32.3	R	Private	Double EE Marina
Mon. R./3	32.4	L	Private	Dock (individual)
Mon. R./3	32.5	L	Private	Dock (individual)
Mon. R./3	32.6	L	Private	Dock (individual)
Mon. R./3	33.1	R	Private	Dock (individual)
Mon. R./3	33.2	L	Public	Monongahela Launching Ramp (off Pa. Route 837 at foot of Nelson Street; PFC)
Mon. R./3	33.2	R	Private	Blair S. Evans Launching Ramp (concrete paved)
Mon. R./3	34.1	R	Public	Sunnyside/Gallatin Twin Rivers Ramp (foot of Maca Road off Pa. Route 136; Forward Township)
Mon. R./3	34.1	R	Private	Dock (individual)
Mon. R./3	34.2	R	Private	Dock (individual)
Mon. R./3	34.3	R	Private	Dock (individual)
Mon. R./3	34.4	R	Private	Dock (individual)

Table 1 (Continued)
Lower Monongahela River Navigation Study
List of Recreation Facilities From "Point" to Maxwell Locks and Dam

Waterway/ Pool	River Mile	Bank	Public/ Private	Description
Mon. R./3	34.5	R	Private	Dock (individual)
Mon. R./3	34.5	R	Private	Frank and Fay Irey Marina
Mon. R./3	34.6	R	Private	Dock (individual)
Mon. R./3	34.7	R	Private	Dock (individual)
Mon. R./3	35.0	R	Private	Dock (individual)
Mon. R./3	36.3	R	Public	Webster Launching Ramp (off Pa. Route 906, two blocks north of Webster Bridge, not paved; Borough of Webster)
Mon. R./3	36.4	R	Public	Borough of Webster Launching Ramp
Mon. R./3	36.6	L	Private	Launching Ramp
Mon. R./3	38.0	L	Private	Dock (individual)
Mon. R./3	38.4	R	Public	City of Monessen Launching Ramp
Mon. R./3	41.1	L	Public	North Charleroi Launching Ramps (off Pa. Route 88 on 7th Street, street parking only)
Mon. R./4	41.8	L	Public	Borough of Charleroi Dock
Mon. R./4	42.3	L	Public	Borough of Charleroi Launching Ramp (paved)
Mon. R./4	42.7	L	Private	Dock (individual)
Mon. R./4	43.3	L	Private	Dock (individual)
Mon. R./4	43.4	L	Private	Southwest Marina, Inc. (lift)
Mon. R./4	43.5	L	Public	Speers Launching Ramp (off Pa. Route 88; PFC)
Mon. R./4	43.5	L	Private	Speers Boat Club
Mon. R./4	45.7	L	Private	G. M. Bradish Riverport, Inc.
Mon. R./4	48.5	L	Public	Launching Ramp
Mon. R./4	49.4	L	Private	Tim's Bait Shop and Marina Launching Ramp (not paved)
Mon. R./4	51.3	L	Private	California Boat Club
Mon. R./4	51.8	L	Public	California Launching Ramp (off Pa. Route 88 at Union Street)
Mon. R./4	55.4	L	Private	A. B. Marina (launching ramp)
Mon. R./4	56.0	L	Public	West Brownsville Launching Ramp (under U.S. Route 40 Bridge, not paved)
Mon. R./4	58.8	L	Private	Denbo Marina (launching ramp)

mouth of the Monongahela River, one is located approximately midway between the "Point" and Locks and Dam 2 and one is near Locks and Dam 2. There are bridges near all four.

In the Emsworth Pool along the Monongahela River there are no private boat docks or marinas. Nearby, however, just upstream from the mouth of the Allegheny River are several private marinas, some of which have boat launching ramps. Like the few marinas on the Ohio River above Emsworth Locks and Dams, the Allegheny River marinas near the "Point" may exert some minor influence on the use of the Monongahela River upstream of Locks and Dam 2. Such influence probably results from use of the Monongahela River as an alternative to the Emsworth Pool in the vicinity of the "Point" and of the Allegheny and Ohio Rivers beyond their nearest navigation projects.

Monongahela River Pool 2 has four public boat launching sites, two of which are on the Youghiogheny River. Two are along the pool's 12.6 mile-long reach of the Monongahela River itself. Two public launching sites (those on the Youghiogheny River) are related to the right bank of the Monongahela River, while two are on the left bank. One of the ramps on the Youghiogheny River is very near that tributary's confluence with the Monongahela and is a usable and effective facility. The other, which is 3.4 miles above the Youghiogheny River's mouth, can be used only by smaller, shallow draft types of boats, and its influence on the Monongahela River is, thereby, considerably diminished.

One-third of a mile above its mouth on the Youghiogheny River's right bank is a small public boat dock. This facility is attached to a riverfront park operated by the City of McKeesport.

The Youghiogheny River enters the Monongahela River at the latter's river mile 15.5, over four miles above Locks and Dam 2. Between those two points, there are no public or private recreational facilities. One mile up the Monongahela River from the mouth of the Youghiogheny River is a public boat launching ramp on the left bank. Less than a mile up the Monongahela River from that ramp is a public launching area on the left bank of the river. Less than a mile below Locks and Dam 3 is the future site of a versatile launching ramp for which the Borough of Elizabeth has obtained a permit. In Pool 2 which is 12.6 miles long, then, the public access opportunities are near the center of the pool with a potential future facility near its upstream end. There are bridges reasonably near to all of the pool's public access points.

One of the twelve private recreation facilities related to Pool 2, a commercial marina, is one mile up the Youghiogheny River from its mouth. Another, a boat club with docking facilities, is one-half of a mile up the Monongahela River from the mouth of the Youghiogheny. The third is a mile downstream from Locks and Dam 3 and is also a boat club with docks. All of these private facilities are on or related to the right bank of the Monongahela River.

Also scattered throughout the middle and upstream reaches of Pool 2 are seven private docks and two boat launching ramps that belong to individuals or families. Three of the private docks are on the left bank of the Youghiogheny River and all of the other private facilities in the pool are on the Monongahela River between the Youghiogheny River's mouth and Locks and Dam 3. All of these with the exception of one boat launching ramp are on the Monongahela River's right bank.

In Pool 3 which is 17.7 miles long, there are nine public boat launching areas, although the nearest of these to Locks and Dam 3 is over six miles upstream from the project. From river mile 30.0 upstream 3.2 miles, there are three public boat launching ramps on the left bank. Less than a mile upstream is the first of four public boat launching ramps on the right bank that vary in distances apart from one-tenth of a mile to 2.2 miles. It is nearly three miles upstream from the last of these four to the last two close-together public launching ramps in Pool 3 which are both on the left bank and are less than one-half mile from Locks and Dam 4. There are bridges reasonably near (a maximum of less than 2.5 miles) to all of these public access sites.

About mid-pool on the left bank is the Monongahela City Aquatorium. Essentially a public amphitheater oriented toward the river and a stage area constructed at the land/water interface, the aquatorium is used for several events each year.

Among the many private facilities in Pool 3 are two boat clubs, one on the right bank 2.5 miles above Locks and Dam 3 and one on the left bank at about mid-pool. Commercial marinas, all but one of which are on the right bank, are much more numerous. Six of the seven marinas, however, are located in the lower half of the pool, and the seventh is less than two miles upstream of the pool's midpoint. At least five of the seven marinas have boat launching ramps, and there are two other private launching ramps, one on each bank and located 3.4 miles apart in the upper middle part of the pool.

Pool 3 has, from a little below mid-pool to 3.5 miles below Locks and Dam 4, at least 14 private boat docks. Like most of the private boat docks in the study area, their capacities vary from one to six boats, although a few have as many as 25 or 30 (these very large private docks are probably small marinas that are listed inaccurately). All except three of Pool 3's docks appear to be related to one small and one large homesite or second homesite development. Three of these docks from river miles 32.4 to 32.6 are on the left bank, while eight located between river miles 34.1 and 35.0 are on the right bank.

Private recreational facilities are typically marinas in the lower reaches of Monongahela River Pool 3. The upper reaches of the pool are characterized by private boat docks and public boat launching areas.

All of the recreation facilities in the 19.7 mile-long Monongahela River Pool 4 are on the left bank. From approximately one-third of a mile above Locks and Dam 4 to 5.2 miles below Maxwell Locks and Dam five public boat launching areas are interspersed at distances varying from 1.2 miles to five miles. One-half mile from its public boat launching ramp, the Borough of Charleroi also operates a public boat dock. In Pool 4, bridges are not as numerous as in the lower pools. There is only one bridge at the lower end of the pool and two bridges at its upper end.

The two private boat clubs in Pool 4 are located two miles above the navigation project structure and almost exactly at the middle of the pool, respectively. Five private commercial marinas separated by intervals of 2.3 to six miles are located in a string from almost two miles above Locks and Dam 4 to just under two and one-half miles downstream from Maxwell Locks and Dam. Of two private docks at the downstream end of Pool 4, one appears to actually be operating as a small marina.

There is ample evidence in the available records of facility development that, over the past two decades, growth in the recreational use of the Monongahela River has increased substantially. The number of all kinds of facilities, public and private, has increased.

Particularly numerous are new marinas and private individual or family docks in Pools 3 and 4. The connection of some of these new marinas and, more particularly, private docks to residential subdivisions appears to be a relatively new phenomenon along the Monongahela River. It should be noted that these subdivisions have been a motivating factor in an acceleration of recreation development in the two pools and that some of them have many lots with river frontage that has yet to be developed.

Taken together with the former industrial areas that have or may become available for various kinds of recreational and residential use, expansion of the subdivisions' river facilities may result in an explosion of recreation development in the future. Already, there have been disputes over "rights" to river areas for private docks and marinas. Commercial navigation interests have protested the granting of some permits for recreational facilities that would impede commercial navigation which is the Congressionally authorized purpose of the Monongahela River Navigation System. While a slow (although inexhorable) rate of recreational development in the Lower Monongahela River is probably more likely to occur than rapid or explosive construction activities, the pressure between different kinds of users, among users of the same types and on the resource is bound to increase.

III. RECREATIONAL USE

Three major sources were available to determine the current level of recreational use and trends in the study area. The first is the Corps of Engineers' Natural Resources Management System (NRMS), an annual compilation of resource and use data that has a lengthy and detailed entry for each Corps project. The use or visitation data that is incorporated into the NRMS is estimated from actual counts of users throughout the recreation season.

In the case of navigation projects, all visitation data is based on the number of recreational lockages. A factor is applied to the number of boats locked to obtain the number of recreation days of boating and other water dependent activities that have occurred in the pool, and other factors are further applied to determine the amount of off-bank use that has taken place. The reliability of such estimating procedures could be highly suspect; however, those who regularly use the procedure contend that periodic surveys have upheld the reasonable accuracy of the method and the formulae used. Little other data is, in any event, readily available.

Table 2 shows the data obtainable for 1988 and 1989 from the NRMS. Detailed data for years prior to 1988 are not readily available; however, the general trend of recreational boat lockages has been upward. This trend is indicated by the second data source, recreational lockages from 1954 through 1989 for Locks 2, 3, and 4, which is the raw information used to derive the NRMS visitation estimates and is illustrated in Figures 1, 2, and 3. Because of the methodology used to estimate visitation by activities, the upward trend is essentially representative for all activities.

Recreational use in 1989 exceeded that recorded and estimated in 1988 for all pools in the project area except Emsworth. Considering the probable small percentage of Emsworth Pool recreation that occurs on the Monongahela River, the rather sharp decrease in that pool had little likely impact on the project area. At 12 percent and 10 percent, respectively, the increases for Monongahela River Pools 3 and 4 reflect the popularity gains of the upstream portion of the study area.

The third source of information available as an indicator for estimating current levels of recreational use of the Monongahela River in the study area is boat registrations. These are tabulated by the Pennsylvania Fish Commission's Bureau of Boating by counties and the data is precise. Table 3 shows the total boat registrations for 1979 and 1989 for the four counties in which the study area is located. It should be noted that for all four counties listed, an increase occurred each year between 1979 and 1989, i.e., there were no decreases. The county with the largest population, Allegheny, contains the City of Pittsburgh and three other smaller cities. It also has the second greatest number of recreational boat registrations among all counties of the entire United States (until recent years it had the greatest number). Two of the counties listed in Table 3 have the rivers as their major boating attractions, while Westmoreland and Fayette also have three substantial lakes. While it must be recognized that many boaters leave their home county for their recreation, the increases in registrations for the three counties generally support the recreational boat lockage and NRMS data for the Monongahela River. The nearly phenomenal increases in registrations substantiate the growth of recreational use rates during the same period on the river.

The study area is generally characterized by an urban, aging and relatively low income population. These attributes are usually associated with low outdoor recreation participation rates. Recreation studies in the Pittsburgh District have, for many years, however, recognized that the region's use patterns and their relationships to the parameters generally accepted as affecting such use are atypical.

Table 2
Lower Monongahela River Navigation Study
1988 and 1989 Visitation for Four Navigation Pools

Navigation Pool/ Activity	Visitation (Recreation Days) 1988	1989
Emsworth		
Boating	103,100	86,400
Swimming	20,600	17,300
Fishing	20,600	17,300
Picnicking	-	-
Sightseeing	82,500	69,100
TOTAL*	206,200	172,700
Monongahela 2		
Boating	21,400	22,200
Swimming	2,500	2,600
Fishing	2,500	2,600
Picnicking	-	-
Sightseeing	300	300
TOTAL	25,200	26,100
Monongahela 3		
Boating	59,700	67,000
Swimming	7,500	8,400
Fishing	7,500	8,400
Picnicking	1,500	1,700
Sightseeing	1,500	1,700
TOTAL	74,600	83,800
Monongahela 4		
Boating	45,500	50,100
Swimming	5,700	6,300
Fishing	8,500	9,400
Picnicking	1,100	1,300
Sightseeing	1,700	1,900
TOTAL	56,900	62,600

*TOTALS do not equal the sum of all activities because one recreation day may include more than one activity.

FIGURE 1
MONONGAHELA RIVER LOCKS AND DAM 2
RECREATIONAL LOCKAGES 1954-1989

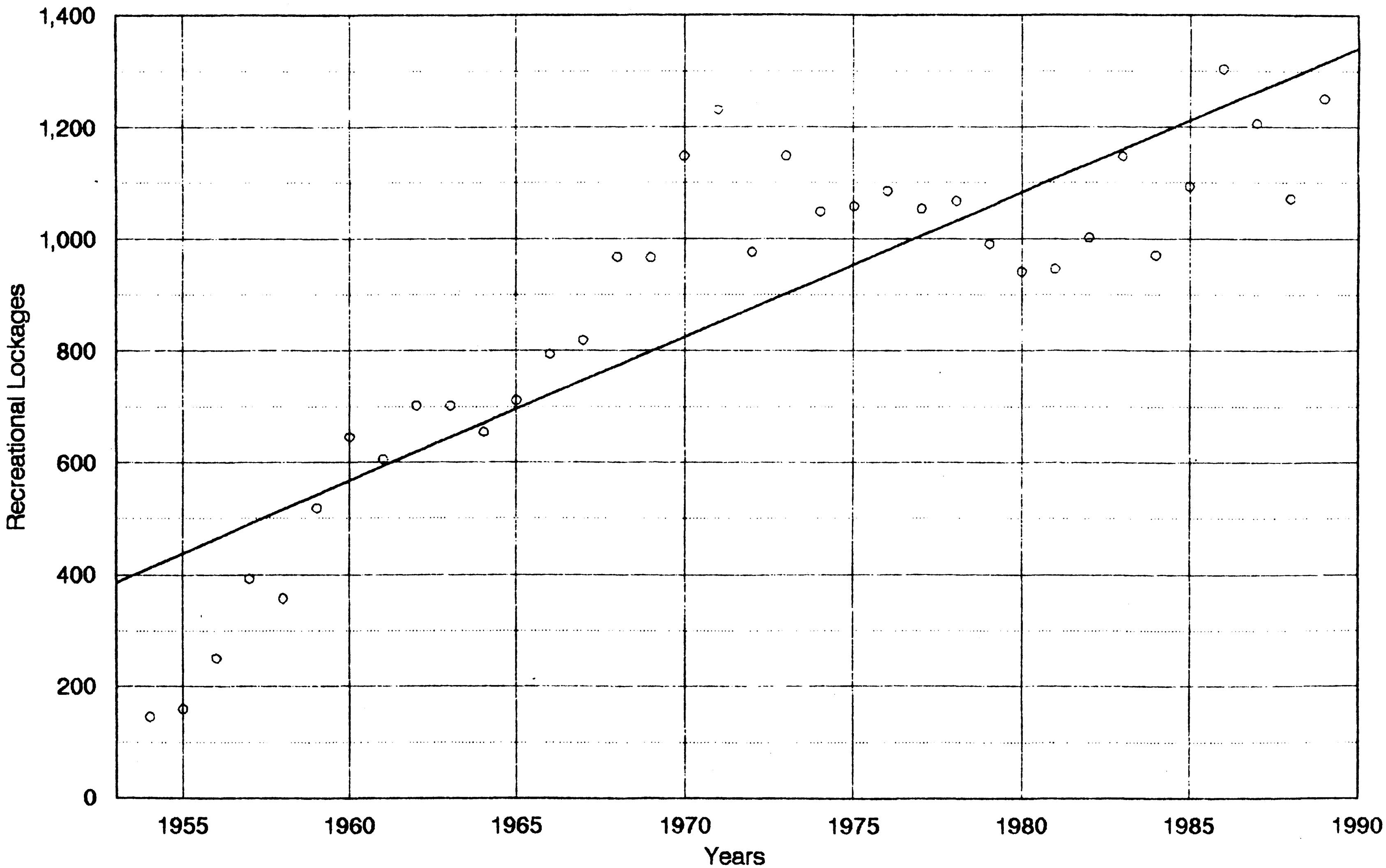


FIGURE 2

MONONGAHELA RIVER LOCKS AND DAM 3
RECREATIONAL LOCKAGES 1954-1989

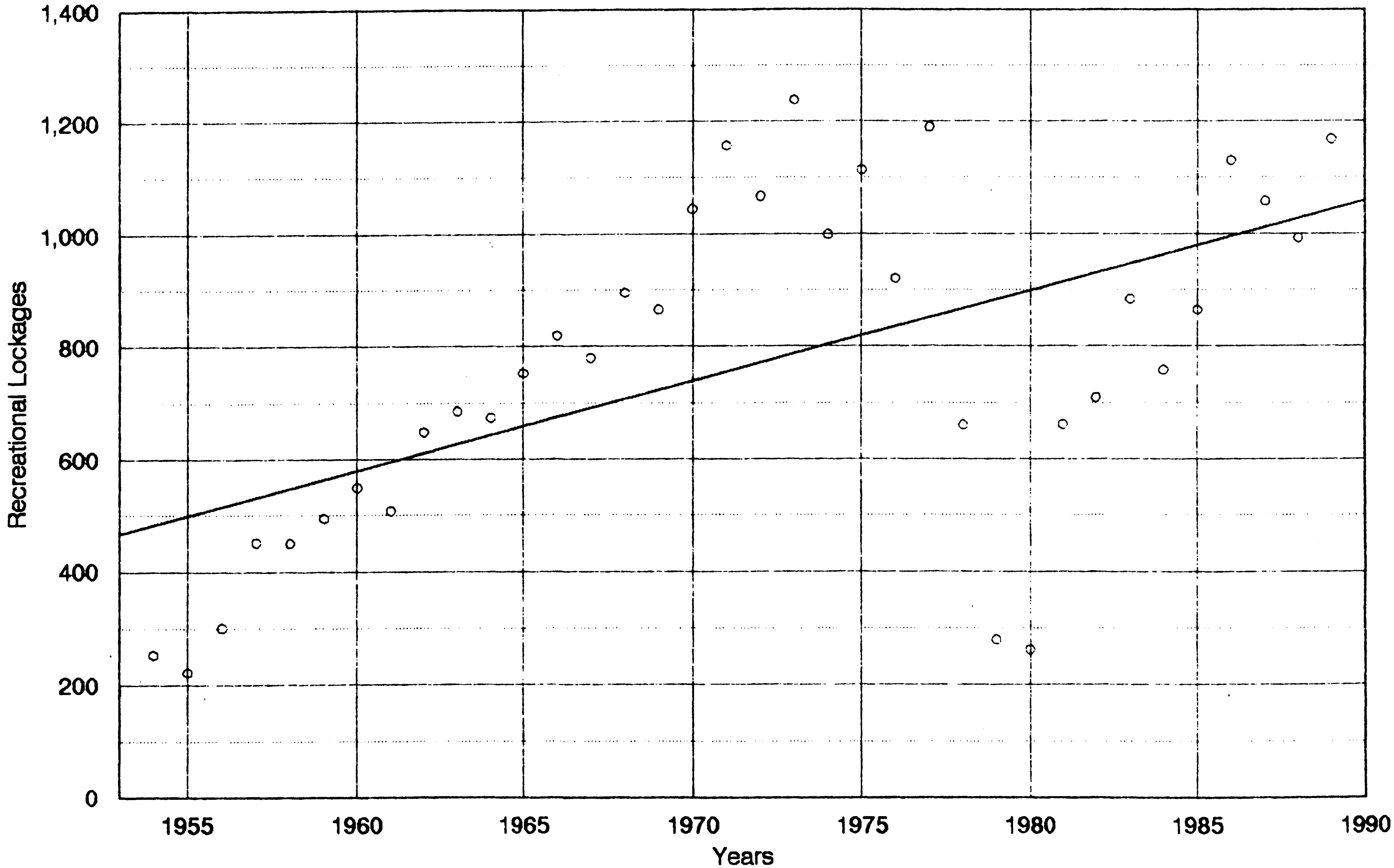


FIGURE 3
MONONGAHELA RIVER LOCKS AND DAM 4
RECREATIONAL LOCKAGES 1954-1989

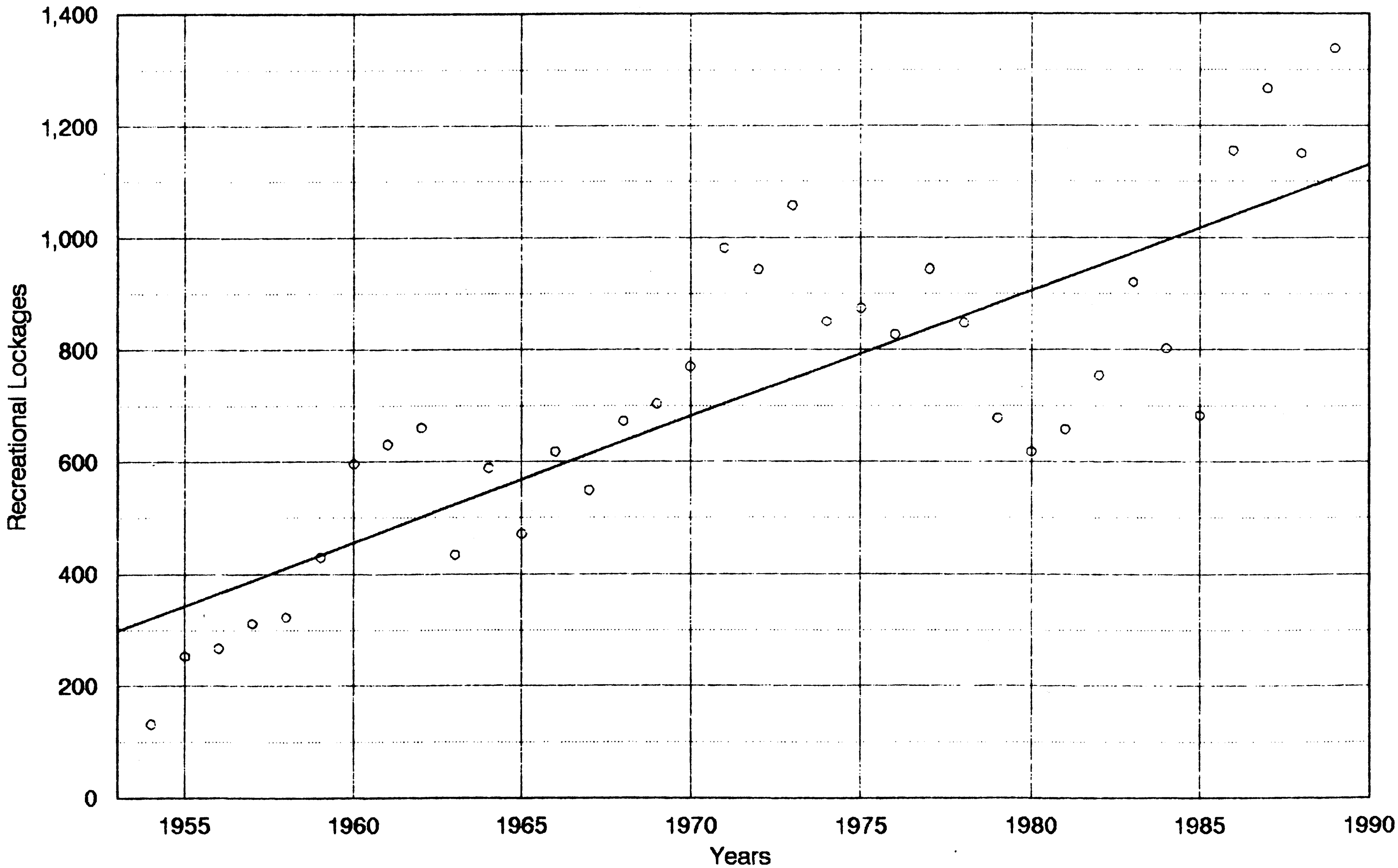


Table 3
Boat Registrations by Pennsylvania Counties, 1979 and 1989

County/Mon River Pools	1979	1989	% Increase
Allegheny/Pools 2 and 3	20,286	28,378	40
Washington/Pools 3 and 4	3,405	5,540	63
Westmoreland/Pools 3 and 4	5,848	9,428	61
Fayette/Pool 4	1,937	3,032	57
TOTAL	31,476	46,378	47

Although no reliable data relating parameters to actual use are known to exist, professional observation indicates that this population's attributes tend more to affect the level or intensity at which recreation is pursued rather than to determine whether it is pursued. For example, residents of the study area who enjoy a high income may have a large houseboat and an expensive runabout. Their neighbors with a more moderate income may have a ski boat, an elaborate bass boat or a small daycruiser. Low income residents may have a fishing boat with a small motor or a used runabout. Older participants may socialize on houseboats or fish from boats, while their younger counterparts may waterski and swim from their boats. This phenomenon appears to apply to all kinds of water-dependent and water-oriented recreation activities and to all but the poorest segments of the population.

In view of the foregoing, the upward trend in recreational usage of Monongahela River Pools 2, 3 and 4 can generally be expected to continue. Current economic conditions may slow the rate of increase temporarily, but over the next decade the trend will probably continue. A factor that controls the rate of change in recreational usage more than any public works project may well be land use decisions regarding vacated industrial sites made by local governments and by property owners as a result of economic conditions. These are matters over which project planning has little influence or control.

IV. RECREATIONAL DEMAND AND NEED

Based on the recreation visitation figures shown above and the inventory of Lower Monongahela River recreational facilities, the number of public facilities appears to be adequate and can be expected to remain so well into the future. Problems with recreational opportunities more involve their distribution throughout the pools of the study area and their quality including the ease and safety with which they may be used. There may come a time, too, in the foreseeable future when parts of Pools 3 and 4 become overcrowded, and new kinds of institutional controls on both public and private facilities may become necessary.

Private facilities in the study area are much closer to capacity than public facilities. Usually, however, the private sector is able to provide needed private facilities more quickly than governments can provide new public opportunities. Although some areas suitable for private facilities are becoming saturated, there are still adequate reserves to satisfy a reasonable amount of future demand. Should conditions occur that stimulate more rapid private development than in the past, however, both Pools 3 and 4 and their adjacent land resources could be severely impacted to the detriment of their users and owners. The time for the appropriate authorities to consider this possibility and to initiate steps to avoid resource destruction and hardship has arrived.

V. FISHING AND FISHING ACCESS

Because they are so highly susceptible to environmental changes, fishing as a recreation activity and access as a function of fishing have been selected for extra consideration. A significant amount of fishing occurs in all of the pools of the study area. There are a large number of sites along the Lower Monongahela River that are regularly used for fishing. Very few of these are developed access sites, but are merely places along the riverbank that people are able to reach and where they may fish undisturbed. Fishing access as provided by these impromptu sites together with the existing developed recreation sites (no sites along the Lower Monongahela River are known to have been developed solely to provide access for fishing) seems to be adequate. As with most recreation activities, the availability of fishing opportunities tends to partially regulate the activity, and additional opportunities would probably stimulate a small amount of latent demand. In the study area, though, activity occurrence is controlled more by the quality of the resource than by access opportunities. Nevertheless, the provision of access opportunities at the Lower Monongahela River's navigation projects would be desirable, if not justifiable in terms of quantifiable demand and need.

At Locks and Dam 2, no fishing except by boat below the dam occurs in the immediate project area. In this case, the limiting factors appear to be a lack of both access and suitable space, because the tailwater fishery should also attract bank fishermen. Under present conditions or with modification of the project, these same project shortcomings would continue to effectively prevent bank fishing.

Fishing occurs immediately above and below the land wall from the right bank and from boats above and below the dam at Locks and Dam 3. A large chemical plant adjacent to the abutment prevents fishing access on the left bank in the vicinity of the dam. The locks have road access, but only by lease from the railroad and only for Corps of Engineers operations. Because of space restrictions between the river and the parallel railroad tracks, there is little opportunity to provide better access at this project, unless the locks and dam are removed, thereby freeing the former lock site for public use. An available Locks 3 site, however, would still lack public access, and it is anticipated that the railroad would be unwilling to grant or sell the necessary access rights.

At Locks and Dam 4, fishing from the dam abutment is popular, although legal public access to the site is not available. Fishing also occurs from boats below the dam. Access to the locks by road for Corps of Engineers operations only is available, but fishing does not occur near the project on the right bank. Modification of the project for navigation purposes could improve the prospects for enhanced fishing access. The close proximity of railroad tracks to the river and probable unwillingness of the railroad to grant or sell the required rights on the right bank would prevent the practical development of such access. But, acquisition of the required rights on the left bank could make public access to the abutment readily available.

As indicated above, there is not currently substantial unsatisfied demand or need for fishing access facilities in the study area. Fishing success downstream of a navigation project (such as Locks and Dam 3) that is eliminated, however, will probably be diminished with a corresponding decrease in the popularity of some downstream fishing sites. One result of project elimination would, then, be a supply deficit (or unsatisfied demand), and the U.S. Fish and Wildlife Service has proposed the provision of fishing access as a mitigation measure.

The development of access opportunities would be desirable, and the Corps of Engineers clearly has the authority to develop the appropriate areas and facilities under the current recreation cost-sharing provisions of law and policy. Both the Locks 3 site after removal of the project and the Dam 4 abutment would offer potential for public fishing access if the necessary access rights could be acquired. Local governmental entities would have to acquire these rights under current policies, but through a cost-sharing program they would receive credit for their value. Because of the low Federal priority currently given to recreation including fishing access, however, it is unlikely that any proposal involving the expenditure of Federal funds to provide access will gain support.

At the Dam 4 abutment, the potential for provision of public fishing access through cost sharing or through local governmental efforts alone will remain essentially as long as the project is in operation. If Locks and Dam 3 is removed, however, the project lands that could become valuable for public fishing access will be subject to disposal. It is recommended, therefore, and because an equivalent opportunity is unlikely to arise, that these lands on the right bank of the river be retained in Federal ownership to preserve their potential for public fishing access. In the future, the conversion to an active access area could, then, be accomplished through a cost-sharing program or solely by a local governmental entity.

VI. IMPACTS OF PROJECT ALTERNATIVES ON RECREATION

All final project alternatives including the No Action Alternative would involve construction of navigation facilities and would have impacts on recreation. Generally, the No Action Alternative, Plan No. 4, and Plan No. 4 Deferred would have minimal impacts that would mostly be temporary. The implementation of Plan No. 1 would have substantial impacts on a wide range of recipients. Some of these impacts would be negative, particularly for certain affected individuals or groups, while others would be positive. Many impacts would be temporary in the sense that the conditions they foster would constitute hardships until the appropriate adjustments can be made. Over the life of the improvements proposed in Plan No. 1, however, the net recreational impact of that plan's implementation would be positive.

The No Action Alternative is comprised of rehabilitiation and of replacement-in-kind construction actions over the periods 1996-2002 (Dam 2, Locks and Dam 3 and Locks 4), 2020-2022 (Locks 2) and 2024-2027 (Locks 4). During these three construction periods at the projects where rehabilitation and replacements would occur, there would be some disruptions and delays in recreational lockages. Additional construction-related river traffic would also have a negative, albeit minor impact on the pursuit of recreation. More serious, even if temporary, would be tailwater fishery losses. During those periods after construction when tailwater fisheries are reestablished, however, impacts of maintaining the No Action Alternative would be characterized by neutrality.

Plan No. 1 includes construction of a new Dam 2 and removal of Locks and Dam 3 between 1996 and 2002, and rehabilitation of Locks 2 between 2020 and 2022. By 2003 new Locks 4 would be constructed. Pool 2 would be raised a nominal five feet, and after removal of Locks and Dam 3, the former Pool 3 would be lowered a nominal 3.2 feet. During the periods of construction and removal of Locks and Dam 3, the temporary impacts associated with these activities would be similar to those discussed above for the No Action Alternative. Elimination of Locks and Dam 3, however, would entail the permanent loss of the present tailwater fishery.

Changes in the elevations of Pool 2 and Pool 3 would inundate or elevate impromptu bank fishing sites where casual fishing occurs because access is available. The usefulness of most such sites would be affected, but it is probable that most, if not all, sites lost would be replaced by new sites that would become available. Much the same situation can be expected to occur with favored fishing areas in the river. Most of these would be altered by pool changes; however, new areas that yield greater than average fishing success would probably develop and offset the loss of the altered areas.

At various points along the river where conditions are favorable and access is available swimming occurs. This activity is neither encouraged nor prevented, although private riparian land owners in some areas deny access to the general public. Pool elevation changes between river miles 11.2 and 41.5 would render some locations where swimming traditionally occurs unsafe or even unusable. As with river fishing areas, new sites that are desirable and available for swimming would undoubtedly be formed through pool elevation changes. It is likely that the net effect would be the replacement of lost opportunities by new ones.

Plan No. 1 implementation would have a widespread effect on developed recreation areas and their facilities. Publicly owned facilities would be adjusted as relocations at Federal expense. In Pool 2 there are seven public recreation areas, one of which has a boat dock, two of which are riverfront parks, and five of which have boat launching ramps (Table 1). The dock and one riverfront park would require minimal modification, while the other riverfront park would require substantial alteration. Some of the launching ramps would remain usable without modification after raising of the pool, while some may require minor adjustments. Costs for the needed public facility modifications are estimated to be at least $440,000.

Reducing the present Pool 3 elevation may potentially affect nine public recreation areas. With the exception of the Monongahela City Aquatorium, all of these are launching sites with ramps. The aquatorium may require major foundation work in connection with a pool change. Many of the boat launching ramps may require extension to a lower elevation and some may require the dredging of a channel beyond the end of the ramp to remain usable, but some may continue to function without any modification. The cost of needed adjustments in the current Pool 3 area is estimated to be at least $386,000 for publicly owned facilities.

Because adjustments to publicly owned facilities would be accomplished as part of the Plan No. 1 implementation, disruption and inconvenience impacts to recreational use of these facilities would essentially be temporary. In some cases, if recreation facility modifications could be made during the off season, there would be no negative impact at all.

Unlike publicly owned facilities, private facilities would have to be modified at the owner's expense to accommodate pool elevation changes. In Pool 2 there are three major private areas where some changes could be required, although two of them, a commercial marina and a boat club with docks may require only minor alterations. For these two, an increase in the river's elevation under Plan No. 1 could conceivably benefit their operation at the land/water interface. The third major facility in Pool 2 is a boat club located in a relatively low-lying area. A considerable amount of this club's land area could be inundated with implementation of Plan No. 1, although the site would probably still remain usable.

There are eight minor private recreation areas generally owned and used by individuals or families for their own benefit in Pool 2. Seven of these have small boat docks and two have boat launching ramps. It is possible that the launching ramps could require some modification to be usable after a pool raise. Many of the docks would require only changes in anchorages and access walkways leading from the shore to the dock, while some may require no modifications at all. There is a possibility, however, that dock sites close in elevation to the present pool elevation could be rendered unusable without a degree of alteration (such as a large amount of dredging) that would be impractical. It has been estimated that adjustments to both major and minor private recreation facilities in Pool 2 would cost a minimum of $27,000.

Pool 3 has nine major private recreation areas, seven of which are commercial marinas and two of which are boat clubs. Most of them have boat launching ramps. There are also 16 minor private recreation areas used by individuals or families in Pool 3. Two of these have boat launching ramps, while 14 have docks for one to six boats. A reduction of the Pool 3 elevation would have deleterious effects on most of these areas and their facilities that would range from minor to serious. Facility modifications required would include replacement of concrete and timber walls and pilings of various types, adjustments to dock anchorages, relocation of docks, alteration of dock access walkways and bridges, dredging of dock areas and of channels at the ends of boat launching ramps and extension of launching ramps. To those with the necessary resources, the need to modify facilities may constitute only an inconvenience. To others, however, it could be personally or collectively devastating if excessively expensive facility alterations are required or if the recreation facility operation is marginal or financed with only limited resources. Some sites, too, could require such extensive modifications that their continued use would be impractical. The minimum collective cost of adjustments to all private facilities in Pool 3 under Plan No. 1 is estimated to be $2,740,000.

Despite the harsh impacts on some private groups or individuals that could be caused by implementation of Plan No. 1, history over the last fifty years in the study area has amply demonstrated that recreation demand is such that all facilities lost will eventually be replaced. Negative effects to society as a whole that are attributable to pool elevation changes would, therefore, be transitory in nature.

Implementation of Plan No. 1 would also have a significant and permanent beneficial impact on recreation. In place of a 12.6 mile long pool and a 17.7 mile long pool separated by locks would be a 30.3 mile long pool which would be comparable in length to the pools formed by the modern Ohio River navigation projects. Offsetting some fishery losses in Pool 2 caused by removal of Locks and Dam 3 would be the ability to access Pool 3 for boat fishing without the need to lock through. The greatest benefit of the longer pool, however, would be realized by those who pursue boating and water skiing.

The elimination of the formidable barrier (Locks and Dam 3) would probably stimulate the popularity of the expanded pool and a corresponding demand for additional facilities along its banks. Development of such facilities could foster overcrowding and congestion in parts of the pool unless the appropriate authorities institute measures to prevent their occurrence. Those responsible for monitoring and, if necessary, regulating use of the river include the Corps of Engineers (navigation), the U.S. Coast Guard (navigation and safety) and the Pennsylvania Fish Commission (boating safety). Riverside communities may also find it desirable or even necessary to regulate the quality and density of riverbank development to assure consistency with their standards.

For those who would use the replaced Locks 4, there would be an additional minor positive recreational benefit associated with implementation of Plan No. 1. The larger, more efficient new lock facilities would make more rapid lockages of commercial traffic possible. This would, in turn, reduce the waiting sometimes experienced by recreationists who wish to lock through.

Plan No. 4 includes construction of a new Dam 2, construction of new Locks and Dam 3 at a new site 0.8 miles upstream from the existing project, and construction of new Locks 4 between 1996 and 2002. Also included is the rehabilitation of Locks 2 between 2020 and 2022.

In the 0.8 mile of river between the old and new Locks and Dams 3, the pool would be reduced in elevation a nominal 8.2 feet.

Construction-related impacts under Plan No. 4 would be similar to those that would occur under the No Action Alternative and with Plan No. 1. There are no developed recreation areas or facilities of any kind along the riverbanks between the locations of the existing and proposed Locks and Dams 3. Impacts to organized recreation activities of the kinds associated with Plan No. 1 would, therefore, not occur under Plan No. 4. A few impromptu bank fishing sites along the river between miles 23.8 and 24.6 would lose their usefulness with the reduction of pool elevation, but other substitute sites at lower elevations would probably be uncovered. Larger new Locks 3 and 4 would reduce the time required for lockage of commercial tows, thereby making more rapid recreational lockages possible.

Plan No. 4 Deferred is identical to Plan No. 4 with the exception of the treatment of Locks 4. Instead of construction of new, larger Locks 4 between 1996 and 2002 as in Plan No. 4, the deferred plan contemplates rehabilitation of the existing Locks 4 during that time period and the eventual replacement of those existing rehabilitated locks with new and larger ones between 2024 and 2027.

All of the impacts associated with Plan No. 4 would also occur with implementation of Plan 4 Deferred. The possibility of more rapid lockages associated with construction of larger Locks 4, however, would be postponed until after 2027. Under normal conditions, the average additional delay at Locks 4 through 2020 is estimated to be little more than one hour with Plan 4 Deferred over Plan 4. The Locks 4 rehabilitation period, would constitute an additional construction period with its typical, although mostly temporary negative impacts.

APPENDIX E

Clean Water Act
Section 404 (b)(1) Evaluation

Clean Water Act
Section 404(b)(1) Evaluation
Lower Monongahela River Navigation System

I. PROJECT DESCRIPTION

A. Location.

The area to be affected by the placement of dredged or fill material includes the vicinity of Monongahela River Locks and Dam Nos. 2 and 4 (r.m. 11.2 and 41.5), and the river between r.m. 10.7 and 42.35.

B. General Description.

The proposed project consists of construction of new Locks 4 and new Dam 2 at the existing sites, improvements to the upper approaches to Locks 2 and 4, bank stabilization as needed in Pool 2, and construction of fish habitat improvements, i.e., fish reefs in Pools 2 and 3, and rubble beds in Dam 2 tailwater and along Locks 3 land wall.

C. Authority and Purpose.

The study to recommend a plan for modification or improvement of the Lower Monongahela River Navigation System was authorized by a resolution adopted on September 23, 1976 by the House of Representatives' Committee on Public Works and Transportation.

D. General Description of Dredged or Fill Material.

The proposed project consists of the placement of dredged and fill material into waters of the United States for modernization of the Lower Monongahela River Navigation System. Stone fill material will be obtained from a clean, upland source. Dredged material will come from navigation channel dredging in Pool 3 which has been determined to be clean fill, or from Pool 4 dredging if the material when tested is determined to be clean fill. The use of submerged stone dikes in place of dredged material to improve the upper approach conditions at Locks 4 will be examined in future modeling studies.

<u>Locks and Dam No. 2</u>

Dam - concrete: 77,100 cubic yards
Dam scour protection - derrick stone: 93,200 cubic yards
- filter material: 29,700 cubic yards
Submerged dikes - random rock fill: 4,200 cubic yards

- graded riprap: 18,000 cubic yards

Cofferdams (temporary)
- sheet pile: 601,000 square feet
- structural steel: 179,800 pounds
- free draining fill: 409,300 cubic yards
- concrete: 740 cubic yards

Tailwater - concrete rubble: 9,600 cubic yards (maximum)

<u>Locks and Dam No. 4</u>

Dam scour protection
- graded stone: 2,200 cubic yards
- grout-filled bags: 3,000 cubic yards

Locks walls (incl. guide and guard walls) - concrete: 273,000 cubic yards

Lock approaches
- graded stone: 79,300 cubic yards
- filter material: 25,100 cubic yards
- compacted granular fill: 136,900 cubic yards
- dredged material: 272,300 cubic yards (maximum)

Cofferdams (temporary)
- sheet pile: 934,500 square feet
- structural steel: 7,200 pounds
- free draining fill: 529,000 cubic yards
- concrete: 33,000 cubic yards

<u>Riprap (Pool 2)</u>
- filter material: 15,500 cubic yards (maximum)
- graded stone: 41,500 cubic yards (maximum)

<u>Fish reefs</u> - concrete rubble: 23,100 cubic yards (maximum)

E. Description of the Proposed Discharge Sites.

1. The new Dam 2 will be constructed 485 feet upstream of the existing Dam 2 at r.m. 11.2 in the main channel of the river.

2. Submerged dikes will be placed in the upper approach to Locks 2 extending upstream to r.m. 11.85.

3. Bank stabilization (riprap) will be placed as needed in non-continuous segments along the right and left banks between r.m. 11.2-23.8, including 800 feet up the mouth of the Youghiogheny River.

4. Fish reefs are proposed in the following reaches:

a. Left Bank - r.m. 21.3 - 21.7, 25.5 - 26.7
b. Right Bank - r.m. 29.2 - 29.8, 30.0 - 31.5, and 32.5 - 33.5.

5. The new Locks 4 will be constructed at their existing location, expanding riverward from the landwall.

6. Riprap will be placed on the right bank 1,415 feet upstream and 3,000 feet downstream of new Locks 4.

7. Dredged material or submerged stone dikes will be placed from about r.m. 42.0 to 42.35 between the right bank and the 200-foot wide excavated channel along the left bank to elevation 728.5 (Normal Pool is elevation 743.5).

8. Rubble (concrete demolition debris) placement in Dam 2 tailwater and along the land wall of the existing Locks and Dam No. 3.

F. Description of Disposal Method.

Sound engineering practices will be followed during all phases of project construction. Temporary sheet pile cofferdams will be driven into the river bottom around the work areas at Dam 2 and Locks 4, and filled with granular material obtained from a clean upland source. The interior of the cofferdams will be pumped dry and placement of the permanent fill (construction of the new dam and locks) will be conducted in the dry. The fill for training dikes at the lock approaches, bank stabilization, and fishery habitat improvements, and dredged material in Pool 4, will be placed mechanically.

II. FACTUAL DETERMINATIONS (Section 230.11)

A. Physical Substrate Determination.

Permanent changes to the physical substrate will occur as the river bed and shoreline (composed of cobble, gravel, sand, and silt) are replaced with concrete structures, large graded stone or ungraded concrete rubble. Construction of Dam 2 and its scour protection will cover about 10.2 acres of river bottom which includes about 0.7 acres presently occupied by the existing dam. Submerged dikes at the upper approach to Locks 2 will occupy about 1.9 acres of river bottom. The new Locks 4 will alter or occupy about 15 acres. Bank stabilization at the new Locks 4 approaches will cover about 0.4 acres, and in the raised Pool 2 (r.m. 11.2-23.8) a maximum of 27.7 acres. Each fish reef will cover about 0.04 acres (or 25 reefs/acre) of river bottom. Disposal of concrete rubble along the land wall of Locks 3 will create benthic habitat where none of value presently exists. Placement of dredged material in Pool 4 would cover up to about 20 acres of river bottom.

The reduction in benthic habitat caused by the construction of new structures will be offset by the removal of Locks and Dam No. 3 and the improved benthic habitat value provided by instream disposal of concrete demolition rubble in the form of fish reefs and rubble beds.

B. Water Circulation and Fluctuation Determinations.

While cofferdams are in place at Dam 2 and Locks 4, current patterns, flow, velocity and hydrologic regime of the river would be affected. The most significant impact is the increase in backwater during high flows due to constriction of the river channel. Given the probability of high flows occurring during the construction period, possible damages could be increased $0.5 million, amortized over the project life. Following removal of the cofferdams, the new gated Dam 2 would reduce the heights of high frequency floods, and cause no increase in the 100-year flood elevation.

The proposed project; raising Dam 2 and removing Locks and Dam No. 3, would cause significant changes in the water quality of the pool impounded by Dam 2. The new pool would be lengthened from 12.6 to 30.3 miles, and increased by five feet in depth at the dam. At higher flow levels, velocities would increase in the upper end and decrease in the lower end, and would be expected to result in some clarification of the lower pool. Low flow, summer period, thermal and dissolved oxygen stratification in the deepened lower pool would be more pronounced than at present. Thermal stratification is largely influenced by the discharges of two electric generating stations located in Pool 3. Duquesne Light Company maintains that during critical low flow conditions the thermal discharge from their Elrama station recirculates behind Dam 3 confining the extreme thermal plume to a relatively small area. Both Duquesne Light Company and West Penn Power maintain that the removal of Dam 3 will have a pronounced impact on the summer, low flow/high temperature operations of these stations. The thermal discharges are regulated by the Pennsylvania Department of Environmental Resources under the National Pollutant Discharge Elimination System (NPDES) program.

A municipal water supply, the Pennsylvania-American Water Company, has an intake at r.m. 25.3. They are concerned that the removal of Locks and Dam No. 3 and the resulting pool changes would aggravate the low flow, summer thermal conditions due to the electric generating station discharges and increase thermophilic blue green algae blooms. These algae create taste and odor problems which result in increased treatment costs. The District, however, does not anticipate this problem in the vicinity of their intake where the pool will be lowered. Although velocities at low flow periods would not change noticeably from existing conditions, the removal of the barrier of Dam 3 should alter recirculation patterns at the Elrama station. The thermal plume would be expected to shift downstream away from the PAWC intake.

In general, the proposed project's influence on flow and circulation will be to negatively impact water quality between r.m. 11.2 - 23.8. This negative impact, however, will be offset by improvements from r.m. 23.8 - 41.5 and downstream of Dam 2. Further discussion of this subject is in EIS Appendix A, *Water Quality of the Lower Monongahela River*.

C. Suspended Particulate/Turbidity Determinations.

Construction activities (placement and removal of cofferdam cells, placement of stone dikes, fish reefs and riprap, and instream placement of dredged material) will cause increased turbidity levels in the immediate vicinity of the work. This increase will be temporary and have no lasting effect on the river's water quality. The fill material, consisting of concrete structures, concrete rubble, and stone from a clean, upland source, will not cause any change in chemical or physical properties of the water column, and will not violate water quality standards. The placement of dredged material has the greatest potential for temporarily increasing turbidity. The material to be used, however, is primarily gravelly sand and sandy gravel with a silt/clay component of less than ten percent. The turbidity levels expected from placement of this material would not cause significant changes in chemical or physical properties of the water column, and will not violate water quality standards. The bank stabilization (riprap) will act to decrease erosion and reduce future turbidity levels in the river. The fish reefs and rubble beds are included to improve aquatic habitat values to offset tailwater losses due to Dam 3 removal.

D. Contaminant Determinations.

The fill material will consist of stone obtained from a clean, upland source, steel, and concrete, which will have no potential to introduce, relocate, or increase water quality contaminant levels. The District tested worst case situations for priority pollutants in dredged material from the navigation channel in January 1990. The results, reviewed by the PaDER, indicated the material may be designated as clean fill (reference: *Investigation for the Presence of Priority Pollutants in the Navigation Channel Substrate, Monongahela River Pool 3*, January 1990, Pittsburgh District, U.S. Army Corps of Engineers).

E. Aquatic Ecosystem and Organism Determinations.

The project will result in the loss of a small amount of river bottom habitat due to construction of new Dam 2 and Locks 4. This loss of benthic habitat will be offset by the removal of existing Locks and Dam No. 3, and placement of fishery habitat structure. The pool changes resulting from removal of Dam 3 will result in a net gain of 76.5 acres of valuable shallow water habitat which represents about a 25 percent increase in the impact area. Bank stabilization in Pool 2 and lock approaches will provide a beneficial increase of structure in a small area of shallow water. Submerged dikes for flow velocity reduction will be situated in the heavily trafficked lock approaches and will provide little beneficial value.

Bank stabilization in combination with the raise in elevation of Pool 2 has the potential to eliminate a significant proportion of the riparian wetlands in this reach. This loss will be minimized by designing the riprap to extend only two feet above normal pool elevation, and to place it only where active erosion (which would preclude wetland development) is observed. This loss will also be offset by the net increase in shallow water habitat in Pool 3 conducive for development of additional submerged/emergent wetlands. No net loss of wetlands is anticipated.

The dredged material to be placed upstream of Locks 4 is of essentially the same constituency as the present substrate. Rapid benthic recolonization is anticipated. The associated dredging and alterations of current patterns may result in the degradation of a significant submerged/emergent wetland along the left bank.

The most significant aquatic ecosystem impact will be the loss of one tailwater with the permanent removal of Locks and Dam No. 3. The extent of the Dam 3 tailwater's high quality aquatic substrate is one-half mile downstream, encompassing 45 acres. The turbulent currents in a tailwater which sort and cleanse the substrate, reoxygenate the water column, and attract fish, cannot be mitigated fully by out-of-kind means. However, the net gain in valuable shallow water habitat, combined with structural features at Dam 2 and Locks 4 to reaerate discharges, and construction of fish reefs and rubble beds to provide structure in the shallow water zone, should offset, to the extent practicable, the tailwater habitat loss.

F. Proposed Dredged and Fill Site Determinations.

The nature of the structural and stone fill materials and their placement raise no concern over dispersion in the water column and adverse impacts on water quality. Secondary impacts, arising from sediment disturbance with placement and removal of cofferdams, submerged placement of stone, and dredging to restore the nine-foot navigation channel, include temporary and localized turbidity levels. Placement of dredged material from the navigation channel in the upper approach to Locks 4 would result in elevated temporary turbidity levels. Also, the new Dam 2 will cause some change in the water quality characteristics of the raised, elongated pool. Placement of the dredged and fill materials will not violate water quality standards.

Temporary increases in turbidity during construction would be a primary impact from dredged material placement and a secondary impact associated with fill placement. Turbidity levels would not exceed naturally occurring levels except possibly in duration and time of year. Impacts to municipal and private water supplies would be minimized by notification during construction activities. There are four privately owned intakes (one of which is a municipal supply) in the project area at r.m. 11.2, 25.1, 25.3, and 29.0.

The loss of the Dam 3 tailwater will result in the significant loss of a recreational fishery resource. This tailwater represents one of three on the Lower Monongahela River and one of nine on the entire river. This loss will be partially compensated by instream disposal of concrete rubble from structural demolition in the form of fish reefs and rubble beds. The provision of tailwater shoreline fishing access at the Dam 4 abutment will be a second compensatory measure. Other recreational values and aesthetics will not be impacted by the proposed project. There are no designated Federal or state parks or preserves in the project impact area.

G. Determination of Cumulative Effects on the Aquatic Ecosystem.

No cumulative effects on the aquatic ecosystem of the Lower Monongahela River can be attributed to the fill activities associated with construction of the structures of new Dam 2 and Locks 4. Riprap bank stabilization in Pool 2 will further reduce available habitat for riparian habitat development in an already heavily developed area. This impact will be minimized by limiting the extent of riprap to the minimum necessary.

H. Determination of Secondary Effects on the Aquatic Ecosystem.

Significant secondary impacts associated with the proposed plan include changes to water quality characteristics of the elongated pool behind Dam 2, loss of Dam 3 tailwater habitat and recreational fishery, and dredging of 2.4 million cubic yards of river bottom. Proposed environmental features of the project will minimize or compensate for these secondary impacts to the extent practicable and justified.

III. FINDINGS OF COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE (Section 230.12)

A. Adaptation of the Section 404(b)(1) Guidelines to this Evaluation.

No significant adaptation of the guidelines were made relative to this evaluation.

B. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem.

A detailed discussion of alternative plans considered for the modernization of the Lower Monongahela River Navigation System is contained in the Feasibility Report and Environmental Impact Statement. The plan that would cause the least environmental disruption is the No Action Alternative ("Without" Plan), which is the replacement in-kind and at existing sites of the existing structures. Plan No. 1 is proposed because it is the designated National Economic Development plan yielding the maximum net benefits of all alternatives. The proposed fill sites were selected based primarily on navigation constraints and economics.

C. Compliance with Applicable State Water Quality Standards.

The proposed project complies with all state water quality standards.

D. Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 of the Clean Water Act.

The fill operations would not violate Section 307 of the Clean Water Act.

E. Compliance with Endangered Species Act of 1973.

Consultation with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act resulted in the determination that no federally designated endangered or threatened species, or critical habitat are in the project impact area.

F. Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972.

Not applicable.

G. Evaluation of Extent of Degradation of the Waters of the United States.

The proposed project may adversely affect human health and welfare through unavoidable secondary impacts related to the potential for increased backwater elevations (i.e., increased flooding) during cofferdam construction phases. The only significant adverse effects on municipal and private water supplies would be the economic cost of adjustments required by changes in pool elevations. The loss of the recreational fishery at the Dam 3 tailwater would be compensated by provision of additional shoreline fishing opportunities at the Dam 4 abutment and fish habitat structure in the river.

The loss of a tailwater would reduce the favored spawning habitat for walleye, sauger, and suckers. The proposed fish reefs and increase in shallow water habitat would compensate to the extent possible by out-of-kind means for this loss, and benefit other aquatic species. With the proposed project's other environmental features, no significant adverse impacts to aquatic ecosystem diversity, productivity, and stability, and recreational, aesthetic, or economic values are anticipated.

H. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem.

Environmental features for the design, construction, and operation of the proposed project have been developed to minimize or compensate for the primary and secondary impacts of fill activities. The rationale for these features is discussed in the Feasibility Report, Section 7.1.e. These features include:

1. A raised sill, low flow gate in Dam 2, and ducts to entrain air in Locks 4 discharge.
2. Fish reefs in the shallow water zone of the adjusted, elongated Pool 2.
3. Rubble beds in Dam 2 tailwaters.
4. Channel and approach dredging would be prohibited from mid-April through June 30.
5. Vegetation to be flooded by the raised Pool 2 would be retained through a modified clearing plan.
6. Selective placement of bank stabilization in Pool 2.

7. Wildlife improvements at upland disposal site restoration.
8. Modified operating schedule for Dam 4.
9. Analysis of dredged material for hazardous and toxic wastes.

I. Finding of Compliance.

On the basis of the guidelines, the proposed disposal sites for the discharge of fill material are specified as complying with the requirements of these guidelines with the inclusion of the above listed features which are appropriate and practical to minimize pollution or adverse effects on the aquatic ecosystem.

Date: 25 November 1991

Harold F. Alvord
Colonel, Corps of Engineers
District Engineer

APPENDIX F

Hazardous and Toxic Waste Site Inventory

Hazardous and Toxic Waste Site Inventory
Lower Monongahela River
Pools 2, 3 and 4

An inventory of known hazardous and toxic waste sites within one-quarter mile landward from the top of left and right banks along the river study area (and including the three proposed disposal areas) was compiled using the U.S. Environmental Protection Agency's (EPA) Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS). The initial listing, which was compiled from a U.S. EPA Region III printout, was subsequently reviewed by the Pennsylvania Department of Environmental Resources (PaDER) for possible additions or deletions and for additional site characterization. The following list is the resulting inventory. As shown in the list, those sites that were derived from CERCLIS have a specific identification (ID) number, whereas those added by the PaDER do not have an ID number. The site descriptions and information on potential for impact at each site due to the various improvement plans were provided by the PaDER.

Hazardous and Toxic Waste Site Inventory
Lower Monongahela River
Pools 2, 3 and 4

FACILITY	LOCATION (Pool/r.m./bank)	SITE TYPE
1. Westinghouse Electric Corp. PAD987270907	Pool 2 / 11.5 / LB	Bulk liquid storage area. Leakage. Hazardous waste generator. Potential ground/surface water, soil contamination. Inactive. Waste tanks removed.
2. Westinghouse Air Brake Div PAD004341269	Pool 2 / 12.0 / LB	Small hazardous waste generator. Drums; tanks. Closure activities ongoing. Leakage in soil/ groundwater. Caustic waters; xylene; waste paints/coolants.
3. USX Taylor Landfill PAD000739672	Pool 2 / 12.5± / LB	Inactive landfill disposal site. Hazardous waste present-benzene; phenols, etc.
4. West Mifflin Sanitary Authority PAD980693147	Pool 2 / 12.5± / LB	No information
5. USX Corp. National Works PAD000731505	Pool 2 / 15.0 / RB	Inactive. Drums; tanks; bins. Solid waste, transformers. PCBs, lead, asbestos, etc. Remedial clean-up.
6. USX Corp. Irvin Works PAD004379061	Pool 2 / 18.5± / LB	Slag; Active site. Drums, diked areas, tanks. Spent pickle liquors generated.

FACILITY	LOCATION (Pool/r.m./bank)	SITE TYPE
7. Carnegie Natural Gas Pipeline, Pipeline 11	Pool 2 / 18.8 / LB	Coke oven residue burial. Active. Unlined pits; trenches. Chromium; lead; mercury. Potential for direct contact exists.
8. USX Corp. Clairton Works PAD004498010	Pool 2 / 20.5 / LB	Sludge/decanter from coking operations. Not hazardous now.
9. Kutsenkow Landfill PAD980830939	Pool 2 / 20.5± / LB	Dump site: pickling acids; aromatic solvents; polyaromatic hydrocarbons.
10. Peters Creek Lagoon PAD981034788	Pool 2 / 21.0± / LB	Inactive. PaDER medium priority. Acids/organics/ phenols. Monitor wells installed.
11. Ben Construction Co. PAD008938474	Pool 2 / 21.0± / LB	No hazardous waste. Roadway fill material. Tree stumps.
12. Hercules-Picco	Pool 2 / 23.6± / LB	Manufacturing operation. Landfill-resins/sludge; hazardous waste.
13. Ashland Oil	Pool 3/ 24.0± / LB	Storage area. Ground water collection and treatment system.
14. Elrama School PAD981034994	Pool 3 / 25.5± / LB	Inactive hazardous waste site. Potential for ground/surface water and soil contamination, acid clays; solvents.
15. Elrama Works Town Gas PAD980706915	Pool 3 / 25.5± / LB	Inactive. Covered by development. No wastes existing since 1935. Coal gasification products.

FACILITY	LOCATION (Pool/r.m./bank)	SITE TYPE
16. Grief Bros. Cooperage Corp. PAD063770200	Pool 3 / 30.3± / LB	No potential hazard or on-site disposal since 1971. PaDER low priority. Pickle liquor acid wastes.
17. Putnaks Packing PAD063770200	Pool 3 / 31.5± / LB	Active non-hazardous waste site. Meat processing.
18. Stauffer Chemical Co. PAD004325692	Pool 3 / 31.5± / LB	Inactive site. PaDER low priority. Hazardous waste generator-solids, liquids. 3 acre site. Potential hazard for ground/surface water & soil contamination.
19. Burrell Construction & Supply PAD004347894	Pool 3 / 34.6 / LB	Asphalt paving material; slag; small hazardous material usage (100 gal/yr).
20. Canastrales Landfill PAD98050847	Pool 3 / 38.9 / LB	No information.
21. Welch's Landfill Disposal PAD980554554	Pool 3 / 41.5± / LB	Active waste site. Collection pond. Pigments; alum mud; waste dyes. 95 acres.
22. Corning Glass Works Charleroi PAD004326542	Pool 4 / 41.6 / LB	Hazardous waste generator; liquid wastes (1,000 gal/yr); solid wastes (200 tons/yr). Stored in containers.

PENNSYLVANIA DER

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
Southwest Region - Field Operations
Highland Building
121 South Highland Avenue
Pittsburgh, Pennsylvania 15206-3988
(412) 645-7100 (answers 24 hrs.)

August 20, 1991

Office of the
Regional Director

Mr. Les Dixon, Chief
Planning Division
Department of the Army
Pittsburgh District
Corps of Engineers
William Moorehouse Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222

RE: Proposed Monongahela River
Lock and Dam Project

Dear Mr. Dixon:

As recently discussed at a meeting between your staff and the Pennsylvania Department of Environmental Resources and in response to several requests by Mr. James Purdy of your staff, the following comments and recommendations are submitted for the proposed modification of various locks and elimination of dam #3 located on the Monongahela River.

The Department's primary recommendation to the Corps is to proceed with Plan 4 rather than Plan 1 because of less impact on industrial outfalls and groundwater contamination sites.

A listing by the U.S. Environmental Protection Agency of Superfund sites in the project area was submitted to the Department for comment. There are several corrections or additions to the list. The location of the Hercules-Picco Resins/Sludge Landfill located at the top of Stilley Road should be changed. The landfill is located at mile point 23.5, not 19.5 as indicated. The Stilley Road site will not be affected by the project. Second, the USX Corporation Clairton Works (Item #18) located at mile point 20.5 and the Peters Creek Lagoon (Item #20) should be considered as one combined site. Third, the Ashland Oil Storage Area located on Glass House Road in West Elizabeth, PA (approximate mile point 24.0) has an extensive groundwater collection and treatment system in place and would be affected by the project. This site should be considered even though it is not an official Superfund site.

The affected critical sites are therefore: the USX Clairton Works and Peters Creek Lagoon (Items #18 and #20); the Hercules-Picco manufacturing operation located at mile point 23.6 and the Ashland Oil storage facility/groundwater treatment project at mile point 24.

Because of the potential for this project to impact industry outfalls located along the Monongahela River, it is recommended that a specific industrial survey be performed as a separate evaluation study. Items that should be taken up with the industries themselves include the existence of groundwater treatment facilities, outfalls, river access points, and adjacent roadways. Raising or lowering water levels may result in the need for re-design or relocation of treatment/collection/conveyance/access structures. This is particularly true of the Clairton Works and Peters Creek Lagoon. Groundwater treatment currently taking place at the Ashland site and the USX Clairton site could be negatively affected if the groundwater table is raised or lowered as a result of the project; this could potentially make the collection well screen location ineffective in dealing with groundwater contaminants. Any reconstruction must be handled so that corrective timetables in existing legal agreements are not affected.

Any marinas or boat access areas located in the project area could be affected. In addition, any facility which has fuel or sewage storage in the project area should be carefully reviewed as to location and access. Location information on tanks and NPDES discharges may be obtained by having the consultant contact the Southwest Regional File Clerk at this this address and phone number in order to schedule a review of pertinent files.

It is further recommended that use of dredged materials from this project be used as landfill cover rather than dispersed along the river banks. Use on the river bank assumes designation of the dredged materials as essentially clean fill; placement of material must not cause contamination of virgin slopes or embankments. Of the disposal sites under consideration, the Dunleavy site has been eliminated. Areas of contamination that can be specifically traced to industry may require separate enforcement actions by the Department. Schedules dealing with dredging activities could be affected by litigation delays with industry. Permits and approvals necessary for this project may include soil erosion and sedimentation control planning, earth disturbance permit, wetlands permit, encroachments permit, and historic/archaeological site approval.

Should you have any questions or wish additional information, please contact me.

Sincerely,

Joseph W Chnupa

Joseph W. Chnupa
Regional Program Coordinator
Southwest Region

JWC:kld

cc: File
Chron
C. Duritsa
T. Dreier/T. Pallas/S. Harper
A. Orlando/G. Campbell

APPENDIX G

National Historic Preservation Act
Section 106 Consultation

The District is pursuing a programmatic agreement with the Advisory Council on Historic Preservation and the Pennsylvania Bureau for Historic Preservation for Section 106 compliance. A draft version of a programmatic agreement was developed by the District and circulated to the above agencies for review in October 1991. The Pennsylvania Bureau for Historic Preservation prepared a revised draft which was enclosed with their December 2, 1991 letter to the District. This revised draft and correspondence under Section 106 consultation is reproduced in this appendix. Finalization and execution of this agreement is subject to further review by the Pennsylvania Bureau for Historic Preservation and the Advisory Council on Historic Preservation.

The Steel Industry Heritage Task Force has formally requested to be considered an "interested person" under the regulations implementing Section 106. Their letter dated October 18, 1991 containing this request is reproduced in Appendix J, Public Review Letters of Comment and District Responses.

Advisory Council On Historic Preservation

The Old Post Office Building
1100 Pennsylvania Avenue, NW, #809
Washington, DC 20004

DEC 5 1991

Colonel Harold F. Alvord
District Engineer
Pittsburgh District, Corps of Engineers
William S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, Pennsylvania 15222

RE: Draft Lower Monongahela River Navigation System Feasibility Study Interim Report, Volume 1 of 6
Main Report and Environmental Impact Statement, September 1991

Dear Colonel Alvord:

Thank you for the opportunity to review the referenced report. It has served as a useful source of information for our ongoing Section 106 consultation with your office regarding the proposed modernization of Locks and Dam Nos. 2, 3, and 4 on the Monongahela River in Pennsylvania. Based on our discussions with your staff and on our review of the referenced report, we offer the following comments.

We agree with the Corps' determination that a programmatic agreement is the appropriate mechanism for treating historic properties for this undertaking. We remain concerned, however, about several issues including the timing of historic property surveys for both archeological sites and historic buildings/ structures in relation to project planning; the identification of potential changes in flood zones and related real estate acquisitions; and, the role of the general public and interested parties in the Section 106 consultation for this undertaking. We recommend that these and other issues be addressed as early as possible and certainly before the Corps makes its final recommendations about this proposed project.

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA HISTORICAL AND MUSEUM COMMISSION
BUREAU FOR HISTORIC PRESERVATION
BOX 1026
HARRISBURG, PENNSYLVANIA 17108-1026

December 2, 1991

James A. Purdy, Chief
Environmental Studies Branch
Pittsburgh District, Corps of Engineers
William S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222

TO EXPEDITE REVIEW
USE BHP REFERENCE NUMBER

RE: ER 87-0469-042-F
Lower Monongahela River Navigation System Feasibility Study and Draft Programmatic Memorandum of Agreement

Dear Mr. Purdy:

Thank you for submitting the Lower Monongahela River Navigation System Feasibility Study and the draft Programmatic Memorandum of Agreement (MOA) for our review. Several alterations and additions have been made to the MOA. Enclosed is the revised MOA, with all changes underscored.

If you need further information in this matter please consult myself or Caroline Henry at (717) 783-8947.

Sincerely,

Kurt W. Carr

Kurt Carr, Chief
Division of Archaeology & Protection

KC/CH
Enclosure
cc: Advisory Council on Historic Preservation (w/ enclosure)

2. Historic District Nomination. Within five (5) years of the date of the execution of this Agreement, the Pittsburgh District shall prepare a thematic nomination to the National Register of Historic Places for the locks and dams along the Monongahela River, based on the surveys conducted as a part of the modernization project. This nomination shall be prepared in consultation with the SHPO and submitted to the SHPO for review and processing.

3. Identification. The Pittsburgh District shall evaluate properties identified through the surveys in accordance with 36 CFR § 800.4(c). If the surveys result in the identification of historic properties that are eligible for the National Register solely for the information they may contain, the Pittsburgh District shall consult with the SHPO and Council in formulating alternatives for preserving that information. The scope of data recovery and recordation, previously approved by the SHPO, shall be carried out in accordance with the Pennsylvania Historical and Museum Commission's Cultural Resource Management in Pennsylvania: Guidelines for Archaeological Survey and Mitigation (July 1991) (see Appendix A) and with the Secretary of the Interior's Standards and Guidelines for Historical Documentation (48 CFR 44728-34) (see Appendix B), as appropriate. If the surveys result in the identification of properties that are eligible for the National Register for another reason, the Pittsburgh District shall comply with 36 CFR § 800.5. If there is a question as to whether or not a property is eligible for the National Register, the Pittsburgh District will seek a formal determination of eligibility pursuant to 36 CFR § 800.4(c).

4. Evaluation. The Pittsburgh District shall apply 36 CFR §800.5 in the evaluation of all District activities, to determine the effect of those activities on historic properties.

5. Mitigation. The Pittsburgh District shall ensure that mitigation alternatives for historic properties found to be adversely affected, either directly or indirectly, by District activities under 36 CFR § 800.5, are formulated in consultation with the SHPO and Council. The District shall be responsible for submitting an effect report on all chosen alternatives and the comments of all interested parties, as a part of the consultation process. Recordation of historic buildings and structures, where appropriate, shall be carried out in accordance with the Secretary of the Interior's Standards and Guidelines for Historical Documentation.

6. Personnel. The Pittsburgh District shall ensure that all historic preservation work carried out pursuant to this Agreement is carried out by or under the direct supervision of a person or persons meeting at a minimum the standards of the Secretary of the Interior set forth in the Secretary of the Interior's Professional Qualifications Standards (48 FR 44738-9).

ADVISORY COUNCIL ON HISTORIC PRESERVATION

By:____Date:____________

THE U.S. ARMY ENGINEER DISTRICT, PITTSBURGH

By:____Date:____________

PENNSYLVANIA STATE HISTORIC PRESERVATION OFFICER

By:____Date:____________

7. Dissemination of Information. The Pittsburgh District shall ensure that reports on all activities carried out pursuant to this Agreement are provided to the SHPO, the Council, and, upon request, to other interested parties.

8. Record Retention. The Pittsburgh District shall ensure that all Federally owned materials and records resulting from the surveys, data recovery, and recordation conducted under this Agreement are curated in accordance with 36 CFR § 79. The Pennsylvania Historical and Museum Commission shall be the preferred repository. All materials recovered from non-Federally owned property shall be maintained in accordance with 36 CFR § 79 until their analysis is complete and if appropriate, are returned to their owner(s).

9. Treatment of Human Remains. The Pittsburgh District shall ensure that any human remains and grave-associated artifacts encountered during this project, under this Agreement are reinterred in consultation with the SHPO. The reinterment shall take place within a reasonable time period allowing for analysis specified in the data recovery plan, in a location where their subsequent disturbance is unlikely, and in a manner as similar as possible to the manner in which they were originally interred.

10. Subsequent Consultation. The parties to this Agreement shall consult biennially, or earlier at the request of one of the parties, to review implementation of the terms of this Agreement and determine whether revisions are needed. If revisions are needed, the parties to this Agreement will consult in accordance with 36 CFR § 800 to make such revisions. Nothing in this Agreement shall be construed as meaning that the Pittsburgh District cannot request the advice, counsel, or assistance of the SHPO at any time.

11. Dispute Resolution. Should the SHPO object with 60 days to any scope of work, proposed action or findings of a report provided for review pursuant to this Agreement, the Pittsburgh District shall consult with the SHPO to resolve the objection. If the Pittsburgh District determines that the objection cannot be resolved, the Pittsburgh District shall request the further comments of the Council pursuant to 36 CFR § 800.6(b). Any Council comment provided in response to such a request will be taken into account by the Pittsburgh District in accordance with 36 CFR § 800.6(c)(2) with reference only to the subject of the dispute; the Pittsburgh District's responsibility to carry out all actions under this Agreement that are not the subject of the dispute will remain unchanged.

Advisory Council On Historic Preservation

The Old Post Office Building
1100 Pennsylvania Avenue, NW, #809
Washington, DC 20004

APR 11 [illegible]

Mr. Les Dixon
Chief, Planning Division
Pittsburgh District, Corps of Engineers
William S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, Pennsylvania 15222

RE: Lower Monongahela River Navigation System Study, Initial Historic Properties Coordination Report Allegheny, Washington, and Westmoreland Counties, Pennsylvania

Dear Mr. Dixon:

On March 18, 1991, the Council received your request to review the referenced study.

The report was a very useful introduction to the proposed modernization of the Monongahela River Navigation System and its potential effects to historic properties. The amount of information gathered for the identification of historic properties will greatly facilitate the continued Section 106 consultation for this project. We agree with your determination that a Programmatic Agreement is the appropriate course of action.

Accordingly, we believe that it would be useful to meet with you and the Pennsylvania State Historic Preservation Office (SHPO) to outline the consultation process for this project. You may contact Valerie DeCarlo at (202) 786-0505 to arrange the meeting.

We trust that your efforts to begin consultation so early in the planning process will prove helpful. We look forward to working with you to reach a successful resolution of this matter.

Sincerely,

Don L. Klima
Director, Eastern Office
of Project Review

DRAFT
PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY ENGINEER DISTRICT, PITTSBURGH
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
AND THE PENNSYLVANIA STATE HISTORIC PRESERVATION OFFICER
REGARDING IMPLEMENTATION OF THE MODERNIZATION OF
THE LOWER MONONGAHELA RIVER NAVIGATION SYSTEM

WHEREAS, the U.S. Army Engineer District, Pittsburgh (Pittsburgh District), proposes to modernize the existing Lower Monongahela River Navigation System, consisting of Locks and Dam Nos. 2, 3, and 4 located in Allegheny, Washington and Westmoreland counties in Southwestern Pennsylvania; and

WHEREAS, the Pittsburgh District has determined that modernization of the Lower Monongahela River Navigation System may have an effect upon properties included in or eligible for inclusion in the National Register of Historic Places (National Register) and has consulted with the Advisory Council on Historic Preservation (Council) and the Pennsylvania State Historic Preservation Officer (SHPO) pursuant to Section 800.13 of the regulations (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act of 1966, as amended in 1980 (16 U.S.C. 470f), and Section 110(f) of the same Act (16 U.S.C. 470h-2(f).

NOW, THEREFORE, the Pittsburgh District, the Council and the SHPO agree that modernization of the Lower Monongahela River Navigation System shall be administered in accordance with the following stipulations to satisfy the Pittsburgh District's Section 106 responsibility for all individual undertakings of the System's modernization.

Stipulations

1. Survey. The Pittsburgh District shall ensure that archaeological surveys are conducted of all areas subject to ground disturbance, and that historic evaluation surveys are conducted on all sites, buildings, structures or objects within the project area, subject to disturbance. The surveys shall be conducted in a manner consistent with the Secretary of the Interior's Standards and Guidelines for Identification (48 FR 44720-23), taking into account NPS publication The Archaeological Survey: Methods and Uses (1978: GPO stock # 024-016-00091) and the Pennsylvania Historical and Museum Commissions's Cultural Resource Management in Pennsylvania: Guidelines for Archaeological Survey and Mitigation (July 1991). The surveys shall be conducted in consultation with the SHPO, who shall approve the survey scope. Reports of the surveys, meeting the standards of the SHPO, shall be submitted to the SHPO for review and approval. The SHPO shall respond to the Pittsburgh District within 60 days.

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA HISTORICAL AND MUSEUM COMMISSION
BUREAU FOR HISTORIC PRESERVATION
BOX 1026
HARRISBURG, PENNSYLVANIA 17108-1026

July 8, 1991

LES DIXON
DEPARTMENT OF THE ARMY
U S ARMY CORPS OF ENGINEERS
PITTSBURG DISTRICT
WILLIAM S MOOREHEAD FEDERAL BUILDING
1000 LIBERTY AVENUE
PITTSBURGH PA 15222

Re: ER# 87-0469-042-C
Lower Monogahela River
Navigation System Study
Initial Historic Properties
Coordination Report

Dear Mr. Dixon:

The above named project has been reviewed by the Bureau for Historic Preservation (the State Historic Preservation Office) in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended in 1980, and the regulations (36 CFR Part 800) of the Advisory Council on Historic Preservation. These requirements include consideration of the project's potential effect upon both historic and archaeological resources.

Before a programmatic agreement can be developed, an evaluation of the probability of cultural resources in each of the proposed project areas must be developed. This must include the identification of all potentially eligible buildings and structures as well as archaeological sites.

If you need further information in this matter please consult the Section of Archaeology at (717) 783-9900.

Sincerely,

Kurt W. Carr, Chief
Division of Archaeology &
Protection

KC:dah

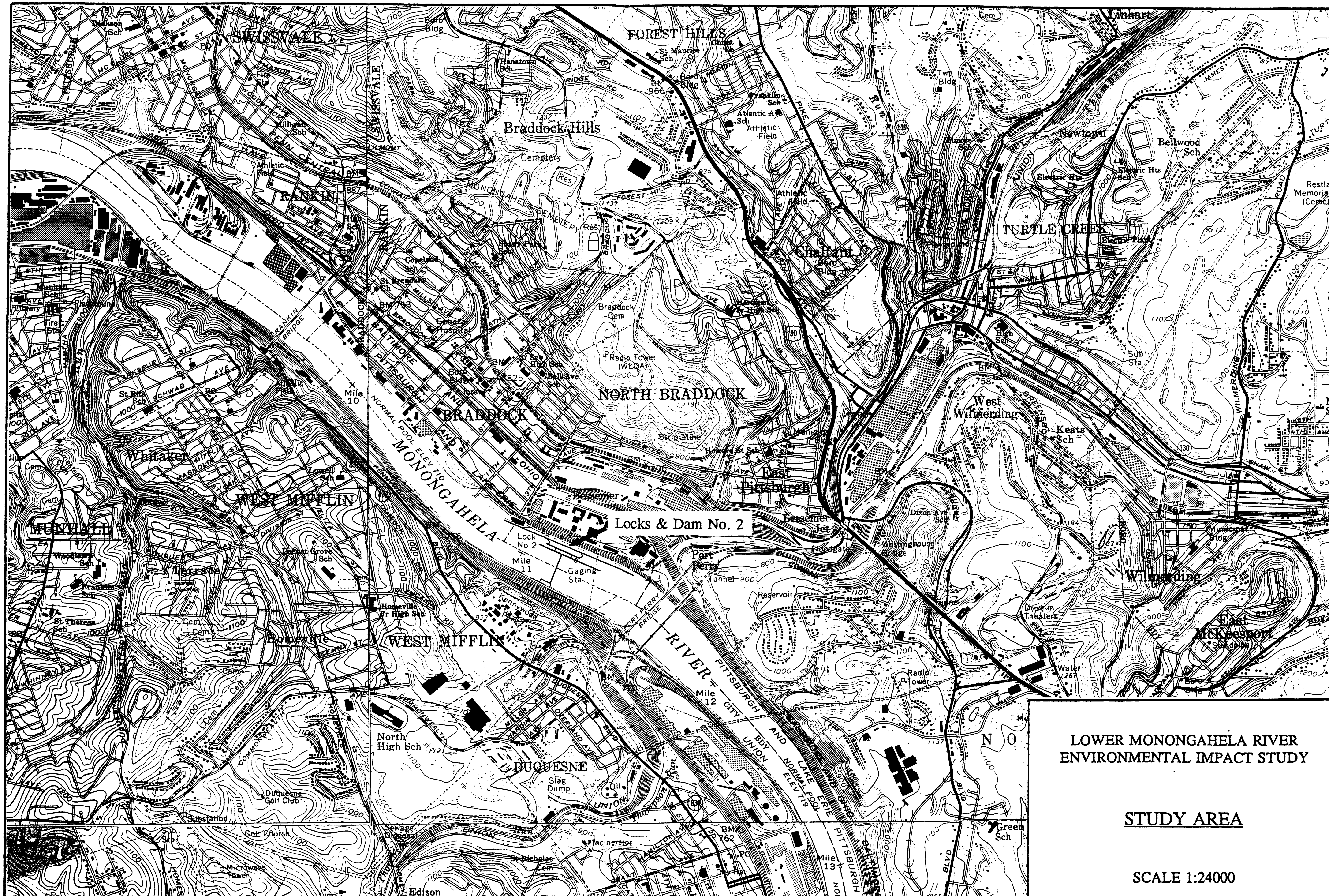
We look forward to working with the Corps and the Pennsylvania State Historic Preservation Office to resolve these issues. If we can be of further assistance or if you wish to discuss this further, please contact Valerie DeCarlo at (202) 786-0505.

Sincerely,

Don L. Klima
Director, Eastern Office
of Project Review

APPENDIX H

Study Area Maps



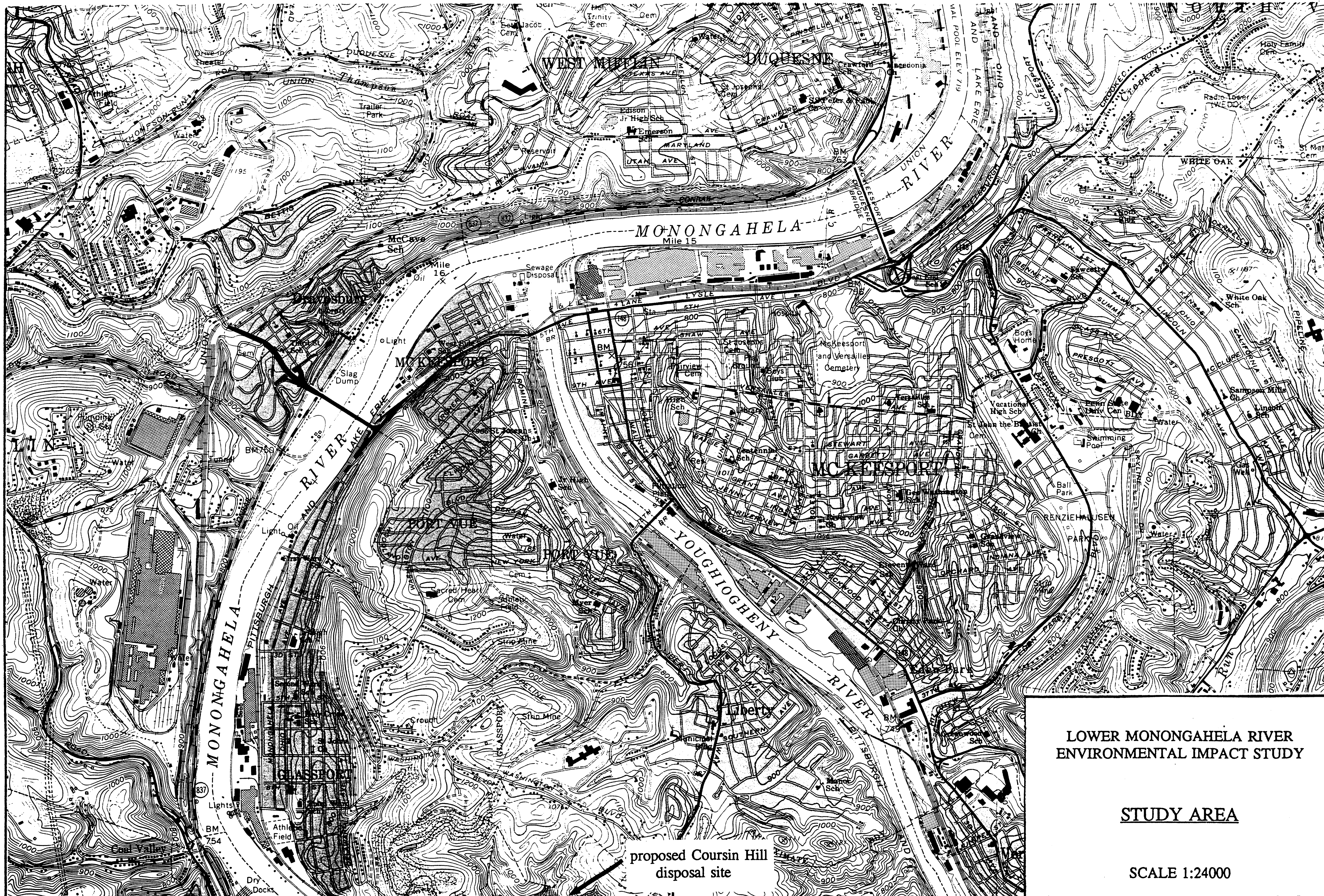
LOWER MONONGAHELA RIVER
ENVIRONMENTAL IMPACT STUDY

STUDY AREA

SCALE 1:24000

MATCH TO SHEET 2

MATCH TO SHEET 1



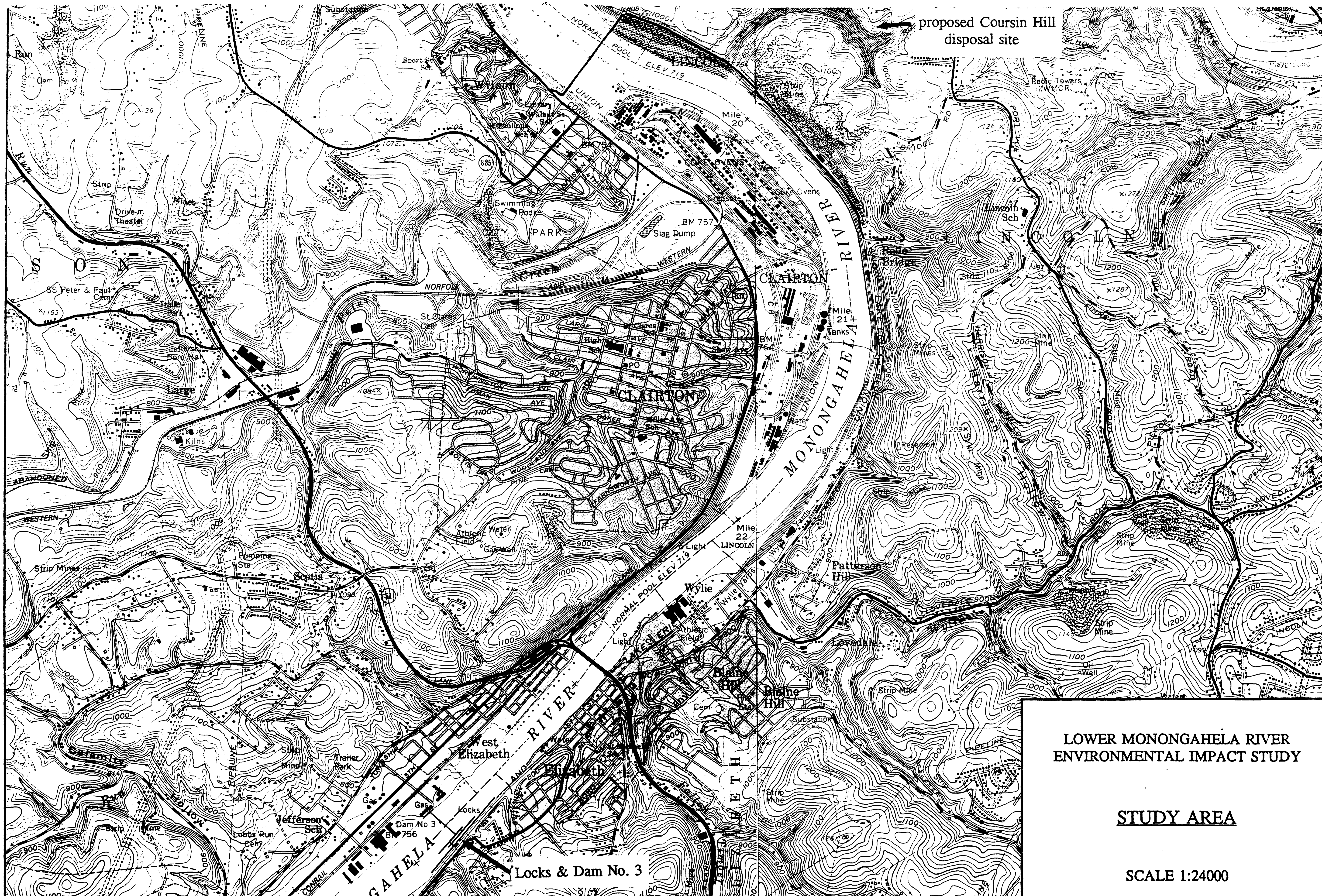
LOWER MONONGAHELA RIVER
ENVIRONMENTAL IMPACT STUDY

STUDY AREA

SCALE 1:24000

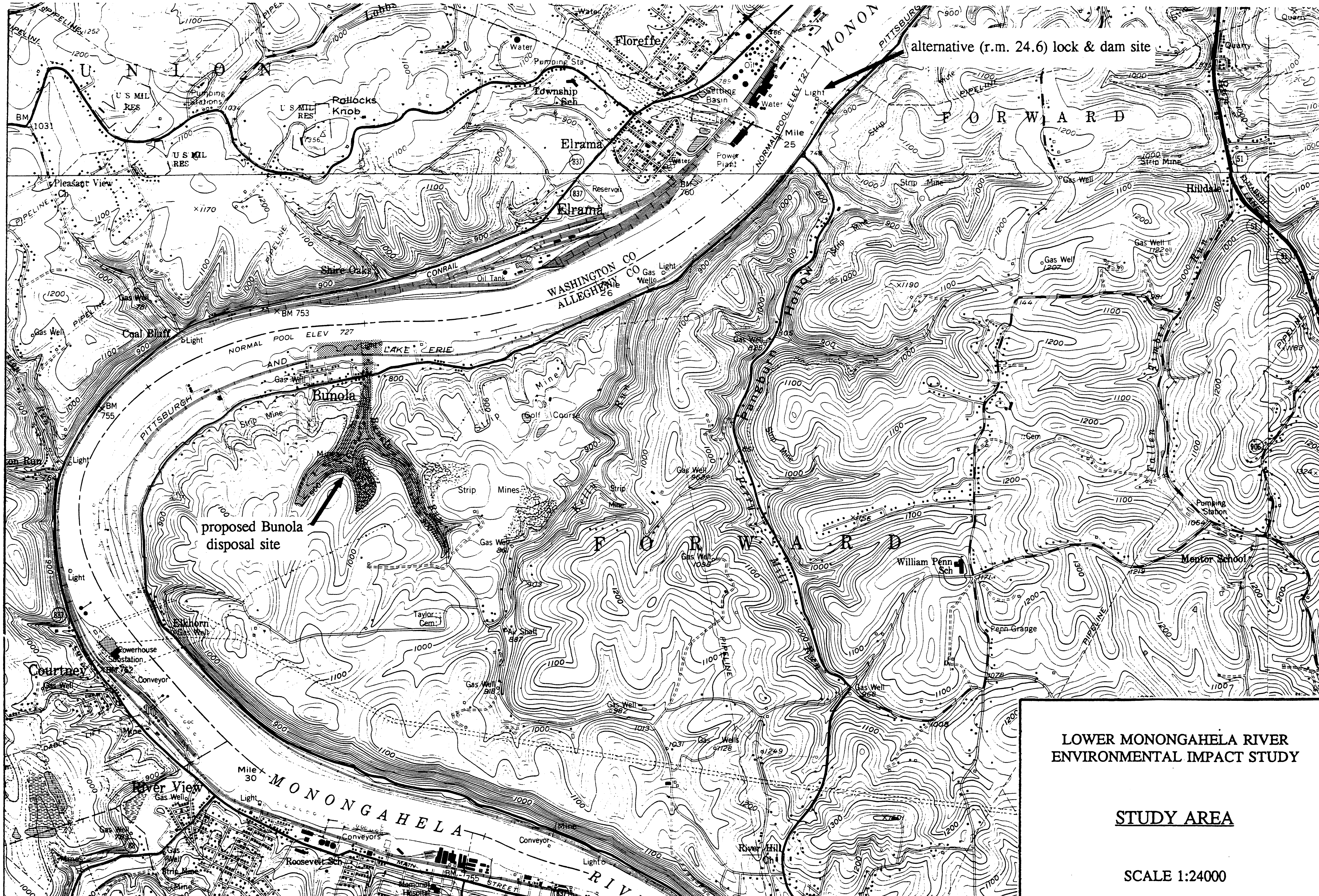
MATCH TO SHEET 3

MATCH TO SHEET 2



MATCH TO SHEET 4

MATCH TO SHEET 3



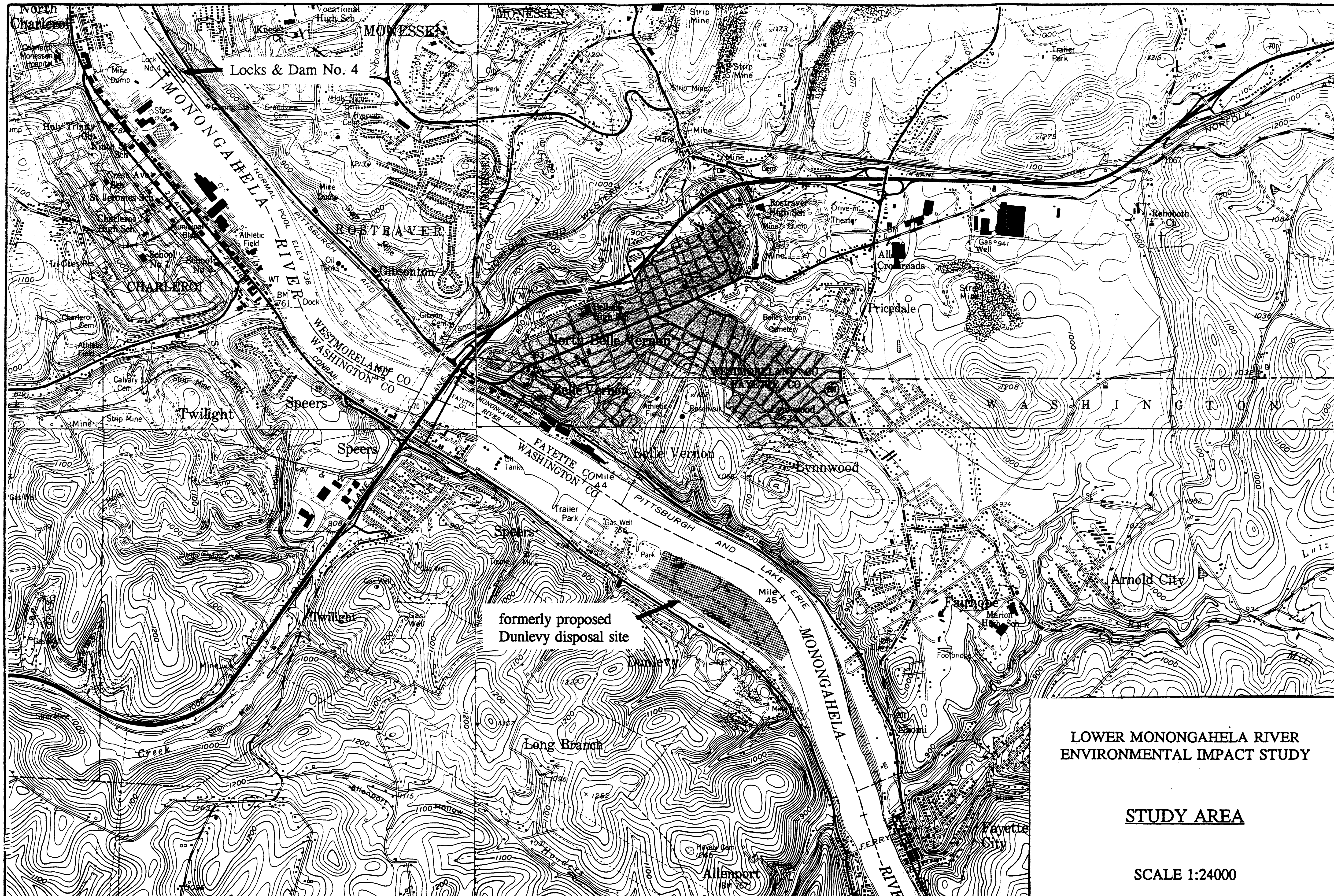
LOWER MONONGAHELA RIVER
ENVIRONMENTAL IMPACT STUDY

STUDY AREA

SCALE 1:24000

MATCH TO SHEET 5

MATCH TO SHEET 5



LOWER MONONGAHELA RIVER
ENVIRONMENTAL IMPACT STUDY

STUDY AREA

SCALE 1:24000

APPENDIX I

Project Drawings, Plan No. 1

Project Drawings, Plan No. 1

Index of Plates

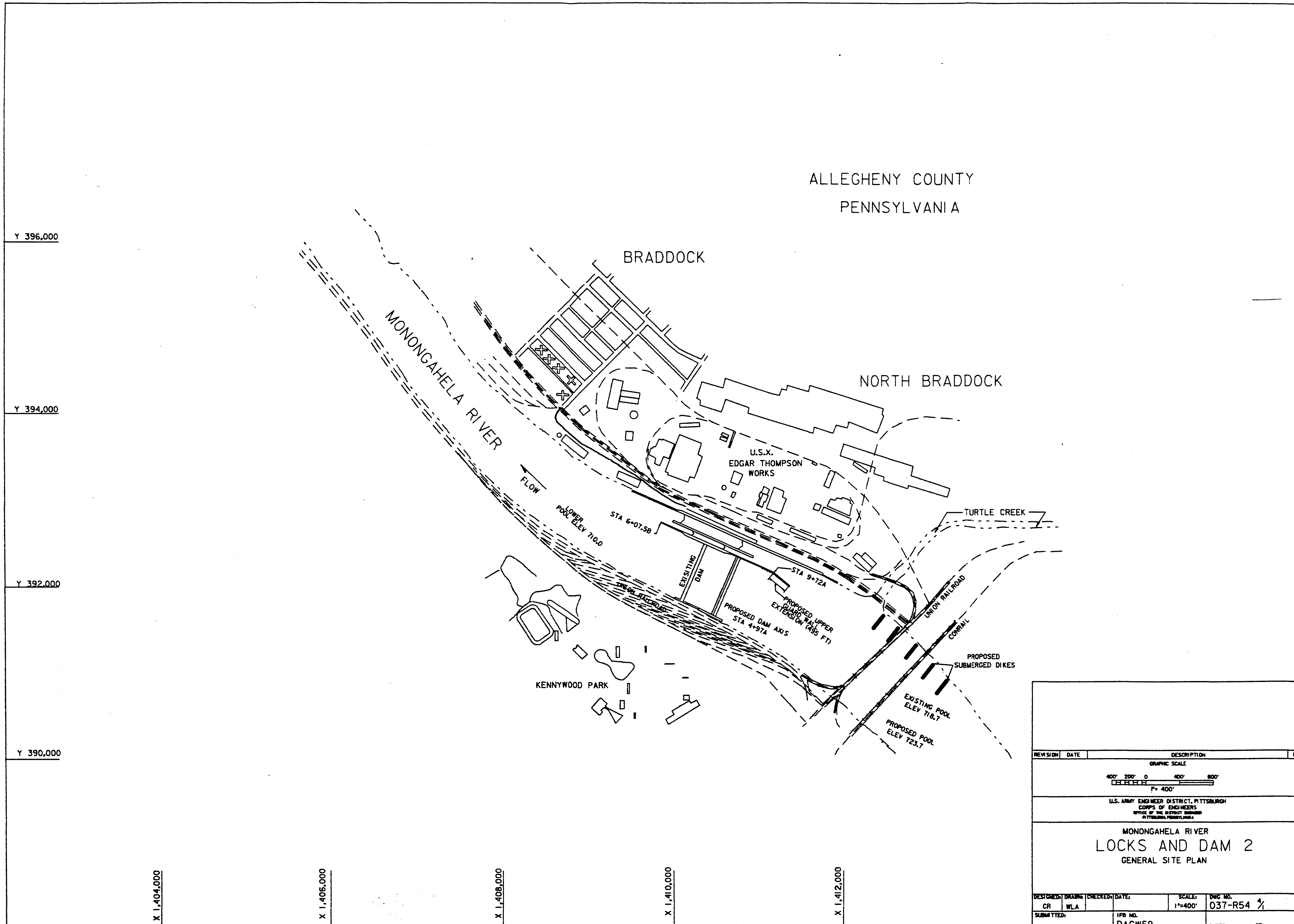
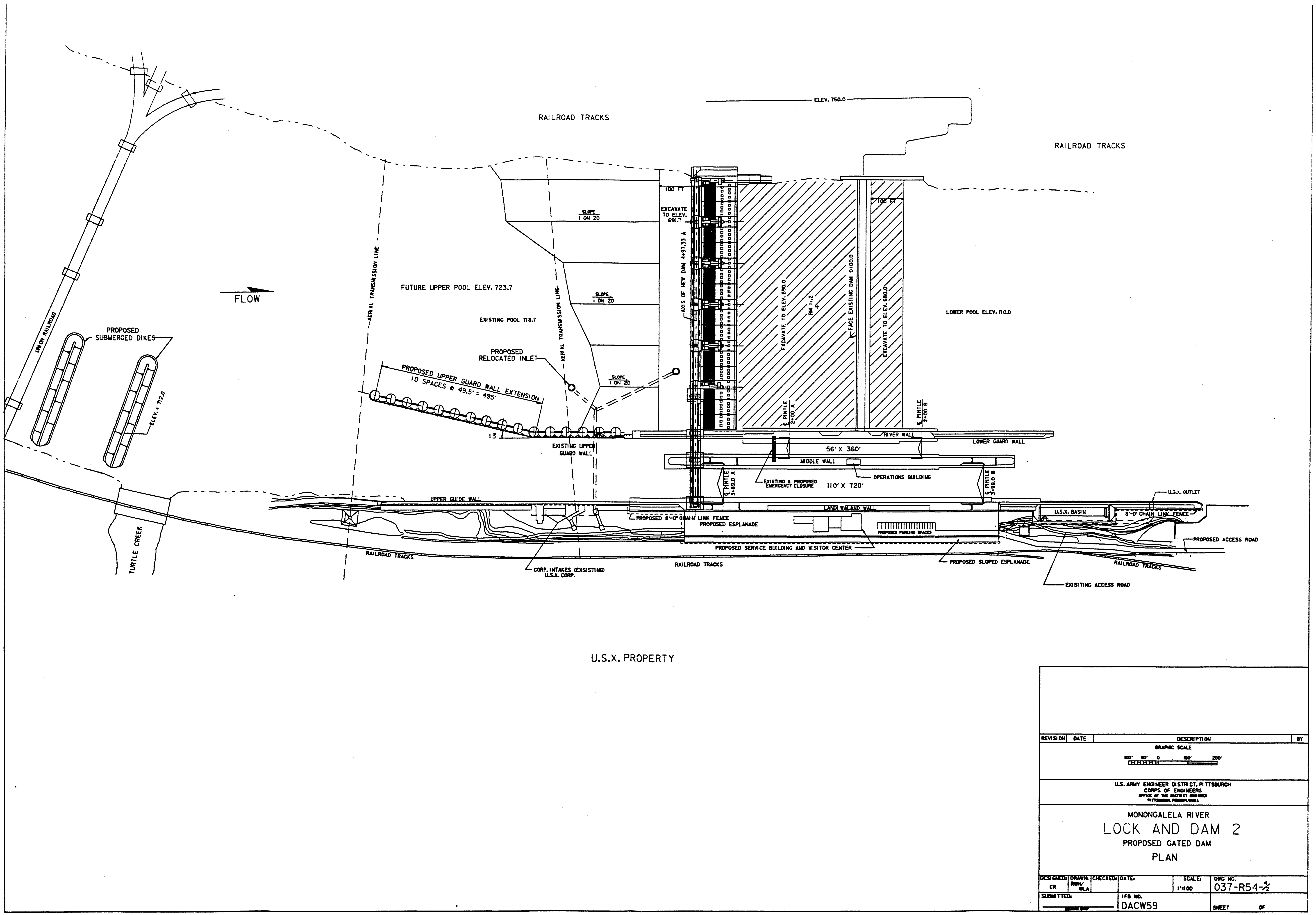
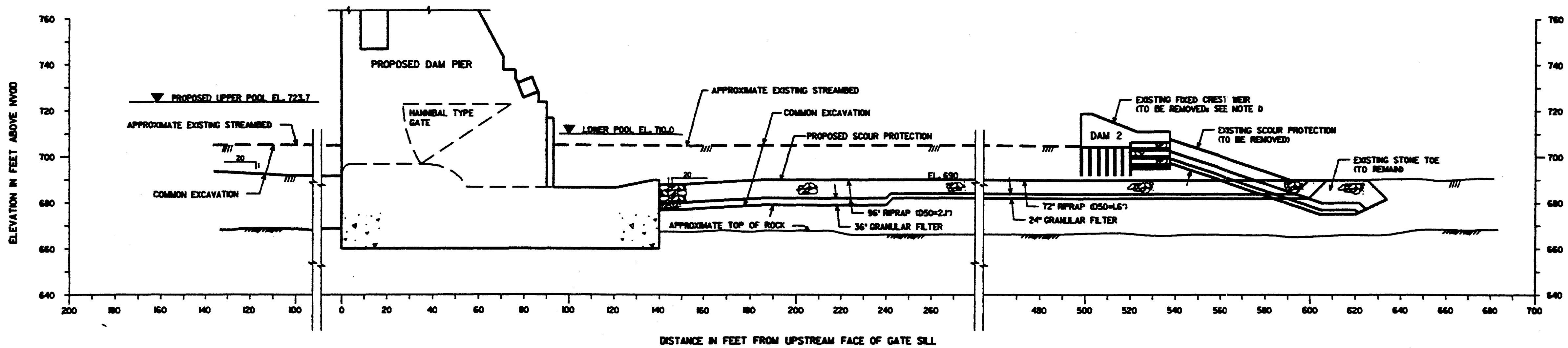

ALLEGHENY COUNTY
PENNSYLVANIA
BRADDOCK
NORTH BRADDOCK
MONONGAHELA RIVER
U.S.X.
EDGAR THOMPSON
WORKS
FLOW
LOWER POOL ELEV 710.0
STA 6+07.58
EXISTING DAM
STA 9+72A
PROPOSED UPPER GUARD WALL EXTENSION (495 FT)
PROPOSED DAM AXIS STA 4+97A
UNION RAILROAD
CONRAIL
TURTLE CREEK
PROPOSED SUBMERGED DIKES
EXISTING POOL ELEV 718.7
PROPOSED POOL ELEV 723.7
KENNYWOOD PARK
Y 396,000
Y 394,000
Y 392,000
Y 390,000
X 1,404,000
X 1,406,000
X 1,408,000
X 1,410,000
X 1,412,000
REVISION
DATE
DESCRIPTION
BY
GRAPHIC SCALE
400' 200' 0 400' 800'
1"= 400'
U.S. ARMY ENGINEER DISTRICT, PITTSBURGH
CORPS OF ENGINEERS
MONONGAHELA RIVER
LOCKS AND DAM 2
GENERAL SITE PLAN
DESIGNED: CR
DRAWN: WLA
CHECKED:
DATE:
SCALE: 1"=400'
DWG NO. 037-R54 4/1
SUBMITTED:
IFB NO. DACW59
SHEET OF

PLATE I


RAILROAD TRACKS
ELEV. 750.0
RAILROAD TRACKS
FLOW
UNION RAILROAD
PROPOSED
SUBMERGED DIKES
ELEV. = 712.0
AERIAL TRANSMISSION LINE
FUTURE UPPER POOL ELEV. 723.7
EXISTING POOL 718.7
PROPOSED
RELOCATED INLET
PROPOSED UPPER GUARD WALL EXTENSION
10 SPACES @ 49.5' = 495'
SLOPE
1 ON 20
100 FT
EXCAVATE
TO ELEV.
691.7
AXIS OF NEW DAM 4+97.33 A
EXCAVATE TO ELEV. 690.0
RM 11.2
FACE EXISTING DAM 0+00.0
EXCAVATE TO ELEV. 690.0
LOWER POOL ELEV. 710.0
℄ PINTLE 2+00 A
℄ PINTLE 2+00 B
EXISTING UPPER
GUARD WALL
RIVER WALL
LOWER GUARD WALL
56' X 360'
MIDDLE WALL
OPERATIONS BUILDING
℄ PINTLE 3+89.0 A
℄ PINTLE 3+99.0 B
EXISTING & PROPOSED
EMERGENCY CLOSURE
110' X 720'
UPPER GUIDE WALL
LAND WALL
U.S.X. OUTLET
U.S.X. BASIN
8'-0" CHAIN LINK FENCE
PROPOSED 8'-0" CHAIN LINK FENCE
PROPOSED ESPLANADE
PROPOSED PARKING SPACES
PROPOSED SERVICE BUILDING AND VISITOR CENTER
PROPOSED ACCESS ROAD
TURTLE CREEK
RAILROAD TRACKS
CORP. INTAKES (EXSISTING)
U.S.X. CORP.
RAILROAD TRACKS
PROPOSED SLOPED ESPLANADE
RAILROAD TRACKS
EXISTING ACCESS ROAD
U.S.X. PROPERTY
REVISION | DATE | DESCRIPTION | BY
GRAPHIC SCALE
100' 50' 0 100' 200'
U.S. ARMY ENGINEER DISTRICT, PITTSBURGH
CORPS OF ENGINEERS
MONONGALELA RIVER
LOCK AND DAM 2
PROPOSED GATED DAM
PLAN
DESIGNED: CR
DRAWN: RWH/WLA
CHECKED:
DATE:
SCALE: 1"=100
DWG NO. 037-R54-4/2
SUBMITTED:
IFB NO. DACW59
SHEET OF
PLATE 2



PROPOSED SCOUR PROTECTION DETAIL

SCALE: 1"=20'

NOTES:

1. REMOVE EXISTING DAM, PILING, ROCK CRIB, AND SCOUR PROTECTION TO EL. 682-±.
2. PLACE NEW FILTER AND RIPRAP TO EL. 690 AND TIE INTO EXISTING STONE TOE.

GRAPHIC SCALE

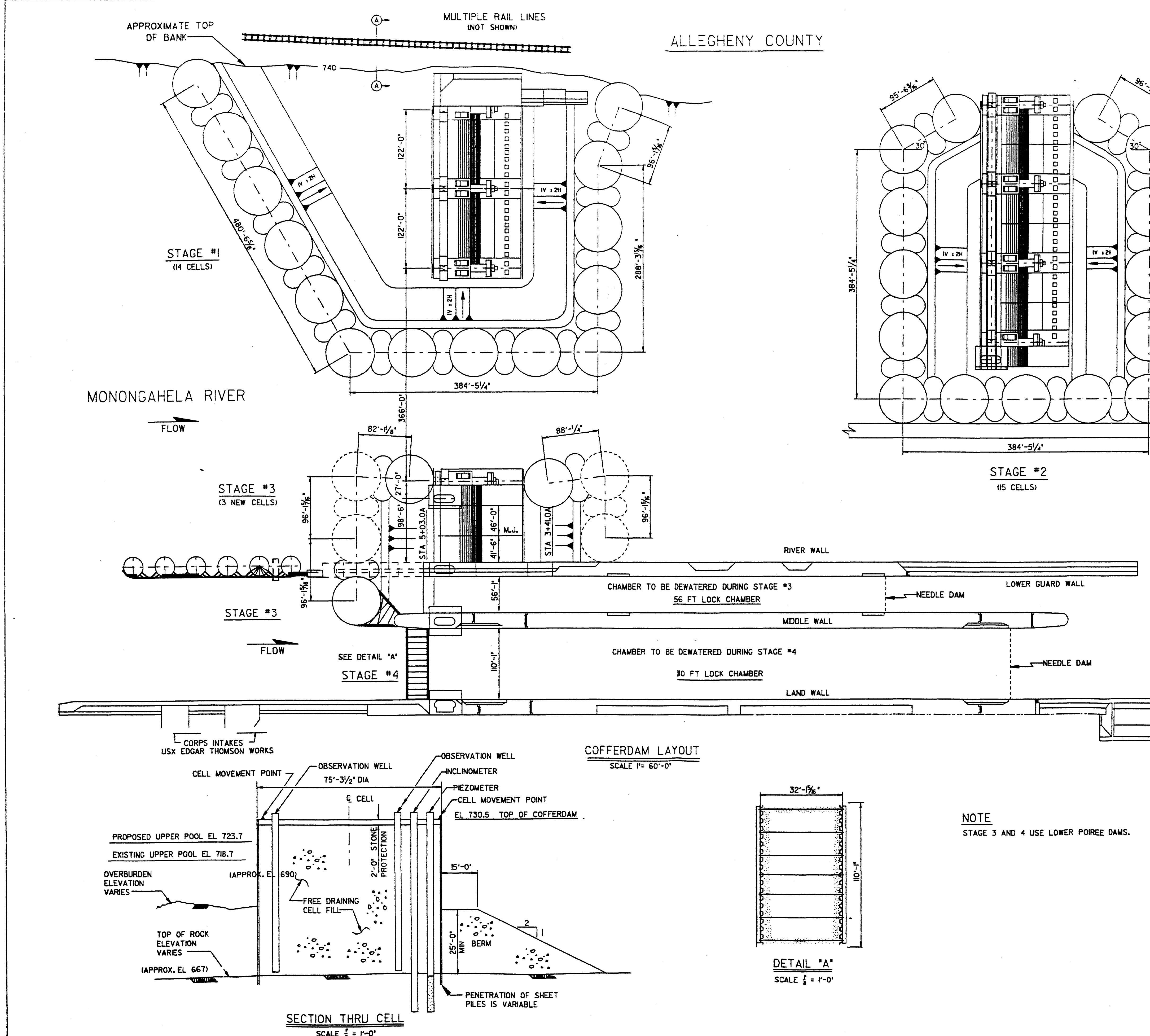
U.S. ARMY ENGINEER DISTRICT, PITTSBURGH
CORPS OF ENGINEERS

MONONGAHELA RIVER

LOCKS AND DAM 2

PROPOSED DAM REPLACEMENT
SCOUR PROTECTION DETAIL

DESIGNED	DRAWN	CHECKED	DATE	SCALE	FILE NO.
DEC	TLB			AS SHOWN	037-R54- 6/1



NOTE

STAGE 3 AND 4 USE LOWER POIREE DAMS.

REVISION	DATE	DESCRIPTION	BY

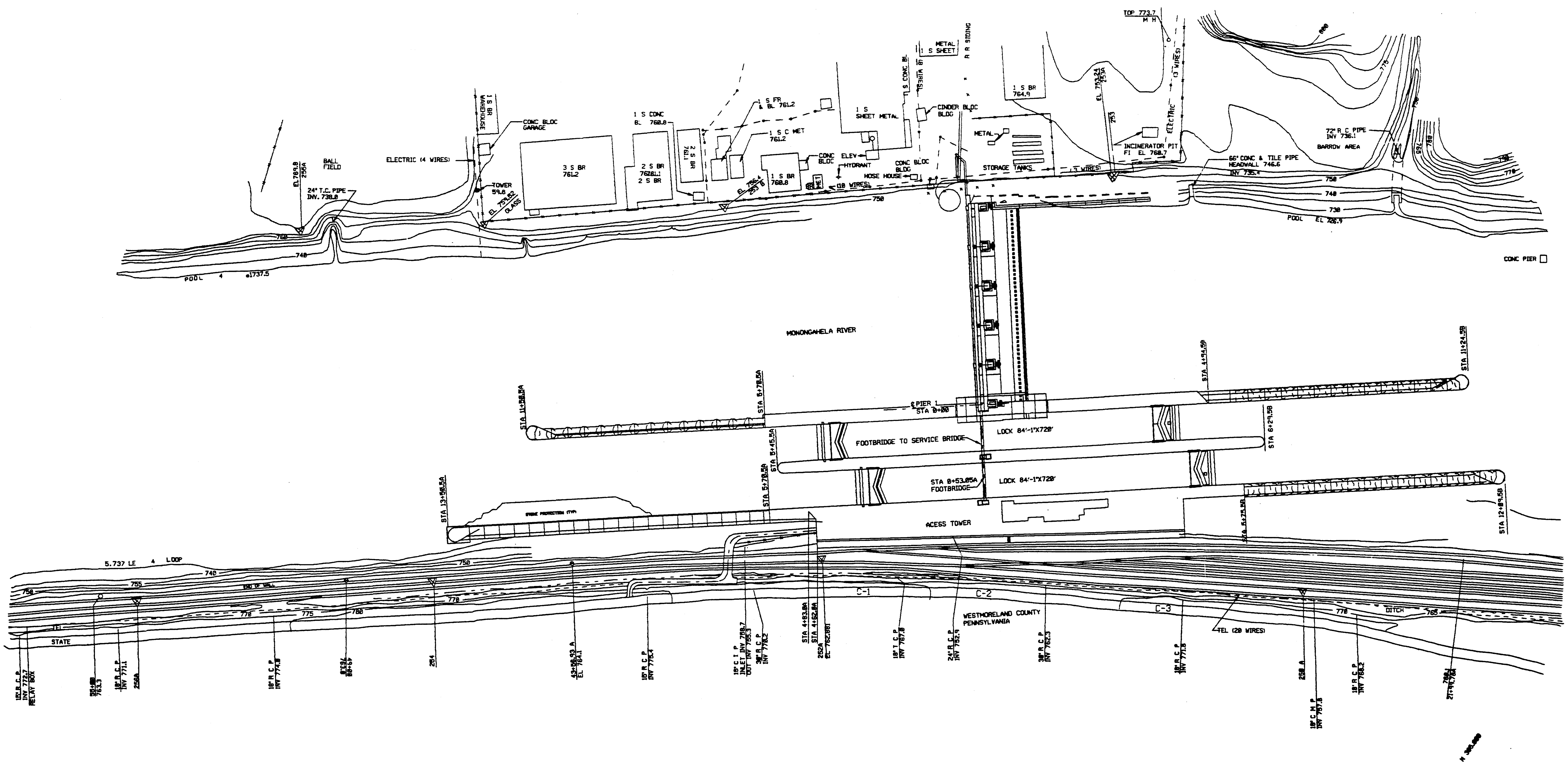
GRAPHIC SCALE
60 30 0 60 120FT
SCALE: 1"= 60'

U.S. ARMY ENGINEER DISTRICT, PITTSBURGH
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER
PITTSBURGH, PENNSYLVANIA

MONONGAHELA RIVER
LOCKS AND DAM 2
FUTURE PROPOSED LOCKS AND DAM
COFFERDAM LAYOUT
PLAN AND ELEVATIONS

DESIGNED	DRAWN	CHECKED	DATE	SCALE	FILE NO.
CJP	CJP	CJP	19 FEB. 1991	1"= 60'-0"	037-R54- 19/1

SUBMITTED / SECTION CHIEF / IFB NO. / DWG OF



REVISION	DATE	DESCRIPTION	BY

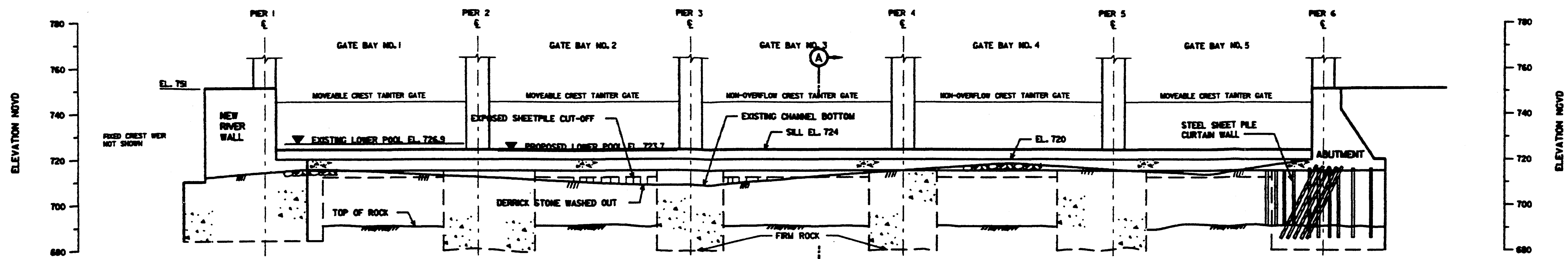
GRAPHIC SCALE

U.S. ARMY ENGINEER DISTRICT, PITTSBURGH
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER
PITTSBURGH, PENNSYLVANIA

MONONGAHELA RIVER
LOCKS AND DAM 4
FUTURE PROPOSED LOCKS AND DAM
GENERAL SITE PLAN

DESIGNED:	DRAWN:	CHECKED:	DATE:	SCALE:	DWG NO.
BR	RWH			NO SCALE	037-R54- 4/3
SUBMITTED:			IFB NO. DACW59		SHEET OF

PLATE 5

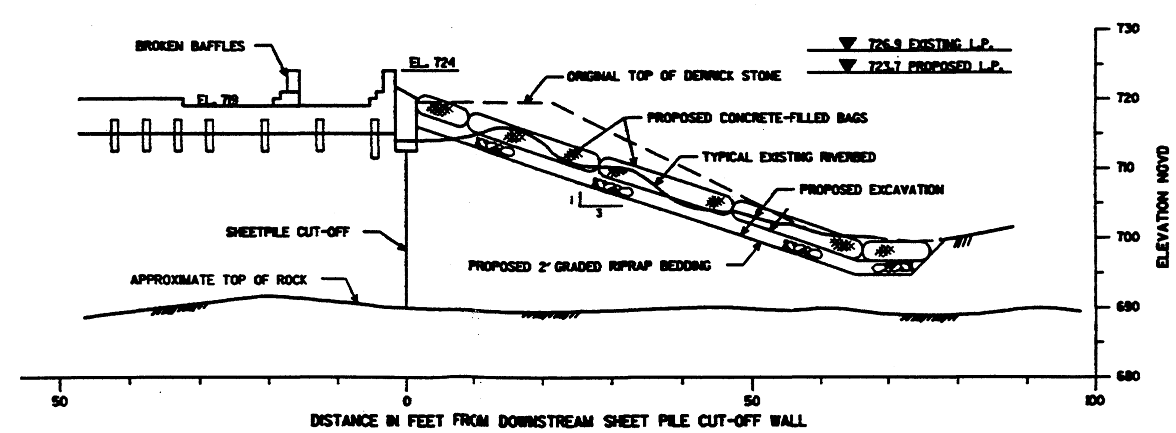


DOWNSTREAM ELEVATION

EXISTING CONDITIONS

SCALE:1"=20'

NOTE: CHANNEL BOTTOM ELEVATION DETERMINED FROM 1987 DIVERS INSPECTION.



SECTION A-A

PROPOSED SCOUR PROTECTION DETAIL

SCALE:1"=10'

GRAPHIC SCALE

1" = 20'

1" = 10'

U.S. ARMY ENGINEER DISTRICT, PITTSBURGH
CORPS OF ENGINEERS

MONONGAHELA RIVER

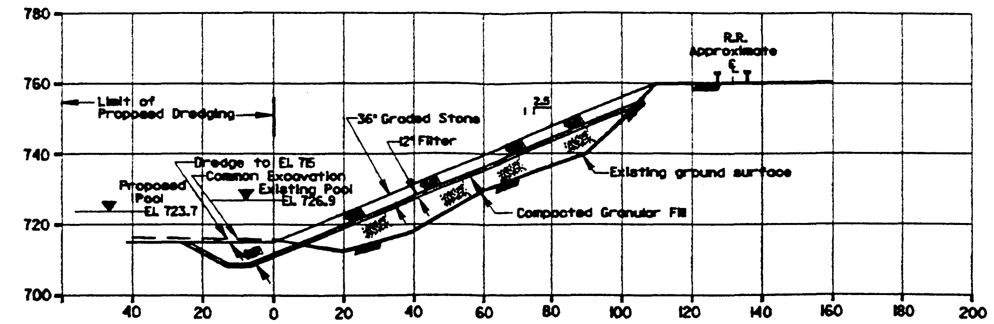
LOCKS AND DAM 4

PROPOSED LOCKS REPLACEMENT

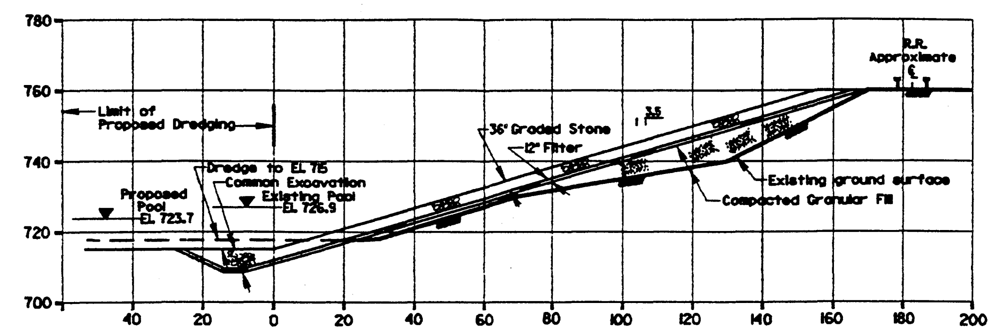
TYPICAL SCOUR PROTECTION DETAIL

DESIGNED	DRAWN	CHECKED	DATE	SCALE	FILE NO.
DEC	TLB			AS SHOWN	037-R54- 61/2

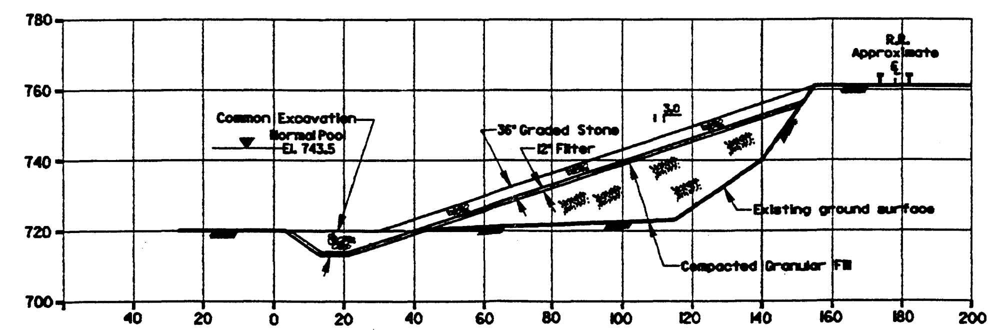
PLATE 6



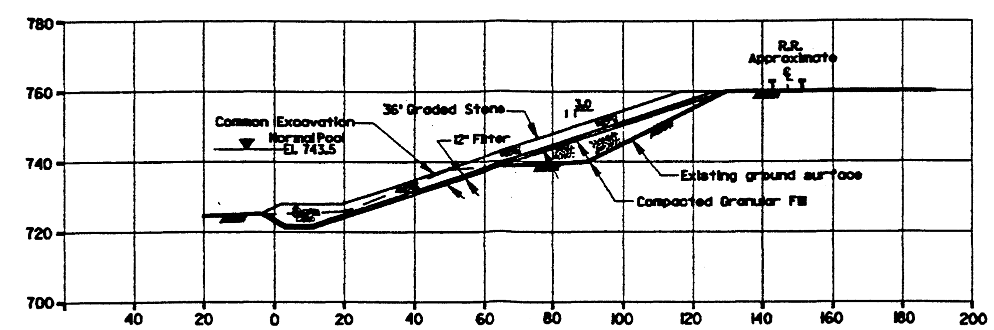
Distance in feet from Dredge Limit
Sta 23+00 B
Lower Approach: Typical Section Sta 22+00 B to 30+00 B



Distance in feet from Dredge Limit
Sta 18+00 B
Lower Approach: Typical Section Sta 15+85 B to 21+00 B



Distance in feet from Projected River Face of Proposed Landwall
Sta 15+00 A
Upper Approach: Typical Section Sta 25+00 A to 10+00 A



Distance in feet from Projected River Face of Proposed Landwall
Sta 3+00 A
Upper Approach: Typical Section Sta 40+00 A to 25+00 A

NOTES:

1. X-Sections developed from 1945 topography.
2. Final design for stone protection gradation and thickness will meet criteria of EM 1110-2-1601.
3. Upstream protection limit at Sta. 40+00 A.
4. Downstream protection limit at Sta. 30+00 B.

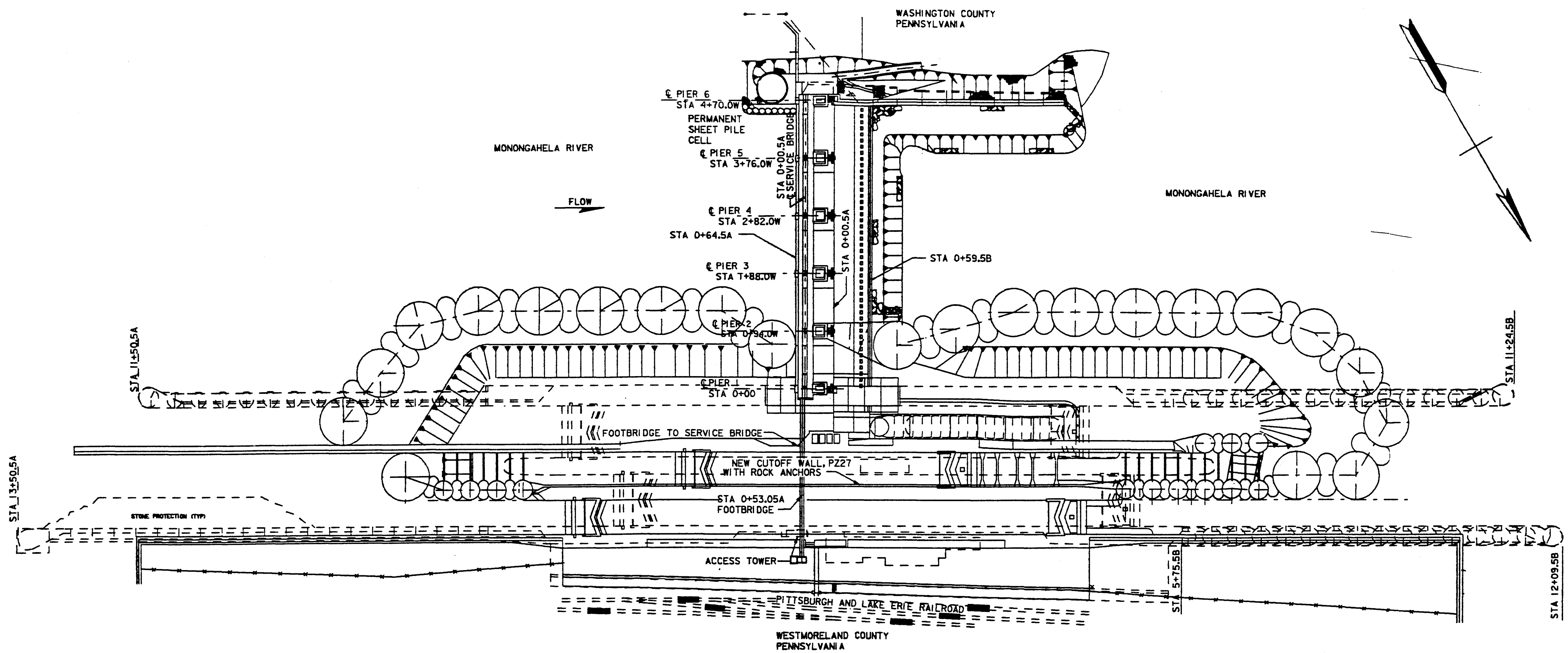
GRAPHIC SCALE
20 10 0 20 40FT
SCALE: 1"= 20'

U.S. ARMY ENGINEER DISTRICT, PITTSBURGH
CORPS OF ENGINEERS

MONONGAHELA RIVER
LOCKS AND DAM 4
PROPOSED LOCKS REPLACEMENT
TYPICAL UPPER AND LOWER APPROACH SECTIONS

DESIGNED	DRAWN	CHECKED	DATE	SCALE	FILE NO.
DEC	PJY	DEC		AS SHOWN	037-R54- 32/1

PLATE 7



PLAN

SCALE 1"= 80'

NOTE:
PROPOSED LOCK WALLS SHOWN IN HIDDEN LINES

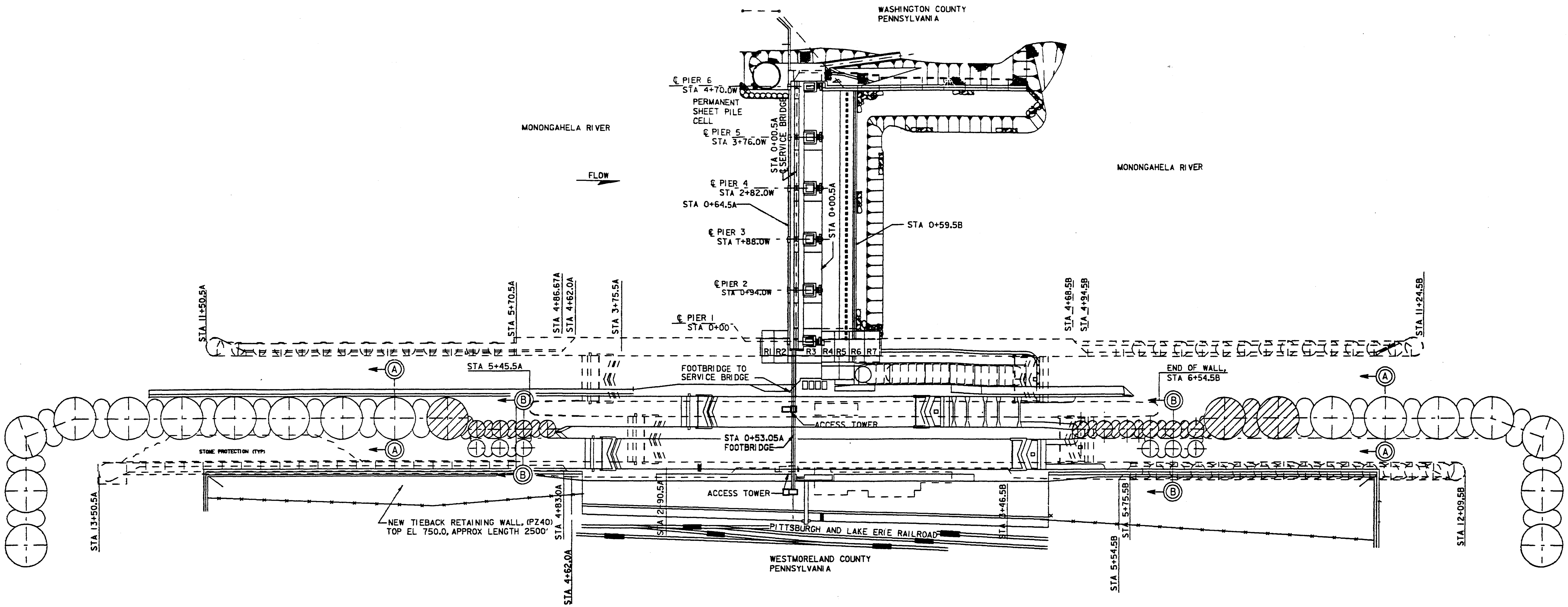
REVISION	DATE	DESCRIPTION	BY

GRAPHIC SCALE

U.S. ARMY ENGINEER DISTRICT, PITTSBURGH
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER
PITTSBURGH, PENNSYLVANIA

MONONGAHELA RIVER
LOCCKS AND DAM 4
FUTURE PROPOSED LOCKS AND DAM
FIRST STAGE COFFERDAM LAYOUT
PLAN

DESIGNED:	DRAWN:	CHECKED:	DATE:	SCALE:	DWG NO.
CPO	RWH			1"=80'	037-R54- 19/2
SUBMITTED:			IFB NO. DACW59		SHEET OF



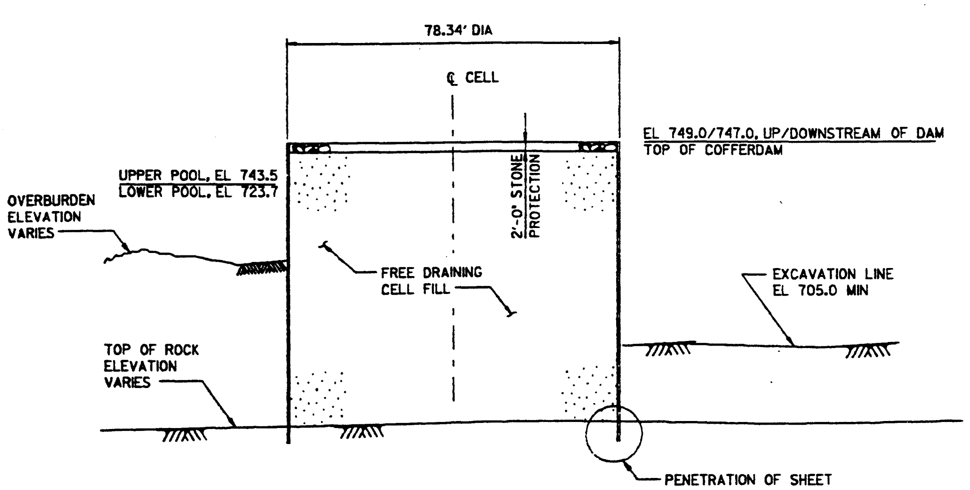
PLAN

SCALE 1"= 80'

LEGEND:

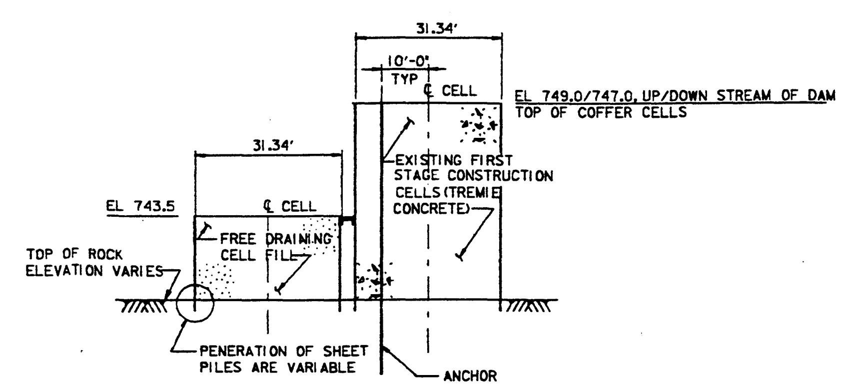
▨ - FIRST STAGE COFFER CELLS TO REMAIN

NOTE:
PROPOSED LOCK WALL SHOWN IN
HIDDEN LINES



SECTION A-A

SCALE $\frac{1}{8}$" = 1'-0"



SECTION B-B

SCALE $\frac{1}{16}$"=1'-0"

REVISION	DATE	DESCRIPTION	BY

GRAPHIC SCALE

0 5' 10' 20' 30' 40' — $\frac{1}{8}$" = 1'-0"

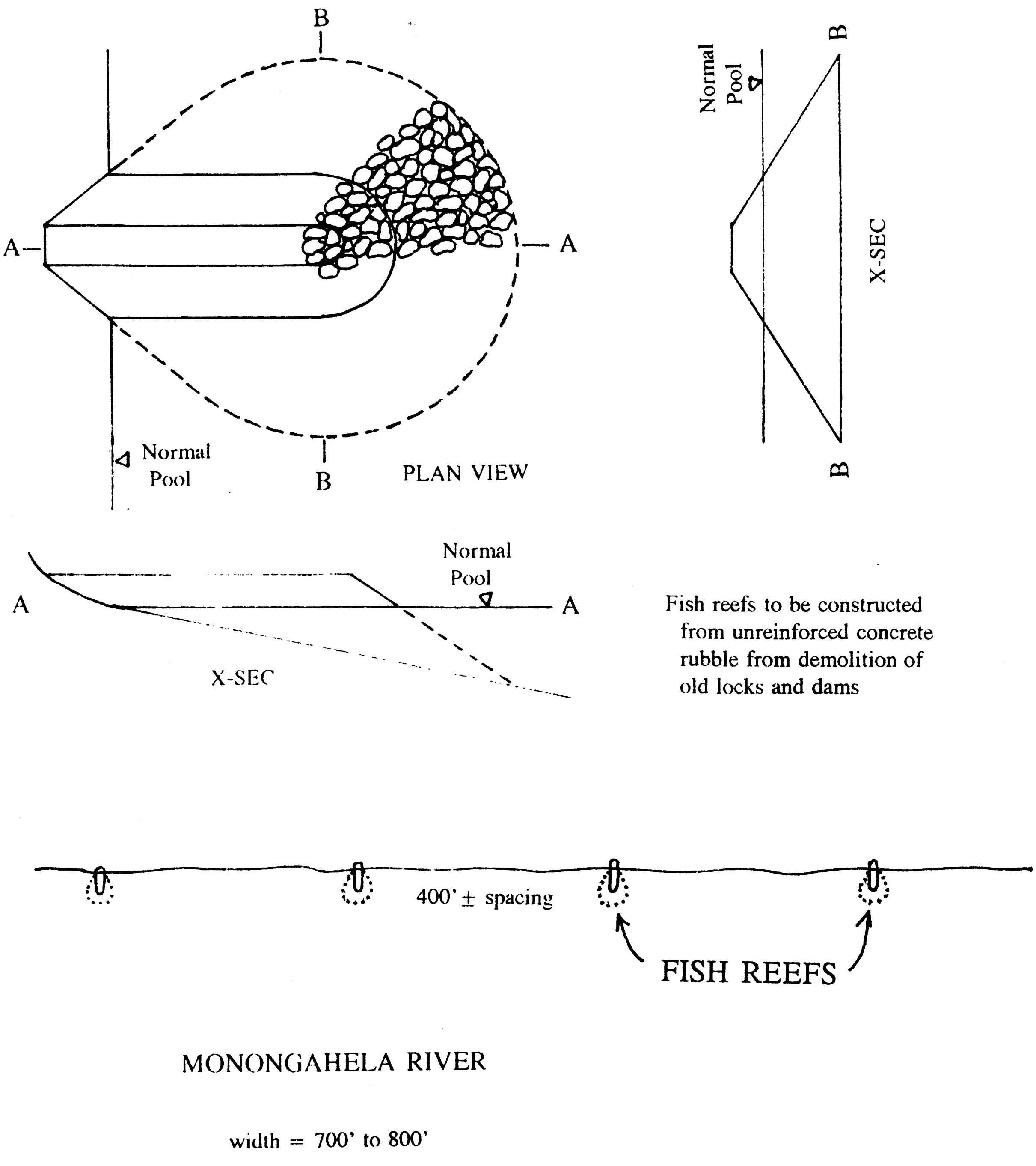
40' 20' 0 40' 80' — 1"= 80'

U.S. ARMY ENGINEER DISTRICT, PITTSBURGH
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER
PITTSBURGH, PENNSYLVANIA

MONONGAHELA RIVER
LOCKS AND DAM 4
FUTURE PROPOSED LOCKS AND DAM
SECOND STAGE - COFFERDAM LAYOUT
PLAN AND ELEVATIONS

DESIGNED:	DRAWN:	CHECKED:	DATE:	SCALE:	DWG NO.
CPO	RWH			AS SHOWN	037-R54- 19/3
SUBMITTED:			IFB NO. DACW59		SHEET OF

PLATE 9



LOWER MONONGAHELA RIVER

FISH REEFS

SCHEMATIC

SCALE: 1"=20', 250'

APPENDIX J

Public Review Letters of Comment and District Responses

Public Review Letters of Comment
and District Responses

Table of Contents

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

Colonel Harold F. Alvord
District Engineer
Pittsburgh District, Army Corps of Engineers
1000 Liberty Avenue
Pittsburgh, PA 15222

NOV 12 1991

RE: Draft Environmental Impact Statement for the Lower Monongahela River Navigation System

Dear Colonel Alvord:

In accordance with the National Environmental Policy Act (NEPA), Section 309 of the Clean Air Act, and Section 404 of the Clean Water Act, EPA has reviewed the Draft Environmental Impact Statement (DEIS) for the above referenced project. Your project has been rated EC-1; EPA has Environmental Concerns while the information provided in the document is adequate (See attached sheet). The document is well organized and easy to read. The needs and alternatives are documented in detail and reflect thoughtful problem solving, alternatives analysis and public participation as required by NEPA. The analysis of the habitat on the site is detailed and the corresponding assessment of impacts give a clear picture of the Environmental Quality Account. EPA is solely concerned with the proposed mitigation plan for the tailwater, wetlands and terrestrial habitat impacts, which is not in final form.

In this review, EPA weighed the human and environmental risk associated with potential barge spills of coal, petroleum products or chemicals versus loss of 1/3 of the tailwaters in the Lower Mon by removal of Lock and Dam #3, as well as wetland and terrestrial impacts. The EIS's preferred alternative, Plan 1, offers increased safety in shipping the over 38.4 million tons (1989) of coal, petroleum products, aggregates, chemicals, metal and other products which pass through these locks. Locks #3 and #4 are undersized for current barges and are deteriorating. The shortness of the upstream approach to Lock 3 requires that longer barge tows be broken into smaller tows thus increasing the chance of having accidents.

The alternative stated as preferred in the EIS will involve losses in three types of habitat: 45 acres of tailwater habitat for walleye, sauger, and suckers; 1 acre of permanent loss of wetlands and 166 acres of temporary wetland loss; and 125 acres of terrestrial habitat, 14.5 of which has no or reduced wildlife value. Additionally, 9.5 miles of river will be dredged. Fish and wildlife habitat mitigation as proposed will consist of several features which seek to replace permanently lost habitat at a ratio of 1:1. A mitigation plan was not prepared for the

DEIS but will be developed with the assistance of the U.S. Fish and Wildlife Service.

The Fish and Wildlife Coordination Act Report assessed the resources on the project site and evaluated the impacts of the proposed alternatives but did not refer to a Habitat Evaluation Procedure (HEP) or Wetland Evaluation Technique (WET) determination of the functions and values of the habitats to be impacted. The Final EIS should indicate that a HEP and WET were used as a basis for determining the type and amount of mitigation and the target species. Currently, no mitigation for terrestrial habitat is proposed. However, once the HEP is completed each terrestrial function should be mitigated. Since the Lower Mon basin is highly developed, values of remaining habitat are increased.

When the mitigation plan is prepared, it should emphasize a basinwide assessment of habitat to set goals and objectives. At a landscape scale, corridors should be protected and enhanced and fragments of habitat united where ever possible. Types of habitat which are becoming less common in the basin should be identified as mitigation targets. Each mitigation site should have a monitoring schedule with a report and color photos prepared at regular intervals. Remedial work should take place where a habitat has not established itself within a predetermined time period set in the mitigation plan.

In light of the magnitude of this project and its large scale impacts, the amount of mitigation proposed seems inappropriate. The project has high potential for severe and long-term impacts during and after the construction phase yet the mitigation proposed is minimal. The scope of the mitigation plan should be commensurate with the scope of the project. EPA recommends that the mitigation plan be re-evaluated and considerably enlarged. We have enclosed a list of mitigations which should be evaluated for implementation in addition to any which the U.S. Fish and Wildlife Service provide.

We encourage the Pittsburgh Army Corps of Engineers to take advantage of this opportunity to assist and protect the return of fish and wildlife to the Mon and its banks. Mitigation initiated in conjunction with replacing the locks and dams could significantly speed the recovery of this area which was once so famous for its pollution.

If you need additional information, contact Abbey Kucera, of my staff, at (FTS 597-9857 or Laury Zicari of the Wetlands Protection Section at FTS 597-2940.

Sincerely,

Diana Esher

Diana Esher, Chief
Environmental Planning and Assessment

Mitigation Measures To Be Evaluated
Lower Monongahela River Navigation System

Aquatic Mitigation

- Each perennial stream which flows into the Mon in the project site could be inventoried for public road culverts which obstruct fish passage. A government publication produced by Federal Highway Administration and the U.S. Forest Service, Fish Passage Through Culverts, (enclosed) provides guidance on standards. Once inventoried, unpassable culverts could be ranked by priority and repaired.

- Additional shallows to provide more spawning habitat could be placed strategically upstream and downstream of the site as well as within the project boundaries providing more beneficial use for the dismantled locks and dams.

- Streams carrying acid mine drainage into the project area could be inventoried, then one or more could be targeted and improved.

Wetland Mitigation

- To mitigate temporary impacts to 166 acres of wetlands, plantings and seeds/roots/corms/etc. of native varieties of hydrophytic plants could be placed in the areas which will become wetlands. These plantings should be based on WET functions and targeted species. The wetlands to be inundated or dewatered may provide a source of soil, vegetation and seed/roots/corms/etc. which could be transferred.

- Additional wetlands could be built or re-established along the river.

- Existing wetlands in the river basin could be enhanced.

- The communities of Japanese Knotweed and any Phragmites could be eradicated using mechanical or thermal methods allowing native species opportunity to grow.

Terrestrial Mitigation

- Terrestrial habitat could be mitigated by planting native trees and shrubs of high wildlife value on the dredge material disposal sites. The plantings should include trees of at least 3 inches in diameter measured at breast height (dbh).

- Non-wetland riparian vegetation could be enhanced with plantings to increase value to wildlife now as a mitigation to the time lapse between the planting and maturation of the vegetation placed on the spoils areas.

- Finally, off-site or on-site riparian properties with wildlife value could be protected from disturbance by being bought outright or by purchase of a conservation easement then donated to public resource agencies or private conservation groups, or by purchase of development rights only leaving the property in private hands. This could be used to provide a corridor along the river, to join fragmented habitats and to provide buffers around sensitive habitats such as wetlands.

Response to Comments:

We believe that the environmental features proposed as part of Plan No. 1 are adequate to compensate for the environmental impacts to fish and wildlife resources. Detailed plans and specifications for environmental features such as fish reefs, the low flow water quality gate at Dam 2, rubble disposal in Dam 2 tailwater, and disposal site restoration will be developed after project authorization in consultation with the fish and wildlife resource agencies. We will also be receptive to any assistance the Environmental Protection Agency would offer in this effort.

Mitigation for terrestrial habitat at the disposal sites will be pursued through surface restoration and revegetation plans. These plans will be developed in consultation with the U.S. Fish and Wildlife Service and the Pennsylvania Fish and Game Commissions. The creation of additional riparian acreage from the lowering of Pool 3 would also offset some of the terrestrial habitat impacts. Any changes in the selected disposal site locations following project authorization as a result of additional proposed siting studies would, of course, require subsequent compliance with the National Environmental Policy Act and other applicable Federal laws. It is possible that a Habitat Evaluation Procedure (HEP) study may be used as part of a subsequent assessment based on consultation with the fish and wildlife agencies.

The wetland impacts of Plan No. 1 have all been characterized as temporary - the majority being associated with the changes in elevations of Pools 2 and 3. Because these shoreline wetlands formed in response to an artificially created navigation system, we believe that the wetlands will reestablish at the new pool elevations. However, since this reestablishment would take place in successional stages over time, we concur with the Environmental Protection Agency's recommendation for monitoring to determine the qualitative and quantitative changes in the shoreline wetland community resulting from the proposed pool changes. This monitoring would be undertaken with the intention of identifying any significant changes which might warrant remedial action. Following project authorization we will develop a wetland monitoring plan in consultation with the Environmental Protection Agency and the Pennsylvania Department of Environmental Resources.

In response to specific mitigation measures to be evaluated:

Aquatic Mitigation. We will consider the applicability of removing obstructions to fish passage in all shoreside relocations. The proposed fish reefs and rubble beds will be constructed with concrete rubble from the demolition of Dam 2 and Locks and Dam No. 3 to improve shallow water habitat values. These features will be placed to the maximum extent that materials and suitable sites are available. Acidity is no longer a primary limiting factor in the lower river, and is not within the scope of this project to rectify as mitigation.

Wetland Mitigation. It is our experience on the Monongahela River that disturbed shorelines will vegetate with wetland species within the first growing season. Artificial plantings to advance successional changes in the shoreline community would be an expensive undertaking with little assurance of either short or long-term benefits. The proposed monitoring program would detect long-term changes with the intention of prescribing remedial actions if necessary. The use of dredged material to create additional wetlands in the project area through creation of islands or extending shallow areas was considered but not recommended primarily because of the narrowness of the river and the intensity of shoreline development.

Terrestrial Mitigation. The use of specific plantings to support wildlife will be evaluated in coordination with the U.S. Fish and Wildlife Service and Pennsylvania Game Commission after project authorization during preparation of design memoranda for disposal site development. As to the enhancement of riparian areas, we have not identified specific mitigation needs for this resource associated with the recommended plan. Should coordination with the resource agencies identify such opportunities within the scope of mitigation, such actions will be considered.

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Affairs
Custom House, Room 217
200 Chestnut Street
Philadelphia, Pennsylvania 19106-2904

TAKE PRIDE IN AMERICA

December 9, 1991

ER-91/1138

Colonel Harold F. Alvord
Pittsburgh District
U.S. Army Corps of Engineers
William L. Moorehead Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222

Dear Colonel Alvord:

The Department of the Interior has reviewed the Lower Monongahela River Navigation System Feasibility Study Interim Report, Volume 1, Main Report and Draft Environmental Impact Statement (EIS). Please consider the comments provided below.

Impacts to Recreational Resources

It is unclear at this time as to the degree of impact and what public facilities may be impacted by the selected proposal. However, inundation of any public parklands provided financial assistance by the National Park Service through the Land and Water Conservation Fund (L&WCF) could constitute a conversion under Section 6(f) of the Land and Water Conservation Fund Act. Any impacted recreation site that has received L&WCF money and is subject to Section 6(f) must be replaced with land of equal or greater value and of reasonable equivalent usefulness and location. The final EIS should address project impacts to such sites. For further information the Pennsylvania State Liaison Officer (SLO) should be consulted. The SLO for Pennsylvania is James R. Grace, Deputy Secretary of Environmental Resources, P.O. Box 1467, Harrisburg, PA 17120 (717-787-2869).

Impacts to Fish and Wildlife Resources

The Main Report (pages 7-17) discusses the proposed Coursin Hill disposal site, a site situated in a wooded ravine bisected by a small perennial stream. The brush along the stream bottom and wooded slopes provide good habitat for small mammals, songbirds, amphibians, and reptiles. White-tailed deer use the area for feeding and resting. We recommend that other less environmentally damaging disposal sites be investigated prior to project construction. Mitigation for fish and wildlife losses associated with disposal sites should be designed in later planning stages and implemented prior to or during porject construction.

Recommended Plan 1 fails to provide for angler use due to the steep slopes and lack of access across private lands at the proposed new locks and dams. We recommend that overhead walkways, railings, piers, or other structures be investigated to provide for angler access. It also appears that access could be developed along the abutment side of Locks and Dam No. 4 near the sewage treatment plant.

Removal of Locks and Dam No. 3 will eliminate a valuable tailwater fishing area which should be replaced as part of the project. The Fish and Wildlife Service office in State College, Pennsylvania is willing to work with your staff during future planning stages to achieve a higher degree of angler access at the projects and to help achieve mitigation for the lost tailwater fishing area. Please contact the Field Supervisor, Fish and Wildlife Service, Suite 322, 315 South Allen Street, State College, PA 16801 for their assistance.

Plan Selection

During the coordination for this project, the Fish and Wildlife Service recommended implementation of either the "Without" Plan or Plan 4 as the least environmentally damaging to fish and wildlife sources. However, Plan 1, the NED plan, was selected by the Corps, a plan which maximizes economic benefits and provides mitigation measures to compensate for fish and wildlife habitat losses. In view of the slight differences in the Service's plan as recommended in the Fish and Wildlife Coordination Act (FWCA) Report dated April 8, 1991 (revised July 1991) and the NED plan with mitigation, we agree with your recommendation that Plan 1 be authorized for construction provided that all mitigation measures recommended in the FWCA report are implemented concurrently with or prior to project construction and operation and that compliance with Section 6(f) of the L&WCF is achieved.

Thank you for the opportunity to review this proposal.

Sincerely,

Don Henne

Don Henne
Regional Environmental Officer

Response to Comments:

The District undertook studies to locate all shoreside facilities that would be affected by the proposed project. The results of these studies were coordinated with the respective municipalities and facility owners to obtain their input on other unidentified facilities and cost estimates for adjusting these facilities to the proposed pool elevations. Facilities were considered to be detrimentally affected by the pool change if their present function or capability would be reduced by a permanent change in pool elevation. All facilities identified along the Monongahela and Youghiogheny Rivers that would be detrimentally affected by the project were addressed in the report.

We are aware of two recreation facilities, the Pennsylvania Fish Commission's fishing access areas at McKeesport and Monongahela, which received Land and Water Conservation Fund monies. The Pennsylvania Fish Commission's ramp at McKeesport was not identified in the report because this facility would not be detrimentally affected by the pool raise. The ramp at Monongahela would be detrimentally affected by the pool lowering and has been addressed and costed in the report. A number of other public recreational facilities such as launching ramps and public parks have been identified in the report with estimated Federal project adjustment costs.

All municipal facilities will be revisited after project authorization and a final determination will be made at that time as to the severity of the effect on each facility, if any, and the required corrective action.

The District has committed to undertake further study of alternative disposal sites and uses of disposal material subsequent to project authorization and will continue to coordinate with the Fish and Wildlife Service during the study process. As stated in our response to the Fish Commission's November 1, 1991 letter, opportunities to improve tailwater fishing access in the project area are limited by the small Federal shoreline ownership and lack of access to that shoreline. Development of tailwater shoreline access at Dams 2 and 4 may require acquisition of private property and would be subject to the Corps' non-Federal recreational cost-sharing requirements. The District will coordinate with the Pennsylvania Fish Commission and local governments on their desire to participate in cost-shared recreational developments, such as those you suggested, in the project area. The District will continue to coordinate with the Fish and Wildlife Service on the implementation of habitat improvement measures to reduce the impact associated with the removal of Locks and Dam No. 3.

Advisory Council On Historic Preservation

The Old Post Office Building
1100 Pennsylvania Avenue, NW, #809
Washington, DC 20004

DEC 5 1991

Colonel Harold F. Alvord
District Engineer
Pittsburgh District, Corps of Engineers
William S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, Pennsylvania 15222

RE: Draft Lower Monongahela River Navigation System Feasibility Study Interim Report, Volume 1 of 6
Main Report and Environmental Impact Statement,
September 1991

Dear Colonel Alvord:

Thank you for the opportunity to review the referenced report. It has served as a useful source of information for our ongoing Section 106 consultation with your office regarding the proposed modernization of Locks and Dam Nos. 2, 3, and 4 on the Monongahela River in Pennsylvania. Based on our discussions with your staff and on our review of the referenced report, we offer the following comments.

We agree with the Corps' determination that a programmatic agreement is the appropriate mechanism for treating historic properties for this undertaking. We remain concerned, however, about several issues including the timing of historic property surveys for both archeological sites and historic buildings/ structures in relation to project planning; the identification of potential changes in flood zones and related real estate acquisitions; and, the role of the general public and interested parties in the Section 106 consultation for this undertaking. We recommend that these and other issues be addressed as early as possible and certainly before the Corps makes its final recommendations about this proposed project.

We look forward to working with the Corps and the Pennsylvania State Historic Preservation Office to resolve these issues. If we can be of further assistance or if you wish to discuss this further, please contact Valerie DeCarlo at (202) 786-0505.

Sincerely,

Don L. Klima
Director, Eastern Office
of Project Review

Advisory Council on
Historic Preservation

Letter of December 5, 1991

Response to Comments:

The District is proceeding under the guidelines of the Advisory Council on Historic Preservation (36 CFR 800) to prepare a programmatic agreement for compliance with Section 106 of the National Historic Preservation Act. This agreement between the District, State Historic Preservation Officer, and the Advisory Council will stipulate responsibilities and procedures necessary for the District to fulfill its Section 106 responsibilities following project authorization. We prepared a draft programmatic agreement for review by the Advisory Council and State Historic Preservation Officer. The State has prepared a revised draft based on their review. A copy of their revised draft is included in Appendix G. The programmatic agreement will be completed and the State and Advisory Council will have an opportunity to comment prior to a final decision on this project.

The identification, evaluation, and assessment of effect upon prehistoric and historic properties will be undertaken following project authorization according to the programmatic agreement stipulations. However, beginning in January 1992 the presence or absence of historical structures in the identified flowage easement acquisition areas will be verified.

The District has committed to undertake further study of alternative disposal sites (and uses of disposal material) subsequent to project authorization. In conjunction with these investigations appropriate cultural resources investigations will be accomplished. The District will be working closely with local agencies and organizations as well as the interested public during these investigations.

COMMONWEALTH OF PENNSYLVANIA
OFFICE OF THE GOVERNOR
HARRISBURG

October 17, 1991

Colonel Harold F. Alvord
U. S. Army Corps of Engineers
Pittsburgh District
William S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, Pennsylvania 15222

Dear Colonel Alvord:

The Commonwealth of Pennsylvania has historically been an advocate for modernization and rehabilitation of lock and dam facilities on the nation's inland waterways, particularly the Monongahela River.

We recognize the vital contribution the Monongahela River has made to the economies of the many communities bordering its shores, and support a proposal which ensures that the Monongahela River continues to provide industry with efficient access to the nation's major waterway arteries. If the modernization is not undertaken, the facilities and the industries and commerce they serve will be subject to breakdowns, increasingly costly maintenance, and congestion. These difficulties ultimately increase the costs of transportation and threaten the competitive advantage to river-dependent industry located in western Pennsylvania.

I have conferred with the Commonwealth's Department of Transportation, which has reviewed the U. S. Army Corps of Engineers "Lower Monongahela River Navigation System Feasibility Study" Interim Report in great detail.

We join in our support of the Corps' proposal, Plan "1," which will serve as the basis for modernization of the lower Monongahela River.

Sincerely,

Marcia H. Feldman

Marcia H. Feldman
PennPORTS

cc: Keith Chase

Office of the Governor, Pennsylvania, PennPORTS Letter of October 17, 1991

Response to Comments:

Letter supports Plan No. 1. No response required.

Twenty Years of Stewardship and Service
PENNSYLVANIA DER
1971·1991

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

P.O. Box 2063
Harrisburg, PA 17105-2063

November 14, 1991

Mr. James A. Purdy, Chief
Environmental Studies Branch
U.S. Army Corps of Engineers
Pittsburgh District
1000 Liberty Avenue
Pittsburgh, PA 15222-4186

Dear Mr. Purdy:

The Pennsylvania Department of Environmental Resources (DER) has reviewed the Corps of Engineers Draft Environmental Impact Statement for the Lower Monongahela River Locks and Dams project. We have the following comments:

1. Loss of Lock and Dam No. 3 at Elizabeth will result in less aeration capability of the Monongahela River and may result in an algal "bloom" problem within the combined pool (presently pools 2 and 3). Additional study of this particular problem is necessary.

2. The drop in average elevation for pool #3 will result in a reduced rate of flow and may adversely affect cooling water discharges by electric utility power stations (West Penn Power and Duquesne Light). Any increase in temperature in the receiving pool caused by cooling water discharge would also contribute to the potential algal "bloom" problem mentioned in Comment No. 1. The chosen alternative could cause the existing power company's NPDES permits discharge limits to be exceeded. This could result in the need for cooling tower construction and consequential rate increases for the customers.

3. Potential for temperature increase in the combined pool is increased by the potential installation of a new electric cogeneration facility at the USX coke production facility in Clairton. A heated discharge will result from this facility and might not be allowed due to excess heat already present in the pool due to the above mentioned power plants.

4. The testing procedure developed between the Army Corps of Engineers Pittsburgh District Office and DER's Southwest Regional Office is to be used for characterization of dredging waste associated with this project. Material designated as "clean fill" should be used to bring low areas up to grade, and should avoid wherever possible taking of existing property. Contaminated dredging material must be taken to disposal sites approved by DER.

5. Should this project receive final approval and funding, consideration should be given to dedication of the existing ACOE-owned river access at Lock and Dam No. 3 to public use.

6. The Equitrans, Inc. Gas Company has a large underground storage area at Bunola, which includes a number of wells on both sides of the river between Bunola and Elrama. Any dredging activity in this area would have to be done carefully to avoid damage to existing piping which interconnects these wells and which runs under the Monongahela River. The Army Corps of Engineers should also determine if the proposed project will impact future Equitrans gas well drilling sites in the Elrama area.

7. The impact statement addresses most of the sewage treatment plant (STP) outfall discharges located within the project area. It has not addressed the Dravosburg Borough outfall (approximately milepoint 16.5) or the City of McKeesport Municipal Authority outfall (approximately milepoint 15.5).

8. The impact statement indicates that the level of the Youghiogheny River will be raised sufficiently to impact the Elizabeth Township Pump Station located near the Boston Bridge (approximately milepoint 4.1). The impact of raising the Youghiogheny River on the Municipal Authority of Westmoreland County's McKeesport Water Treatment Plant intake or the backwash and sludge dewatering outfalls located beneath the 15th Street Bridge (approximately milepoint 0.5) has not been addressed.

9. The proposal intends to raise the City of Duquesne's wellheads a sufficient distance so that the wellheads will not be beneath the normal river pool level. This implies that the well field will be flooded as a result of the construction of the new Lock and Dam #2. Flooding the well field will place the water supply for the City of Duquesne at an elevated level of risk and almost assuredly will result in a groundwater system being converted to groundwater under the influence of surface water. Therefore, significant changes to the treatment procedures will be required. We suggest the Corps join with the City of Duquesne in constructing a seawall to protect the wellheads rather than simply raising the level of the top of the wells.

10. Complications may arise from the blockage of the Allegheny County Sanitary Authority (ALCOSAN) bypass structures located within the project area and the potential submersion of ALCOSAN manholes located in the Turtle Creek bed.

11. The project information indicates that approximately $111,000,000.00 will have to be borne by private industry or landowners. This estimation may be low, however, since other costs such as electric utility cooling tower construction, potential loss of income by Equitrans, and potential business closings or layoffs resulting from this project may not have been fully evaluated. The comparison of businesses that may benefit due to decreased towing charges with those that will pass on associated project costs to Pennsylvania rate payers and private citizens is needed.

If you have any questions, please feel free to contact Joe Chnupa, DER's Southwest Regional Office at (412) 645-7202. We appreciate the opportunity to review this proposed action.

Sincerely,

F. Carlson

Frederick G. Carlson, Director
Secretary's Office of Policy
Department of Environmental Resources

Response to Comments:

1. Data presented in the environmental impact statement water quality appendix indicates that neither of the fixed crest dams (Nos. 2 and 3) are efficient reaerators during low flow conditions. Summer low flow data from below Dam 3 actually shows a decline of about 0.2 mg/l dissolved oxygen, which may be related to the elevated water temperatures in lower Pool 3. The District believes that the design modifications proposed for the new Locks 4 and Dam 2 for reaeration of low flows would bring dissolved oxygen to saturation levels entering and leaving the elongated Pool 2 under Plan No. 1.

The potential for an algal bloom problem developing with Plan No. 1 was raised by the Pennsylvania-American Water Company in connection with thermophilic blue-green algae near their intake in the lower end of Pool 3. The Water Company believes that heated cooling water from the electric generating stations in Pool 3 recirculating behind Dam 3 may cause elevated water temperatures favoring blue-green algal blooms in the vicinity of their intake. With the proposed removal of the Dam 3 barrier, the District believes that recirculation will be less likely, and that the potential for thermally related algal blooms at the Water Company intake would be decreased. The District proposes to add sampling stations in lower Pool 3 for algae and chlorophyll measurements as part of our annual Monongahela River water quality monitoring program to detect any changes after project construction.

2. None of the modernization alternatives including the No Action Alternative would have an effect on flow levels in the Lower Monongahela River. Flow is a function of natural runoff with minimum flow levels maintained for navigation and water quality by controlled releases from the District's Tygart Lake, Youghiogheny River Lake and Stonewall Jackson Lake projects. All of the modernization alternatives including the No Action Alternative, however, would affect the volume of water held in Pool 3 as a consequence of relocation or removal of Dam 3. The two electric power generating stations in Pool 3 operate with thermal discharge variances to their Pennsylvania Department of Environmental Resources' National Pollutant Discharge Elimination System permits granted on the basis of studies relating to the volume of river water available for cooling. The District does not believe that the utilities' future retention of their thermal variances is solely dependent on continuation of the existing navigation system configuration, nor that the necessity for cooling towers or load reductions can be attributed to any of the project alternatives.

3. Noted.

4. Noted.

5. Upon completion of the project, the Federally owned land at Locks and Dam No. 3 would normally be turned over to the Government Services Administration (GSA) for disbursement. Their policy presently consists of offering the land for development to a Federal Agency, then to the state, and finally to the local government. If no one is interested in the property, then it is offered for public sale. However, prior to disposal, we will be receptive to offers from a non-Federal partner for cost-shared recreational development of this property (see also response to Pennsylvania Fish Commission letters).

6. Although the proposed project includes the lowering of Pool 3 through the Bunola and Elrama area, dredging will not be required in this area. Dredging would take place upstream beginning around r.m. 32.0. Equitrans, Inc. Gas Company will be contacted to insure continued coordination on proposed gas well drilling sites.

7. These structures are addressed in Table 7-6 of the Feasibility Report, Vol. 1. The Dravosburg outfall is identified to r.m. 16.4, left bank. The City of McKeesport Municipal Authority outfall consists of two sewers, one at r.m. 15.6, right bank, and one at r.m. 15.7, right bank.

8. Mr. Denni Kozac, superintendent of the Authority's McKeesport filtration plant, stated to the District on November 13, 1991 that a nominal five-foot rise in pool will not adversely affect the facilities owned by the Authority. He said the filtration plant is on the right bank, almost directly across the river from these facilities, and that an increased head will improve their functional ability, and improve their operation during a drought.

9. The District held a meeting with representatives of the City of Duquesne, the city engineer and public works employees on November 19, 1991. There was general agreement that the modifications proposed by the Corps were sufficient to mitigate the effects of the increased pool. Due to the close proximity of the wells to the river, the system is already under the influence of the river. The average increase of 2.5 to 3.0 feet over the existing pool will not substantially change the behavior of the system. We do not believe that impacts to the city caused by raising Pool 2 justify construction of a seawall.

10. The District contacted Mr. Albert Schneider of ALCOSAN on November 15, 1991 who indicated that the pool adjustment would, to the best of his knowledge, have no adverse impact on their facilities. He said the manholes were on the banks of Turtle Creek and high enough so that access would still be possible. The bypass structures are along the Monongahela River near Locks and Dam No. 2 in Braddock and would not be adversely affected.

11. The $111 million of costs borne by private industry or landowners are those costs that are directly attributable to the recommended plan. Included are the costs of relocating or otherwise adjusting pipelines (such as Equitrans) that lie under the river to a safe depth. Operation of the company could continue as a new trench or new pipeline is constructed. The

only cost would be the construction or relocation cost, and not necessarily an interruption of business.

The cost of constructing power plant cooling towers was not included for the following reason: the plan would not change the temperature of water discharged at the plants, but only the amount of area it is distributed over the river. This is true to a certain extent of all of the alternatives, so that the need for cooling towers and their costs could be an element of all of the plans, not just one. If the costs of cooling towers was included in all plans, they would increase the total costs but not the relative ranking of plans. However, because the plans do not affect discharge temperatures, it is not obvious that the construction of cooling towers, if required, could be attributable to the plans evaluated by the Corps. Therefore, the costs were not included as a project cost.

A list of businesses that may close because of the project was not compiled. We are aware of two possible closures: 1) an automobile salvage yard in one of the disposal areas, and 2) a commercial dock whose owner indicates that the higher cost of dredging would force him out of business. The cost of acquiring the salvage yard was included as a project total cost, as was the cost of dredging for the dock owner. Local employment and income impacts were not evaluated since the businesses can be relocated.

A list of businesses that would benefit due to decreased towing charges and those that will pass on associated project costs to Pennsylvania rate payers and private citizens was not compiled. However, the benefits and costs were factored into our economic analysis at a more general level in terms of lower transportation costs (benefits) and shoreside adjustment costs (costs) which are passed on to consumers. Net benefits, or the difference between project benefits and costs, are an important consideration in the selection of the recommended plan. As it turned out, Plan 1 provided the highest net benefits of all of the alternatives.

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA HISTORICAL AND MUSEUM COMMISSION
BUREAU FOR HISTORIC PRESERVATION
BOX 1026
HARRISBURG, PENNSYLVANIA 17108-1026

October 8, 1991

Harold F. Alvord
Department of the Army
Pittsburgh District, Corps of Engineers
Attn: Environmental Studies Branch
William S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222

Re: ER# 87-0469-042-E
Lower Monongahela River
Navigation System
Feasibility Study
Interim Report
Allegheny, Washington &
Westmoreland Counties

Dear Alvord:

The above named project has been reviewed by the Bureau for Historic Preservation (the State Historic Preservation Office) in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended in 1980, and the regulations (36 CFR 800) of the Advisory Council on Historic Preservation. Our comments are as follows:

There are numerous significant archaeological resources located along the lower Monongahela River which may be affected by this project. These resources do not appear to be dealt with specifically in the recommendations section of this report. We assume you intend to follow the procedures outlined by the Advisory Council on Historic Preservation for the identification and evaluation of cultural resources once you have identified specific project impact areas.

If you have any questions or comments regarding our review of this project, please contact Mark Shaffer at (717) 783-9900.

Sincerely,

Kurt W. Carr

Kurt W. Carr, Chief
Division of Archaeology
and Protection

KC:ms

Pennsylvania Historical and Museum Commission

Letter of October 8, 1991

Response to Comments:

The District is proceeding under the guidelines of the Advisory Council on Historic Preservation (36 CFR 800) to prepare a programmatic agreement for compliance with Section 106 of the National Historic Preservation Act. This agreement between the District, State Historic Preservation Officer, and the Advisory Council will stipulate responsibilities and procedures necessary for the District to fulfill its Section 106 responsibilities following project authorization. The District prepared a draft programmatic agreement for review by the Advisory Council and State Historic Preservation Officer. The Pennsylvania Bureau for Historic Preservation has prepared a revised draft based on their review. A copy of their revised draft is included in Appendix G. The identification, evaluation, and assessment of effect upon prehistoric and historic properties will be undertaken following project authorization according to the programmatic agreement stipulations.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF COMMUNITY AFFAIRS
HARRISBURG
17120

413 State Office Building
300 Liberty Avenue
Pittsburgh, PA 15222

October 4, 1991

Harold F. Alvord
Colonel, Corps of Engineers
W.M.S Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222

ATTN: Environmental Studies Branch

Dear Colonel Alvord:

This responds to your letter of September 15, 1991, in which you invited comments on the Draft Environmental Impact Statement on the Lower Monongahela River Study.

In general, the Commonwealth's Department of Community Affairs wishes to indicate two elements of concern. The first involves the impact of the Corps' Plan I upon existing facilities and the second involves the impact of that same Plan I upon such facilities as may now be only in the planning stage.

In reference to existing facilities, we note, that no mention is made of the riverfront park on the lower reaches of the Youghiogheny River in McKeesport. Although specific measurements have not been taken, we believe that the anticipated five foot raising of the water level will impact significantly upon some of the structures in McKeesport's park. This omission, readily apparent in the Feasibility Report but indistinguishable in the Environmental Impact Statement, causes us to suspect that other publicly-owned facilities in the Mon-Valley may also have been overlooked.

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In reference to facilities that may be only in the planning stage, please be advised that this Department is actively engaged with almost every Mon-Valley municipality in preparing plans to revitalize distressed riverfront properties. A few of these projects are now actually in the critical transition stage between planning and construction and the raising of the water level will have an obvious and significant impact upon them. The plans for others, may not be so far advanced and therefore may be more easily adapted to meet the water level adjustment. We call your attention to the City of Duquesne's plan for the development of its Waterworks Park as an example of this situation.

In addition to the above, we wish to call your attention to a technical error, reference Item 7-17. There is no Lincoln Township in Allegheny County. There is, however, a Lincoln Borough. Your text and maps should be adjusted.

We would be happy to consult with your staff on these matters should that be necessary.

Yours Truly,

Ellen Kight dyr

Ellen Kight

EK:sec

Response to Comments:

The riverfront part in McKeesport along the Youghiogheny River is located above the pool raise elevation and would not be detrimentally affected by the project. It was not, therefore, addressed in the report. The McKeesport city engineer, in response to our inquiry on the facilities within their jurisdiction that would be affected by the project, did not relate anything relative to the riverside park. All municipal facilities will be revisited at a later time in the study process and a final determination will be made at that time as to the severity of the effect on each facility, if any, and the required corrective action.

The District contacted all shoreside communities along Monongahela River Pools 2 and 3 to collect their input as to affected facilities within their jurisdiction. In addition, the rivers were investigated by a District study team to determine if any facilities were omitted from the listing of facilities to be adjusted.

Adjustment costs in the report can only relate to facilities in place. If the previously identified municipal facility would be detrimentally affected by the project when we revisit this area following project authorization, the facility will be adjusted at Federal expense. Following Congressional authorization of the recommended plan, all future riverside developments must consider the proposed pool adjustments. Should a proposed facility be built between project authorization and construction, it will be evaluated for relocation at Federal cost under Section 111 of Public Law 89-298. Representatives of the District met with Duquesne City representatives and on November 19, 1991 and determined that access to their Waterworks Park would not be affected.

All references to Lincoln Township in the report have been corrected to read Lincoln Borough.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
HARRISBURG, PENNSYLVANIA 17120

OFFICE OF
SECRETARY OF TRANSPORTATION

October 16, 1991

Colonel Harold F. Alvord
U. S. Army Corps of Engineers
Pittsburgh District
William S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222

Dear Colonel Alvord:

The Commonwealth of Pennsylvania has always been a strong advocate for programs calling for the modernization and rehabilitation of all lock and dam facilities on the nation's inland waterways, particularly the Monongahela River.

We recognize the strategic role the Monongahela River has played in the continued economic well-being of the communities bordering its shores, and will support a proposal to assist the Monongahela River continue to perform its role as one of the nation's major waterways arteries.

However, the Commonwealth is particularly aware of the small, aged, and deteriorating locks and dams on the lower Monongahela River and recognize that continued aging of these facilities will only result in breakdowns, increased costly maintenance and congestion which will develop into an inefficient, outmoded lock system that will increase the costs of transportation.

Recognizing that energy is a critical problem facing the nation, Pennsylvania, a large coal producing state, intends to take advantage of its natural assets, its rivers and coal and to assist in contributing to a solution of the energy problem. Any proposal designed to expedite coal and other commodity shipments at lower freight rates benefits Pennsylvania as well as the nation.

The Commonwealth's Department of Transportation has reviewed the U. S. Army Corps of Engineers "Lower Monongahela River Navigation System Feasibility Study" Interim Report which calls for the construction of a new, larger, modern facility at Lock and Dam #2 (Braddock, PA) and #4 (Charleroi, PA). The Plan also calls for the elimination of the facility at Lock and Dam #3 at Elizabeth, PA, which will result in the deletion of future operation maintenance costs and permit more expeditious movement of freight on the lower Monongahela River.

Therefore, we concur with the Corps that Plan "1" will serve as the best solution for modernization of the lower Monongahela River.

Sincerely yours,

Keith Chase, Special Assistant
to the Secretary for Aviation,
Rail, and Ports

Response to Comments:

Letter supports Plan No. 1. No response required.

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA FISH COMMISSION
Division of Environmental Services
450 Robinson Lane
Bellefonte, PA 16823-9616
814-359-5147

November 1, 1991

U.S. Department of the Army
Colonel Harold F. Alvord, District Engineer
Pittsburgh District, Corps of Engineers
Federal Building, 1000 Liberty Avenue
Pittsburgh, PA 15222

Re: September 1991 Draft Lower Monongahela River Navigation System Feasibility Study Interim Report and Environmental Impact Statement

Dear Colonel Alvord:

Frankly, the Pennsylvania Fish Commission is extremely disappointed with several of the conclusions reached in the Lower Monongahela September 1991 documents, along with some apparent omissions. While the elimination of a tailwater fishery has seemed a foregone conclusion for some time, the perceived inability to adequately compensate for this loss - especially in terms of angling access - comes as a surprise. Flat statements like "no opportunity for fisherman access because of the steep terrain and lack of access to the abutment" (page 7-19) at new Dam 2 seem to indicate less-than-creative thinking in this regard. Likewise, there's no obvious mention of alternative access possibilities such as near eliminated Dam 3, improvements at existing Dam 4 or other boating or shore fishing enhancements along the pools. The angling public deserves better treatment!

A second major concern is the potential destruction of streams to accommodate dredged material disposal. The page 7-17 Coursin Hill disposal site description implies that the perennial stream occupying the ravine would be eliminated. The page 7-18 brief assessment of the Bunola disposal site mentions no streams. The Pennsylvania Fish Commission remains adamantly opposed to perennial stream valley fills for waste disposal and seriously questions how such practices can comply with Section 401 of the

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Clean Water Act. The Fish Commission again suggests further consideration of in-river spoilage of suitable materials to create shoreline irregularities, etc.; page 7-20's statement about the "certainty of considerable adverse impact on commercial traffic" is not very convincing.

Not to be entirely negative, the proposals to leave stumps and shrubs in the newly - created shallow water area (page 7-5), and to create "fish reefs" of demolition debris (page 7-5,6) will provide improved aquatic habitat if implemented. Reaeration provisions both at the new dam and at existing Dam 4 (page 7-6) should help maintain the water quality benefits now provided by Dam 3.

The Fish Commission is hopeful that these concerns can be satisfactorily addressed in forthcoming project documentation, and will continue to work with your staff as well as the Fish and Wildlife Service to insure environmentally acceptable upgrading of the Lower Monongahela navigation system. Thank you for the opportunity to comment.

Sincerely,

Ron Tibbott

Ron Tibbott, Hyd. Eng. Tech.
Division of Environmental Services

RT:srh

cc: PFC - Ammon, Hyatt, Small, Lorson
PGC - Grabowicz
FWS - Kulp

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA FISH COMMISSION
Division of Fisheries Management
R.D.#2
Somerset, PA 15501

December 5, 1991
(Faxed 12/5/91)

U.S. Department of the Army
Colonel Harold F. Alvord, District Engineer
Pittsburgh District, Corps of Engineers
Federal Building, 1000 Liberty Avenue
Pittsburgh, PA 15222

RE: September 1991 Draft Lower Monongahela River Navigation System Feasibility Study Interim Report and Environmental Impact Statement

Dear Colonel Alvord:

Thank you for the opportunity to comment on the above report. My comments will concentrate on aspects of water quality, the recreational fishery and fisheries management connected to the proposed alternative plans.

From a fishery resource and environment protection standpoint, the "tentatively identified alternative" for removal of Lock and Dam 3 eliminates the "artificial riffle" responsible for dissolved oxygen increase and tailwater aquatic life production effects. As stated in the report Syllabus (Page 1), the specific objectives of the project are stated as (a) a need to provide safe and reliable navigation, (b) to minimize towing inefficiencies, and (c) to maintain or improve environmental conditions. The tentative alternative will meet (a) and (b), but present environmental conditions will be degraded.

Spillage from the dams are a major aeration factor left in the Three Rivers since the advent of the navigation channel. Results of this aeration led to increased production of aquatic invertebrates, forage fishes and game fishes. This production ultimately provides a significant recreational fishery in the tailwaters, something that was recognized in the Interim Report. Dissolved oxygen reduction through removal of a dam raises concern over reduced assimilative capacity for wastewater discharges, particularly sewage. Hence, lower dissolved oxygen concentration will lead to higher concentrations and increased vegetative effects from the stated "biochemical oxygen demanding wastes." The Draft Environmental Impact Statement also states: "In recent years there has been a dramatic improvement in Monongahela River water quality and aquatic life through abatement of acid mine drainage, domestic and

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industrial sewage treatment, and the loss of much of the steel industry." Is it reasonable to take a step backward from this trend as a result of this project?

We do not presently have comprehensive and up to date fisheries data from this portion of the Monongahela River. We are scheduled to obtain that information during sampling in 1992. Our work will assess fish populations in Pools 1, 2 and 3 through the use of night electrofishing, gill nets and shoreline seining. After this sampling, we will be able to quantify the fishery that will be impacted by this project. Also, a Recreational Use Survey and Valuation of Recreational Use Types on this portion of the Mong River will take place during 1992. This study will determine the economic benefits of recreational activities in the lower portion of the Mong and Alleheny Rivers, and the Pa. portion of the Ohio River. The results of these two studies can provide the information necessary to be able to quantify the recreational fishery and fishing that will be impacted by the removal of L&D 3. It is felt that the Draft Environmental Impact Statement does not adequately address the magnitude of the recreational fishery. Due to the paucity of this type of information related to this project, the final plan should not be chosen until this data can be used.

Natural reproduction for species including smallmouth bass, spotted bass, largemouth bass, walleye, sauger, carp, channel catfish, crappies, rock bass, white bass, suckers, and freshwater drum supports a viable fishery. To provide additional fishing opportunities the Pa. Fish Commission stocks walleye, muskellunge, tiger muskellunge and striped bass hybrids in this section of the river. Removal of the tailwater effects of L&D 3 would alter the fisheries management utility of the supplemental stockings. This fishery for walleye and striped bass hybrids is typically concentrated in the tailwaters of a dam.

For the reasons outlined above, the position of the Pa. Fish Commission, Division of Fisheries Management, is maintained at a 3 for 3 replacement alternative, rather than a 2 for 3 alternative. This is the same position that was supplied verbally by this office to Conrad Wieser of your office during the report preparation stage for this project.

Sincerely,

Richard D. Lorson

Richard D. Lorson
Area 8 Fisheries Manager
ee

cc: R. Snyder
R. Hoopes
J. Ammon
D. Hyatt
K. Small
T. Qualters
J. Arway
R. Tibbott

Response to Comments:

The District believes that the presently adequate boating and shoreline fishing access to Pools 2 and 3 (apart from tailwaters) would not be adversely affected by the recommended plan. Opportunities to improve tailwater fishing access in the project area to compensate for loss of shoreline access to one tailwater are presently restricted by the limited Federal shoreline ownership and lack of access to that shoreline. Development of tailwater shoreline access at Dams 2 and 4 or the development of old Locks and Dam No. 3 property may require condemnation of private property and would be subject to the Corps' non-Federal recreational cost-sharing requirements. The District will coordinate with the Pennsylvania Fish Commission and local governments on their desire to participate in cost-sharing recreational developments in the project area.

The small perennial streams draining the proposed disposal sites would be relocated on the surface of the completed disposal site. Although they would be altered, they would not be eliminated, for example, by burial in a culvert. During site construction, surface drainage from above the site would be diverted to the stream below the disturbed area. Drainage from the disturbed area would be handled according to a Pennsylvania Department of Environmental Resources approved sedimentation and erosion control plan. The District proposes to consult with the U.S. Fish and Wildlife Service and the Pennsylvania Fish Commission in the project's design phase to develop specifications for restoring the relocated stream.

The District does not believe that further consideration of in-stream disposal for creating shallow water habitat is warranted. Compensation for Plan No. 1's aquatic habitat impacts is provided by construction of fish reefs, and by the overall 76.5-acre increase in shallow water habitat due to pool changes. Our selection of fish reefs rather than in-stream disposal was based on the limited number of shoreline sites suitable for modification, and on the need for aquatic habitat diversification which fish reefs could satisfy. Sites eliminated from consideration included outer bends (tow traffic and erosional areas), inner bends (depositional areas, already shallow water habitat), and existing docks and shoreline development which left few suitable sites for habitat modification. The small increase in shallow water habitat which could be added to the expected 76.5-acre gain by in-stream disposal at these sites was believed to be less desirable than using fish reefs to improve habitat diversity.

The District believes that dissolved oxygen augmentation features incorporated in the design of replacement structures described for Plan No. 1 will greatly assist in offsetting the loss of reaeration resulting from the removal of Locks and Dam No. 3. Compensation for Plan No. 1's aquatic habitat impacts will be provided by construction of fish reefs, and by the overall 67.5-acre increase in shallow-water habitat due to pool changes. Moreover, the District will continue to coordinate with the Pennsylvania Fish Commission on the implementation of habitat improvement measures to assure a minimization of impact of Plan No. 1 upon fishery resources.

Allegheny County Health Department

COUNTY COMMISSIONERS

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MARGOT WOODWELL

November 5, 1991

Les Dixon, Chief
Planning Division
Pittsburgh District
U. S. Army Corps of Engineers
William S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222

*RE: LOWER MONONGAHELA RIVER
NAVIGATION SYSTEM
FEASIBILITY STUDY
IMPACT STATEMENT*

Dear Mr. Dixon:

We have reviewed the U. S. Army Corps of Engineers' (USACOE) "Lower Monongahela River Navigation System Feasibility Study" Environmental Impact Statement relative to the potential impact of the proposed project on drinking water and sewage treatment facilities within Allegheny County. We would like to raise a number of issues regarding this project:

- While the impact statement addresses most of the sewage treatment plant (STP) outfall discharges located within the project area, USACOE has not addressed the Dravosburg Borough outfall (approximately milepoint 16.5) or the City of McKeesport Municipal Authority outfall (approximately milepoint 15.5).

- The impact statement prepared by USACOE indicates that the level of the Youghiogheny River will be raised sufficiently to impact the Elizabeth Township Pump Station located near the Boston Bridge (approximately milepoint 4.1). USACOE has not addressed the impact of raising the Youghiogheny River on the Municipal Authority of Westmoreland County's McKeesport Water Treatment Plant intake or the backwash and sludge dewatering outfalls located beneath the 15th Street Bridge (approximately milepoint 0.5).

24-CS-0489

- USACOE proposes to raise the City of Duquesne's wellheads a sufficient distance so that the wellheads will not be beneath the normal river pool level. This implies that the well field will be flooded as a result of the construction of the new Locks and Dam #2. Flooding the well field will place the water supply for the City of Duquesne at an elevated level of risk and almost assuredly will result in a groundwater system being converted to groundwater under the influence of surface water. Therefore, significant changes to the treatment procedures will be required. We recommend USACOE join with the City of Duquesne in constructing a seawall to protect the wellheads rather than simply raising the level of the top of the wells.

- The impact statement does not address possible complications arising from the blockage of the Allegheny County Sanitary Authority (ALCOSAN) bypass structures located within the project area nor the potential submersion of ALCOSAN manholes located in the Turtle Creek bed.

- USACOE has proposed disposing of dredgings and construction demolition wastes at two sites in Allegheny County. Both of these sites would require permitting by the Pennsylvania Department of Environmental Resources and this Department as solid waste disposal facilities. Further, a cursory examination of the proposed disposal areas, particularly the Coursin Hills Site, Lincoln Borough, indicates that these sites may not meet current State and County regulations. If these sites cannot be permitted, USACOE will need to seek other disposal facilities.

We appreciate the opportunity to comment on this major restructuring of the Lower Monongahela River Basin. If you have any questions or wish to discuss our comments, please feel free to contact me.

Sincerely,

Gerald M. Barron

Gerald M. Barron
Deputy Director

lo

cc: John W. Schombert

Response to Comments:

The first four issues in this letter were also raised by the Pennsylvania Department of Environmental Resources (PaDER). For our response, please refer to the PaDER letter dated November 14, 1991.

According to the April 1988 revision to the Solid Waste Management Act, uncontaminated concrete rubble, earth excavations and dredged material are classified as clean fill. As clean fill, no landfill permit is required for disposal provided the site meets other governmental regulations such as those concerning erosion and sediment control. The District has committed to evaluating alternative disposal sites after project authorization to reduce, if possible, the level of social and environmental impacts associated with the proposed sites.

TOWNSHIP OF FORWARD

R.D. #3 • BOX 40-A
MONONGAHELA • PENNSYLVANIA • 15063
(412) 258-7895

November 1, 1991

U. S. Army Corp.
Col. Alvord
Wm. S. Moorhead
Federal Bldg.
1000 Liberty Ave.
Pittsburgh, PA 15222-4186

TO WHOM IT MAY CONCERN:

Please consider this my request for an extension of the public comment period regarding the Locks & Dams Project on the Monongahela River. Also, if the extension is granted, I would like another public meeting concerning the above mentioned. This meeting should be well publicized and be made part of public record.

Please contact the Township office in response to my request, or if you have any further questions.

Sincerely,

TOWNSHIP OF FORWARD

Anthony J Piscitelli

Anthony J. Piscitelli
Chairman of the Board

TOWNSHIP OFFICE
ROUTE 136 EAST
MONONGAHELA, PENNSYLVANIA 15063
FAX (412) 258-3038

11-4-91

TOWNSHIP OF FORWARD

R.D. #3 • BOX 40-A
MONONGAHELA • PENNSYLVANIA • 15063
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November 25, 1991

Lester S. Dixon
U.S. Army Corps of Engineers
Wm. S. Moorhead Federal Bldg.
1000 Liberty Ave.
Pittsburgh, PA 15222-4186

Dear Mr. Dixon,

The Forward Township Planning Commission strongly opposes the choice of the Bunola area as a disposal site for the Lower Monongahela River Navigation Project. Bunola is one of the few residential zones on Forward Township's shoreline. To permit a large industrial project to take place in a residential area when 90% of our shoreline is zoned commercial and industrial goes against our Comprehensive Plan. Such action would make it difficult in future dealings with other industries who may adversely effect residential areas, by setting precedence.

We would like you to consider an alternate site south of Bunola at the old railroad yard, and to look into the possibility of using this industrial site both as a staging area and small fill site. If the area were to be raised above the 500 year flood plain, it could be used as a future industrial park site. We understand that this site cannot hold the projected fill from the entire project, but ask that you consider the following alternatives individually and in combination.

* In-river disposal
* Disposal at the two RIDC sites at National Steel in McKeesport and Duquesne Works
* Disposal at Consol Coals'Black Diamond property
* Contact Canestrale Landfill of Monessen who may use the material as part of a landfill operation

TOWNSHIP OFFICE
ROUTE 136 EAST
MONONGAHELA, PENNSYLVANIA 15063
FAX (412) 258-3038

Lester S. Dixon
U.S. Army Corps of Engineers
Wm. S. Moorhead Federal Bldg.
1000 Liberty Ave.
Pittsburgh, PA 15222-4186

* Utilize the smaller alternate site located near Elkhorn Road

We feel that using these alternate sites would reduce community impact and using the industrial fill site along the river could possibly benefit the Township in the future. We respectfully ask that you consider our recommendations and enter this letter into the public record for the Lower Monongahela Project.

Thank you.

Sincerely,

FORWARD TOWNSHIP PLANNING COMMISSION

John Greenwald

John Greenwald, Chairman

TOWNSHIP OF FORWARD

R.D. #3 • BOX 40-A
MONONGAHELA • PENNSYLVANIA • 15063
(412) 258-7895

November 26, 1991

Mr. Lester S. Dixon
U.S. Army Corps of Engineers
Wm. S. Moorhead Federal Bldg.
1000 Liberty Ave.
Pittsburgh, PA 15222-4186

RE: Monongahela River Navigation Project

Dear Mr. Dixon:

The Township of Forward Board of Supervisors are in opposition to the use of the Bunola area as a disposal site for the above referenced project. We support the Forward Township Planning Commission's recommendations for use of alternate sites that were listed in their letter to you dated November 25, 1991.

We also would expect that the Army Corps of Engineers comply with any Township ordinances that would pertain to this project.

Thank you in advance for your consideration of our recommendations and we would appreciate this letter being entered in the public record for the Lower Monongahela Project.

Sincerely,
TOWNSHIP OF FORWARD
BOARD OF SUPERVISORS

A.J. Piscitelli

A.J. Piscitelli, Chairman

enclosures

TOWNSHIP OFFICE ROUTE 136 EAST MONONGAHELA, PENNSYLVANIA 15063 FAX (412) 258-3038

Response to Comments:

The District was not aware of local zoning when the offloading area shown in the environmental impact statement and feasibility report Engineering Technical Appendix was proposed. Although this area remains as part of the recommended plan in the final report, the District has committed to evaluate other offloading areas, alternative disposal sites and other uses of the disposal material. These include the suggestions in their letter dated November 25, 1991 and others which may arise through continuing local coordination.

OFFICE OF THE MAYOR

Borough of Glassport

Fifth and Monongahela Avenue, Glassport, PA 15045
Mayor Thomas Urbanski

October 15, 1991

Department of the Army
Pittsburgh District, Corps of Engineers
William S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222

ATTENTION: Les Dixon
Chief, Planning Division

Dear Mr. Dixon:

I am sorry I can't attend the Public Hearing this evening (Tuesday, October 22, 1991), but I had other commitments. However, I would like to give some of my thoughts. From what I read in the paper (Press and Local), on removing the Elizabeth Lock and engineering a new lock for Braddock would raise our river approximately five foot in the Glassport area. I fished and swam in the Monongahela Rivers since I was ten years old. I have been fishing at least once a week from where the Youghiogheny River enters the Monongahela River to the Elizabeth Locks. I have been studying what our riverbank would look like from the Youghiogheny to the Clairton Bridge if it was raised five foot. I feel that our riverbank and or recreation area would be short changed between the scenery and the beautiful trees that are there now. Near Copperweld and the Foundry there is alot of history with round sand stone piled along our riverbank is history of the old Axe and Tool that was located in Glassport in 1927. A little further up the river we have a wall built out of core pattern where they poured hot copper into the stone and bent cores to make copper billets. Thousands of these will be washed out with another four or five feet of water.

In the same area we have two storm sewers that will be completely full of water at all times. Our launching area for our boats and fishing contests at Harrison Street and site seeing area will be eliminated. The same area as our launching and fishing area we have our sewage plant where there is a twenty four inch

BOROUGH OF GLASSPORT, PENNSYLVANIA INCORPORATED SEAL pipe coming from our sewage plant will have to be raised or it will fill up with sediment. We already experienced that with higher flood waters. Also in the same area we have a storm sewer coming from Harrison Hollow with mine waters. By raising the river that sewer will be completely under water. The most important part that bothers me is my experience swimming in the Monongahela River thirty to forty years ago. As kids we would swim in the middle of the river and we would go down and pick up the muck. It was so greasy and black that it would turn the water from green to black just bringing it above the water. My feeling is that the bottom of the river could be the most contaminated sludge in Allegheny County. The sludge is acids, oils and chemicals that were released by the Clairton Mill and the mills in Glassport. I wouldn't be afraid to bet that it is at least twelve inches of black oily muck at the bottom.

I understand that you are going to dredge this part of the river and haul this up in Coursin Hollow. I feel that this is the most contaminated soil or sludge in the area. I also feel that our river was used as a sewage plant for thirty to forty years and all that muck is on the bottom of the river.

I feel that when the river is dredged that it should be processed like we process our sludge at the sewage plant. I am in no way against improving our waters, or our river areas; however, I disagree with our fish commission saying that it will not disturb the wild life and fish along our river. You probably noticed next to Clairton Mill the island that is formed by erosion from Peters Creek. Of course the river is low but we actually have trees growing in this area. Another three or four years the barges will never make it through. When they go through now if you are on the Clairton Bridge you can see mud on their motors or paddles hitting bottom.

I also feel that this Public Hearing should have taken place in Glassport or McKeesport where the actual areas will be affected by this change.

Very truly yours,

BOROUGH OF GLASSPORT

Thomas Urbanski
Mayor

TU/nmp

Response to Comments:

The proposed raise of Pool 2 may impact some uninventoried historical resources. At this time, however, we are not aware of any resources which are of such significance that would warrant a change in the recommended plan. Following project authorization, the District will conduct comprehensive inventory and evaluation studies of historic resources in project impact areas in consultation with the Pennsylvania Bureau for Historic Preservation and the Advisory Council on Historic Preservation. Should any significant historic resources be adversely affected by the project, appropriate mitigation would be undertaken in coordination with the above agencies.

We are aware of the aesthetic benefits afforded by the vegetation which lines the banks of industrialized Pool 2. The pool raise will slightly reduce the width of the band of vegetation along the banks, but we do not believe it will have a significant impact on its overall appearance.

There are two 48-inch storm sewers located in Glassport which are identified in the project feasibility report. Our records, based on field investigations, indicate that other pipes in this area do not meet our screening criteria. The criteria which we used to determine whether or not a pipe would be affected is based on '1/3 submergence' criteria of the outlet. Future studies may indicate additional lines which are adversely impacted, and which will be added at that time. These same studies may also indicate that some pipes which meet the '1/3 submergence' criteria are not impacted and, therefore, would not be relocated. The 24-inch sewage plant effluent pipe is currently submerged most of the time and would not be adversely impacted by an additional 2.5 to 3.0-foot submergence. The launching and fishing area was visited by District representatives, and in their opinion, would not be affected.

No dredging in the Glassport vicinity (Pool 2) where the pool is to be raised will be undertaken as part of the recommended plan. Where dredging is required in the upper end of Pool 3, the District tested the navigation channel material for presence of priority pollutants in coordination with the Pennsylvania Department of Environmental Resources. This material has been determined to be clean fill and will not require special handling and disposal.

The public meeting was held near Elizabeth which is more centrally located in the project area (Pools 2 and 3) than are Glassport or McKeesport.

PETRAGLIA & MUSCANTE
Attorneys at Law
408 Grant Building
Pittsburgh, Pennsylvania 15219
Telephone: (412) 621-9022
Fax: (412) 281-4355

JAMES F. PETRAGLIA
FALCO A. MUSCANTE

BLOOMFIELD OFFICE
4738 Liberty Avenue
Pittsburgh, PA 15224

November 11, 1991

Lester S. Dixon, Ph.D., P.E.
U.S. Army Corps of Engineers, Pittsburgh District
William S. Moorehead Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222-4816

RE: Lower Monongahela River Navigation Study
Lincoln Borough - Coursin Hollow Area
Extension of Time for Public Comment

Dear Mr. Dixon:

As you are aware, the undersigned is Solicitor for the Borough of Lincoln.

I am writing to confirm that at the special meeting held by the Council of the Borough of Lincoln on November 8, 1991, you agreed, on behalf of the U.S. Army Corps of Engineers, that additional public input would be accepted after the statutorily mandated November 12, 1991 deadline. Specifically, you indicated that although the statutory deadline for public comment would expire on November 12, 1991, any formal comment from the Borough of Lincoln or any additional public comment through November 30, 1991 would be made a part of any submission and/or recommendation submitted by the U.S. Army Corps of Engineers for the Lower Monongahela River Navigation Study. Also, you stated that this extension for public comment through November 30, 1991 was a formal commitment by not only yourself, but also Col. Harold F. Alvord. Please be advised, therefore, that the Borough of Lincoln intends to submit a formal comment on the Borough of Lincoln's position at its regular November Council meeting of November 19, 1991.

Please provide the Borough of Lincoln and this office with written confirmation that additional public comment will be accepted and made a part of the Lower Monongahela River Navigation Study through November 30, 1991. Thank you for your cooperation in this matter.

Very truly yours,

Falco A. Muscante

FAM/klb

cc: Borough of Lincoln

PETRAGLIA & MUSCANTE
Attorneys at Law
408 Grant Building
Pittsburgh, Pennsylvania 15219
Telephone: (412) 621-9022
Fax: (412) 281-4355

JAMES F. PETRAGLIA
FALCO A. MUSCANTE

BLOOMFIELD OFFICE
4738 Liberty Avenue
Pittsburgh, PA 15224

November 27, 1991

Lester S. Dixon, Ph.D., P.E.
U.S. Army Corps of Engineers, Pittsburgh District
William S. Moorehead Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222-4816

HAND DELIVERED

RE: Lower Monongahela River Navigation Study
Lincoln Borough - Coursin Hollow Area
Extension of Time for Public Comment

Dear Mr. Dixon:

Enclosed please find a copy of the official Resolution which was adopted by the Lincoln Borough Council on November 19, 1991 regarding its position on the Lower Monongahela River Feasibility Study. Also enclosed please find copies of the Petitions signed by Lincoln Borough residents as referenced in the Resolution.

Pursuant to your correspondence of November 13, 1991, please include this Resolution and the Petitions as a part of the Feasibility Study to be addressed in the Environmental Impact Statement.

Very truly yours,

Falco A. Muscante

FAM/klb
Enclosures
cc: Borough of Lincoln

OFFICIAL

BOROUGH OF LINCOLN

COUNTY OF ALLEGHENY, PENNSYLVANIA

RESOLUTION NO. ____

A RESOLUTION OF THE COUNCIL OF THE BOROUGH OF LINCOLN, TO BE MADE A PART OF THE PUBLIC RECORD FOR THE LOWER MONONGAHELA RIVER FEASIBILITY STUDY OF THE UNITED STATES ARMY CORPS OF ENGINEER CONCERNING THE RENOVATIONS OF LOCK AND DAMS 2, 3 AND 4 ON THE MONONGAHELA RIVER, EXPRESSING THE BOROUGH OF LINCOLN'S OPPOSITION TO THE RECOMMENDED PLAN OF THE UNITED STATES ARMY CORPS OF ENGINEERS WHICH WOULD HAVE A SEVERE AND DETRIMENTAL IMPACT ON THE BOROUGH OF LINCOLN.

WHEREAS, the Council of the Borough of Lincoln and the residents thereof were not properly notified by the United States Army Corps of Engineers as required by the pertinent regulations, and as a result, the Borough of Lincoln could not properly protect the interests of its residents at the October 22, 1991 public hearing;

WHEREAS, the Council of the Borough of Lincoln has been notified that the public comment period on the Lower Monongahela River Feasibility Study ended on November 12, 1991, which also severely restricted the ability of the Borough of Lincoln to properly represent the interests of its residents;

WHEREAS, the Council of the Borough of Lincoln, after preliminary review of the Lower Monongahela River Feasibility Study, has determined that the recommended plan of the United States Army Corps of Engineers for the renovation of lock and dams 2, 3 and 4 on the Lower

Monongahela River, which has been identified as Plan 1 or the "2 for 3" Plan, will have a severe and detrimental impact on the Borough of Lincoln and would severely and seriously affect the health, safety and welfare of the citizens of Lincoln Borough;

WHEREAS, the Council of the Borough of Lincoln believes and has determined that the recommended Plan 1 could have a severe and devastating economic impact on businesses located within Lincoln Borough, and due to the limited number of businesses which comprise the tax base in Lincoln Borough, the loss of even one business will cause severe financial distress to the Borough of Lincoln and threaten its continued economic viability;

WHEREAS, the Council of the Borough of Lincoln believes and has determined that the recommended Plan 1 will result in the forced dislocation and relocation of approximately ten (10) private landowners within Lincoln Borough, and the resulting loss of tax revenues from even one resident and/or landowner will have such a severe and detrimental financial impact on the Borough of Lincoln that it will be difficult, if not impossible, for the Borough of Lincoln to remain financially solvent;

WHEREAS, the Council of the Borough of Lincoln believes and has determined that the recommended Plan 1 will result in over 4.5 million cubic yards of dredged and excavated material, a substantial portion of which the United States Army Corps of Engineers has recommended to be dumped on inhabited property in the Coursin Hollow area of Lincoln Borough, which is in close proximity to the most populated area of Lincoln Borough and will have a severe and serious impact on the health, safety and welfare of the citizens of Lincoln Borough;

WHEREAS, the Council of the Borough of Lincoln believes and has determined that the dumping of the dredged and excavated material in the Coursin Hollow area of Lincoln Borough, an area whose soil has been polluted with carcinogenic and toxic substances from years of exposure to emissions from the United States Steel Clairton Coke Works, will create a concentrated disruption of the carcinogenic and toxic pollutants into the air in the most populated area of Lincoln Borough, causing a severe and serious impact on the health, safety and welfare of the citizens of Lincoln Borough;

WHEREAS, the Council of the Borough of Lincoln has determined that the Coursin Hollow area of Lincoln Borough has been zoned conservation since the organization of the Borough of Lincoln and is a natural watershed of great value to the area surrounding Coursin Hollow;

WHEREAS, the Council of the Borough of Lincoln believes and has determined that the United States Corps of Engineers has not properly and/or sufficiently evaluated or investigated alternative disposal locations for the deposit of the dredged and excavated materials, and that such alternative disposal locations exist which would not have the severe and detrimental impact as that proposed by the United States Army Corps of Engineers, including In-River Disposal, Pangburn Hollow, RIDC developments at the USS National Steel site in McKeesport and the USS Duquesne Works site in Duquesne;

WHEREAS, the Council of the Borough of Lincoln believes and has determined that prior to any forced dislocation of the residents of Lincoln Borough or the acquisition of property in Lincoln Borough for a disposal site, the U.S. Army Corps of Engineers must be required to thoroughly and fully evaluate and investigate alternative disposal sites, including, but not limited to In-River Disposal, Pangburn Hollow, RIDC developments at the USS National Works site in McKeesport and the USS Duquesne Works site in Duquesne and all other alternative disposal locations which will reduce and/or eliminate the negative social and environmental impact on Lincoln Borough while providing substantially equivalent or decreasing project costs;

WHEREAS, in excess of three hundred fifty (350) residents of the Borough of Lincoln have signed Petitions which oppose the recommended Plan 1 and oppose any dumping of dredged or excavated materials on inhabited land in the Coursin Hollow area of the Borough of Lincoln; copies of said Petitions are attached hereto and made a part hereof; and

WHEREAS, it has also come to the attention of the Council of the Borough of Lincoln that any recommendations made by the United States Army Corps of Engineers regarding the Lower Monongahela River Feasibility Study will invariably affect the health, safety and welfare of the community of Lincoln Borough.

NOW, THEREFORE, BE IT RESOLVED AND IT IS HEREBY RESOLVED BY THE COUNCIL OF THE BOROUGH OF LINCOLN, AS FOLLOWS:

1. The Council of the Borough of Lincoln finds that it is in the best interest of the health, safety and welfare of the Borough of Lincoln and the residents thereof, that Plan 1 or the "2 for 3" Plan, which is recommended by the United States Army Corps of Engineers for the Lower Monongahela River Navigation Project should be publicly opposed by the Borough of Lincoln.

2. Regardless of which Plan is recommended or implemented, the Council of the Borough of Lincoln finds that it is in the best interest of the health, safety and welfare of the Borough of Lincoln and the residents thereof, that the Coursin Hollow area of the Borough of Lincoln is not a suitable and/or proper location for the dumping and/or deposit of the dredged and excavated material, but rather the United States Army Corps of Engineers must be required to investigate and identify alternative disposal locations for the deposit of the dredged and excavated material, including, but not limited to, In-River Disposal, Pangburn

Hollow and the RIDC developments at the USS National Works site in McKeesport and the USS Duquesne Works site in Duquesne.

3. This Resolution shall serve as the official statement of the Council of the Borough of Lincoln regarding its position with respect to this issue, and a copy hereof with the attached Petitions signed by the residents of Lincoln Borough shall be delivered forthwith to the United States Army Corps of Engineers to be made part of the public record for the Lower Monongahela River Feasibility Study. Also, copies of the Resolution and the attached Petitions shall be delivered forthwith to United States Congressman Joseph Gaydos, United States Senator Arlen Specter, United States Senator Harris Wofford, the Secretary of the Department of Environmental Resources of the Commonwealth of Pennsylvania, the Honorable Robert P. Casey, Governor of the Commonwealth of Pennsylvania, and all other local and elected officials representing the citizens of the Borough of Lincoln.

4. The Borough may designate representatives to meet with and/or communicate the Borough's interest in this matter to representatives of the U.S. Army Corps of Engineers and/or any other governmental agency involved in

this matter, from time to time, as the circumstances warrant.

ADOPTED this 19th day of November, 1991.

Steve L. Kadar

Steve L. Kadar,
Council President

Ronald A. Rosche

Ronald A. Rosche,
Vice President

Charles W. Byers

Charles Byers

William K. Kiger, II

Nick Vay

Nick Vay

Catherine L. Burchell

Catherine Burchell

Kathy Roper

Kathy Roper

Florence Swantack

Florence Swantack, Mayor

ATTEST:

Sharon Matheys

Sharon Matheys,
Borough Secretary

The US Army Corps of Engineer's recommended plan for renovating the locks and dams along the lower Monongahela river, called plan 1 or the "2 for 3" plan, will tear down Lock and Dam 3 at Elizabeth and renovate or replace lock and dams 2 and 4. This will change the water levels along a 30 mile stretch of the Monongahela river, forcing utility companies, area businesses, and private land owners to spend over $100 million in modifications, such as changing water intakes, docks, cooling systems, etc. It will also force the US Army Corps of Engineers to dredge the Monongahela between Charleroi and Elizabeth in order to keep the river open for barge traffic. Over 2 million cubic yards of dredged and excavated material will, according to the current plan, be dumped on inhabited property in Bunola and/or Coursin Hollow.

Another plan studied by the US Army Corps of Engineers, plan 4 or the "3 for 3" plan, is nearly identical to the "2 for 3" plan except that it rebuilds Lock and Dam 3 with modern 84'x720' locks instead of tearing it down. According to the US Army Corps of Engineers, the net cost of the "3 for 3" plan is estimated to be only 3% higher than that of the "2 for 3" plan and the "3 for 3" plan saves residents and companies in this economically depressed lower Monongahela valley $100 million in rebuilding costs. Both plans modernize the locks and dams along the lower Monongahela, reducing the chance of failure and greatly improving river navigation.

The undersigned urge that the US Army Corps of Engineers adopt the "3 for 3" plan instead of the "2 for 3" plan and, no matter which plan is adopted, find uninhabited land on which to dump the dredged and excavated material.

	Name	Address
1)	[illegible]	RD#4 Box 77A Eliz. PA 15037
2)	Christine C Baines	R.D.#4 Box 149 Eliz. PA 15037
3)	Gregory S Platte	RD#4 Box 37 Eliz. Pa 15037.
4)	Margaret H Platte	Rd#4 Box 37 Elizabeth Pa 15037
5)	David Hame	RD4 Bx 459 Eliz. PA 15037
6)	Margaret Thayer	RD4 Box 58 Eliz Pa 15037
7)	Thomas E. Thayer	RD4 Box 58 Elizabeth Pa 15037
8)	Lane Matthys	4017 LIBERTY WAY LINCOLN BORO 15133
9)	Rebecca Sprau	RD#4 Box 108 ELIZABETH PA 15037
10)	Adolph Moga	Rt. #1 Box 200 Elizabeth, Pa. 15037
11)	Dorothy Fulmer	3800 LIBERTY WAY (UPPER COURSIN HOLLOW RD) LINCOLN BORO, MCKEESPORT PA 15133
12)		

Petraglia & Muscante
Attorneys at Law
Representing the Borough of Lincoln

Letters of November 11 & 27, 1991
w/attached Resolution and Petition

Response to Comments:

The District was in error in not including the Borough of Lincoln in the initial Public Meeting Notice mailing on September 23, 1991. Via contact with local citizenry and resultant notification by the Borough of the error, the District mailed a report and Public Meeting Notice to the Borough on October 11, 1991. Although the public comment period was not extended, comments were accepted in the District through the end of November 1991. The Borough was notified of this consideration in a meeting with the Borough officials and citizens on November 8, 1991 and also by letter dated November 13, 1991.

The District will continue to investigate alternative disposal sites after project authorization in the interest of reducing social and environmental impacts without increasing project costs. Although minimizing impacts to residents is a definite consideration, consideration must also be given to the location of sites relative to the river, and their capacity to handle large amounts of material.

The District plans to establish a Citizen's Advisory Committee that would meet on a regular basis to provide continuing input during the remaining work on this project. Lincoln Borough will be invited to actively participate on this committee.

LOCAL UNION NO. 2274

United Brotherhood of Carpenters and Joiners of America

495 MANSFIELD AVENUE
PITTSBURGH, PA. 15205

INSTITUTED AUGUST 12, 1881

ALWAYS DEMAND THE LABEL

PHONE: (412) 922-6210
FAX (412) 921-3242

October 3, 1991

Colonel Harold F. Alvord
District Engineer
Pittsburgh District
U.S.Army Corps of Engineers
1000 Liberty Avenue
Pittsburgh, PA 15222

Dear Harold:

On behalf of the PA State Council of Carpenters, the District Council of Western Pennsylvania and Heavy Construction Carpenters Local Union No. 2274, representing more than 25,000 carpenters, I am writing to you concerning the Locks and Dams Nos. two, three and four on the Monongahela River.

We are strongly in favor and do wholeheartedly support your Plan 1 which is "2 for 3".

If I or my office can be of assistance to you at any time, please do not hesitate to contact me. Thank you.

Sincerely,

James T. Strutt
Managing Business Representative

JTS/mmp
cc: Barry Palmer, Ex. Director

Response to Comments:

Letter supports Plan No. 1. No response required.

David W. Kreutzer
General Manager -
River Division

CONSOL

Consolidation Coal Company
River Division
Post Office Box 387
Elizabeth, Pennsylvania 15037
(412) 831-4558
(412) 384-6550

October 30, 1991

Colonel Harold F. Alvord
District Engineer
Pittsburgh District
U. S. Army Corps of Engineers
1000 Liberty Avenue
Pittsburgh, PA 15222

Dear Colonel Alvord:

This letter is written to advise you of our support for the selection of Plan #1 outlined in the Lower Monongahela River Navigation System Study.

Consolidation Coal Company, a leading coal producer in the eastern United States, ships over 20 million tons of coal on the inland waterways each year. Many of these river shipments are on or through the Pittsburgh District. A subsidiary of Consol, Twin Rivers Towing Company, tows 12 million tons of coal annually on the Monongahela and Upper Ohio Rivers. As you know from our work with the Corps and the Congress, we are intensely interested in the efficiency and reliability of the waterways system in the Pittsburgh District. We and our customers, primarily steel mills and electric generation plants, are dependent on the system for transportation of coal. Any interruptions in the system would have disastrous effects on our customers, Consol, and the economy of our region.

Severe structural deterioration of the dams at Lock and Dam #2 and Lock and Dam #3 and the lock at Lock and Dam #3 as well as the uncertainty of their continued usage and reliability are causes for concern. We concur with the Corps that some action to correct this situation be undertaken as soon as possible.

We feel that the Corps has an opportunity and perhaps even an obligation to complete the modernization of the Mon River. Plan 1 will eliminate bottlenecks to traffic and improve the reliability of the system.

It is recognized that Plan 1 will have impacts on its users and its surrounding communities. We feel that these impacts are minimal on the whole and well worth enduring to complete the modernization of the Mon and to transform this unsound river system into an interstate water highway for the future.

Thank you for this opportunity to submit this comment.

Sincerely,

David W. Kreutzer

David W. Kreutzer
General Manager - River Division

/bzm

cc: W. G. Karis
L. W. Kobitter
B. Palmer
S. G. Young

Response to Comments:

Letter supports Plan No. 1. No response required.

PITTSBURGH HISTORY & LANDMARKS FOUNDATION
ONE STATION SQUARE, SUITE 450 PITTSBURGH, PA 15219-1170, 412-471-5808, FAX 412-471-1633

October 15, 1991

Department of the Army
U.S. Army Engineer District, Pittsburgh
Moorhead Federal Building
Pittsburgh, PA 15222-4186

Gentlemen:

We have examined the September 1991 draft of the Lower Monongahela River Navigation System Feasibility Study (Vol. 1, containing the EIS).

We note that in your preferred plan the river will rise 5 feet above Locks and Dam 2. We cannot speak about archaeological sites, but we note that the Conrail bridge at Mile 11.7 will have to be removed to give adequate clearance. This is a bridge of c. 1900, and we would regret its removal but would not object to or argue against it.

Yours truly,

Walter C. Kidney
Historian

WCK/sk

Response to Comments:

The Conrail bridge at r.m. 11.7 has been identified for relocation to achieve a vertical clearance of 42.5 feet as required by the U.S. Coast Guard. The District anticipates the relocation would consist of removing the existing channel span and constructing a new channel span with a more efficient structural design. Because of its age, the District recognizes this bridge may have historical significance. It will be included in future studies to evaluate the significance of identified historic properties to comply with Section 106 of the National Historic Preservation Act. The need for and type of mitigation will be developed in consultation with the State Historic Preservation Officer and the Advisory Council on Historic Preservation. See also our response to the Pennsylvania Historical and Museum Commission letter of October 8, 1991.

STEEL HERITAGE

STEEL INDUSTRY HERITAGE TASK FORCE

October 18, 1991

LTG Henry J. Hatch
Commanding General - Chief of Engineers
U.S. Army Corps of Engineers
Pulaski Building
20 Massachusetts Avenue N.W.
Washington D.C. 20314

SUBJECT: Environmental Review - Section 106 Compliance
Historic and Cultural Resource Notification
Corps Pittsburgh District Monongahela River Lock and Dam
Nos. 2, 3 and 4 Improvement Plan -

Dear LTG Hatch:

This is to notify the Corps of Engineers that the Steel Industry Heritage Task Force is an organization authorized by U.S. Public Law 100-698 to survey natural, cultural, recreational and historic industrial resources in the six county area of Southwestern Pennsylvania, and to develop and present a plan for the interpretation and conservation of those resources to the U.S. Congress and the Secretary of the Interior. Concurrently, the Steel Industry Heritage Task Force is compiling a report on these same resources to the Commonwealth of Pennsylvania under its Heritage Parks Program.

The region includes the six Pennsylvania counties of Allegheny, Beaver, Fayette, Greene, Washington and Westmoreland. This region takes in a substantial portion of the watersheds of the Monongahela, Youghiogheny and Ohio Rivers in the Commonwealth of Pennsylvania, along with a portion of the lower Allegheny River watershed. As such, the recently announced plans by the Army Corps for improvements to locks and dams on the Monongahela River and channel dredging may have an effect on the historic and cultural resources now under study by the Steel Industry Heritage Task Force. Some of those resources may suffer adverse effects due to planned activities by the Corps.

In the course of planning and implementing activities in the region described above, the Army Corps of Engineers is asked to consult with the Steel Industry Heritage Task Force as an "interested person," as defined by Section 106 of the National Historic Preservation Act and the implementing regulations of the Advisory Council on Historic Preservation (36 CFR Part 800, 1986).

The Steel Industry Heritage Task Force is made up of a broad cross section of groups and individuals from the region involved in the administration of local, county, state and federal government agencies, historic preservation activities, academic institutions, organized labor, economic development and tourism promotion.

TINDALL BUILDING △ 303-305 EAST EIGHTH AVENUE △ HOMESTEAD, PENNSYLVANIA 15120 △ (412) 464-4000

The Steel Industry Heritage Task Force is prepared to assist the Army Corps in implementing its planned improvements along the Monongahela River, and to help identify existing historic cultural and natural resources, and to mitigate any potential adverse effects on those resources.

If you have any questions, please contact Mr. August R. Carlino, Project Director, on (412) 464-4000. Thank you for your attention to these matters.

Sincerely,

Jo DeBolt

Jo DeBolt
Chair

Attachments

cc: Congressman William Coyne
Congressman Joseph Gaydos
Congressman Joseph Kolter
Congressman Austin J. Murphy
Congressman Rick Santorum
Senator Arlen Specter
Senator Harris Wofford
Dr. Brent Glass, Pennsylvania Historical and Museum Commission
Mr. Don L. Klima, Advisory Council Historic Preservation
Col. Harold F. Alvord, Pittsburgh District, US Army Corps of Engineers

Response to Comments:

The District acknowledges the desire of the Steel Industry Heritage Task Force to be an "interested person" in the Section 106 (National Historic Preservation Act) compliance process. We will consult with the Task Force during preparation of the programmatic agreement with the State Historic Preservation Officer and the Advisory Council on Historic Preservation to define how they might best participate in the District's Section 106 activities.

Washington County Historical Society

49 East Maiden Street • LeMoyne House • Washington, PA 15301 • (412) 225-6740

October 31, 1991

Colonel Harold Alvord
Corps of Engineers
Department of the Army
William Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222

Dear Colonel Alvord:

Thank you for inviting our organization to comment on the Draft Lower Monongahela River Navigation System Feasibility Study Interim Report, Volume I of 6, Main Report and Environmental Impact Statement.

We are pleased that the study recognizes the need to identify and evaluate the significance of historic cultural resources in the area impacted by the proposed plans.

Furthermore, we recommend that in addition to a Section 106 review being made of the Locks and Dams 3 and 4, that possibly an Historic American Engineering Record be completed for these locks by the National Park Service.

Also, if the plan that is chosen results in the lowering of the navigation pool for what is currently Pool 3, then we suggest an archaeological survey be accomplished for any mining and industrial sites that may be exposed by the pool lowering. Furthermore, if an archaeological survey is accomplished that the information be made accessible to local historical organizations so that it may be incorporated into educational programming.

Currently the Williamsport Bridge Pier is being eroded during high water. This pier is all that remains of one of the first three bridges to cross the Monongahela River. This bridge was a major route for westward migration during the 1800's. The stone for the pier was quarried at Maple Creek and floated by keel boat to its current point. The ability to cross the river at this point contributed significantly to the growth and development of Monongahela City. Whichever plan is finally adopted some consideration should be made to commemorate this site. Possibly it could be made into a historic parklet.

Sincerely,

Roy Sarver, Administrator

RS:brs

Response to Comments:

The Williamsport Bridge Pier and Locks and Dam Nos. 2, 3, and 4 were identified as potentially significant historic properties from existing historic property inventories in the project area. Following project authorization the District will conduct additional surveys to inventory the entire project area, including such areas as the pool change zone. Where significant historic properties would be adversely affected by the project, appropriate mitigation measures would be developed through consultation between the District, the State Historic Preservation Officer, the Advisory Council on Historic Preservation and any interested persons. In the case of locks and dams, appropriate mitigation may include documentation according to Historic American Engineering Record standards.

The District and the Pennsylvania Bureau for Historic Preservation have already discussed the desirability of making historical information developed during the Section 106 process available to the interested public. We will be sensitive to this need as mitigation recommendations are developed. See also our response to the Pennsylvania Historical and Museum Commission letter of October 8, 1991.

Grogan, Graffam, McGinley & Lucchino, P.C.
Attorneys at Law
Three Gateway Center, 22nd Floor
Pittsburgh, Pennsylvania 15222
412/553-6300
FAX: 412/642-2601 **Direct Dial:**

October 11, 1991

Colonel Harold F. Alvord
District Engineer
Pittsburgh District, U.S. Army
Corps of Engineers
1000 Liberty Avenue
Pittsburgh, PA 15222

Re: Locks and Dams 2, 3, and 4 - Monongahela River

Dear Colonel Alvord:

I wholeheartedly support Plan A as the proposed improvements for Locks and Dams 2, 3, and 4 on the Monongahela River.

A considerable portion of my practice involves maritime matters. I am quite familiar with the importance of our lock and dam systems to the Pittsburgh economy. Also, I'm quite familiar with the need for improvements for Locks and Dams 2, 3, and 4.

Very truly yours,

GROGAN, GRAFFAM, MCGINLEY & LUCCHINO, P.C.

Dennis A. Watson

DENNIS A. WATSON

DAW/dap

Response to Comments:

Letter supports Plan A (No. 1). No response required.

RD #4 Box 101
Elizabeth Pa 15037
Oct 23 1991

U S Army
Corps of Engineers

sitting in last nights meeting I could not believe the dump sights picked. Just 1 mile toward Elizabeth from Coursin Hollow is Bellebridge Road. Only a handful of houses as you enter the road.

At the first turn (one block up the road) is a deep gully on the right side. Penn Dot dumped there at one time, but loads of room left between the hills tops. Continueing up Bellebridge is bottomless gully after gully on the left side of the road. Only 2 unaccupied houses and one occupied involved.

When that hollow is filled contenue a block up the road and you will find another hollow just waiting for fill That is three dump sights all as close as Coursin hollow and the combined area just as big

You missed more than Lincoln's address we are loaded with large unaccupied hollows Why disturb Coursin Hollow? It can't be distance it only amounts to few miles one way or the other" Build your locks dump your garbage but let our residents alone. Use some of our open areas to your advantage and ours

yours truly
Aedena Steffan

Response to Comments:

The valley near Belle Bridge was eliminated from consideration primarily because of the lack of a nearby offloading area, the lack of access other than by a public highway, and the presence of a small number of residences. As a result of comments received during the public review process, the District will undertake further study of alternative disposal sites and uses of disposal materials subsequent to project authorization. This study will include further local coordination.

Oct 31, 1991

Dear Dr. Dixon

As a homeowner on Coursin Hollow Road. in Lincoln Boro. Allegheny County, Pa We are writing to request that the army Corps of Engineers in their Lower Manongahela River Navigation System study consider an alternative dump site. As senior citizens having lived in Coursin Hollow 42 years. We would prefer not to move out of our home. If no alternative dump site can be located. We would request a fair dollar value for our house and land. at our age. We would not care to live some where for a couple of years and then return to try to rebuild a home Please reconsider the dump site locations to allow us to remain in Coursin Hollow.

Sincerely,

William J. Bennett, Sr.

Helen M. Bennett

Nov 1, 91.

Dear Dr. Dixon,

First of all I want to say "We Don't Want Your Dredge Material Brought to Coursin Hollow, Lincoln Boro". Secondly if we don't have any say so & you still bring it in & take our homes, I want the Korp to buy my property & my home. It would be of no use to me then.

Thank you
Margaret Ann Walker
(over)

Please put this letter or a copy into Public Record concerning Lower Monongahela River Navigation Survey Study.

November 1, 1991

I'm writing in regards to the US Army Corps of Engineer's recommended proposal for the renovation of the locks and dams along the Monongahela river.

The proposal includes using Coursin Hollow Road in Lincoln Boro, Elizabeth, Pa. as one of the dumping sites for disposing of the 4 million cubic yards of material that will be dredged when Lock 3 is removed with your "2 for 3" plan.

We, the residents, family, and friends of residents, would like to propose that the property on which the homes stand, that are going to be eliminated to make a road accessible, also be included in the purchase price.

Most of the residents in this area are sick and/or elderly living on fixed incomes, or unemployed due to the economically poor conditions of our area.

It is unfair to expect these people to continue to pay taxes on land that they cannot use.

Please consider these important facts when the decision is made concerning purchase of structure verses purchase of structure and property.

Thank you.

Mr & Mrs William Barnett Jr.
Mr. & Mrs Richard J. Barnett
Mrs Clara M Lenhart

Identical letters were received under the following signatures:

Mr. and Mrs. Wayne Thompson
Mr. and Mrs. Ralph Nouseman
Mr. and Mrs. James Yokiel
Madeline Randig
Edith Myers
Anne M. Ashbaugh
Mr. and Mrs. Lewis DeMoss
D. Geysa
D. DeMoss
Fern Miller
Albert Miller
Ruth M. Kelly
Rev. Roy A. Kelly
Mr. and Mrs. Lucas
Mrs. Anna Dougherty
Mrs. Nettie E. Cole

William, Sr., and Helen Bennett	Letter of October 31, 1991
Margaret A. Marker	Letter of November 1, 1991
Form Letter, multiple signatures	Letter of November 1, 1991

Response to Comments:

The District will follow current Corps of Engineers real estate policy in acquiring property as provided for in P.L's. 85-500, 86-645, and 91-646. Briefly stated, this policy is to acquire the minimum interest in property for project purposes. In the case of a disposal area and haul road where use of the land is for a temporary period of time, temporary work area easements are all that is required. If structures are located within the limits of the proposed work area, they are purchased at fair market value and the owners/tenants are provided relocation benefits. However, if the remainder of the property is determined to be an uneconomic remnant subject to the easement and removal of the structures, then purchasing the entire parcel would be considered in accordance with good real estate practice.

We cannot make a commitment to purchase fee interest in any specific property at this time. Following project authorization and development of specific real estate requirements, the District Engineer will hold a landowners public meeting. At this time the District will discuss specific land interests to be acquired, approximate acquisition lines, an acquisition schedule, and public rights and benefits. A commitment as to whether the Corps would purchase fee interest in specific properties would be made at that time.

Carnegie Mellon

Department of Computer Science
Carnegie Mellon University
Pittsburgh, Pennsylvania 15213-3890
Telephone: (412) 268-7555
David.Pugh@cs.cmu.edu

November 1, 1991

Colonel Alvord
US Army Corps of Engineers
1900 Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222

Dear sir:

We have been closely following the US Army Corps of Engineer's plans for the lower Monongahela river and are deeply concerned by two aspects of the proposed plans. First, the process of notifying people who are affected by the plan seems to be, at best, seriously flawed. Second, the selection of the "2 for 3" plan (Plan 1) over the "3 for 3" (Plan 4) seems to show a callous disregard for the residents of the lower Monongahela valley.

With regard to the notification process, we first learned about the Corps' plans in early October. Since then, we have been attempting to contact and inform people, including elected officials, all along the Monongahela about the Corps' intentions. We have found that, even as late as October 29th, people who would be directly affected by the Corps' plan had not yet been notified. In particular, at least one resident of Bunola did not know that the Corps was planning to destroy his home until the 10/29 meeting between the Corps and the residents of Bunola. In general, most of the people that we talked to did not even know that the Corps was planning to modify the locks and dams. And, of the people that did know, few of them knew about the October 22nd citizen's meeting. As a result, we can not help but believe that the 10/22 meeting did not provide an adequate forum for people to express their opinion about the various plans to rebuild the locks and dams along the lower Monongahela river.

In addition, we have spoken with representatives of the Army Corps who have claimed that:

- they have discussed their plans with people and elected officials along the Monongahela river, and
- most people have not expressed a preference between Plans 1 and 4.

This directly contradicts our experience in talking with people up and down the river. Our experience has been that most people, when shown with the cost estimates for Plan 1 and Plan 4, are strongly in favor of Plan 4. To us, this means that the Corps is not adequately describing the various plans and their consequences. For example: Colonel Alvord, in his opening statement at the citizen's meeting on 10/22, described Plan 1 while stressing the need to upgrade the locks and dams on the lower Monongahela. When describing the impact of changing the river levels between Charleroi and Braddock, he was very careful to point out that the cost of rebuilding public facilities would be born by the Federal Government. However, he failed to mention that another plan was under consideration which would preserve the current river levels, avoid the need to rebuild public facilities and save area residents $100 million in modifications to private facilities.

It is easy to imagine that a harried local official who, when given a similar presentation, might fail to express a strong preference for any particular plan.

With regard to the selection of Plan 1 over Plan 4, we have looked at the economic analysis of both plans. According to the cost estimates produced by the US Army Corps of Engineers, the net cost of Plan 4 ($520.1 million) is only 3% higher than the net cost of Plan 1 ($503.8 million). However, at this point in the study, these cost estimates are little more than educated guesswork and it is impossible to say which plan will actually have the lowest net cost, since the difference in costs is far smaller than the potential error in the analysis. What is clear from looking at the two plans is that Plan 1 will seriously harm the economy along the lower Monongahela river. Because Plan 1 changes the water level along a 30 mile stretch of the Monongahela river, private companies, utilities and land owners will have to spend over $100 million modifying their facilities (water intakes, drainage systems, docks, etc.). Some companies will be able to pass these costs onto their customers. Others will be forced out of business because the market is not flexible enough to let them raise prices. In either case, the local economy is damaged.

Both Plan 1 and Plan 4 modernize the locks and dams along the lower Monongahela, reducing shipping costs and the chance of a catastrophic failure. The only advantage Plan 1 seems to offer over Plan 4 is that it reduces shipping costs slightly more than Plan 4 does. This benefit does not seem to justify imposing $100 million in costs on an economically depressed area. This is especially true once you realize that, even with the existing and nearly obsolete locks, transporting material by barge is currently economical and profitable.

In conclusion, we are requesting that the US Army Corps of Engineers does the following:

- extend the public comment period for the Lower Monongahela River System study by at least 30 days,
- notify, at the very least, anyone who has a permit for a river-side structure in the affected area or owns land on or near any of the proposed dumping sites,
- hold a second citizen's meeting in early December and notify each resident of the lower Monongahela valley area using a mass mailing to every home at least one week before the meeting,
- strongly recommend Plan 4 when the Lower Monongahela River System Study is presented to Congress, and
- find uninhabited land on which to dump any dredged or excavated material, instead of land on which people are now living.

Nothing less than these actions can alleviate our concerns about the Corps' plans for the lower Monongahela river.

We would like this letter to be included in the public record for the Lower Monongahela River

2

Navigation System Study.

Thank you,

David Pugh and Judy Krauss

3

Response to Comments:

Providing adequate notification to everyone who might have an interest in our projects is always a problem, especially with large scale projects such as the Lower Monongahela River Navigation System Study. The suggestion of a mass mailing to all residents of the project area has merit for smaller projects, but is impractical for this study where over 130,000 mailings would be required. In these situations, the District relies on the local media to provide mass notification. The District's public notice of the project and the formal public meeting to be held on October 22, 1991 was sent to over 900 local addresses including Congressional and state representatives, Federal and state agencies, mayors, commissioners, postmasters, libraries, newspapers, radio stations, industry, and citizens. Prior to the public meeting, District representatives made a door to door notification of proposed disposal site residents, either speaking with the residents or leaving a copy of the public notice.

While the costs of Plan Nos. 1 and 4 are very close and subject to some uncertainty, they were developed by a team of experts whose job it is to develop estimates of costs for different jobs. They do not develop one cost estimate, but rather thousands of individual cost estimates for every item required as part of a job, or plan. Estimates for all non-Federal relocation costs, such as sewer line adjustments, were obtained directly from the facilities' owners since they are more familiar with the work and cost required to make the adjustment. As a result, we feel that the cost estimates that we have developed for each plan are reasonable and, moreover, relatively correct in that further refinements would not favor one plan over the other.

The District believes that Plan No. 1 will help, not harm, the economy along the Lower Monongahela River in much the same way as the proposed Mon Valley Expressway. It will make the industries along the river more competitive through lower transportation costs and possibly encourage other industries to locate there at the sites of the closed steel mills. The majority of the companies having to bear the costs of relocating their shoreside facilities are regional, national, and even international (USX) companies whose principal link to the local communities is through employment at their plants, and not as a major market for their goods. Some industries, however, such as the water company near Duquesne, may incur costs for adjusting to pool changes without any corresponding benefit.

Our investigations indicate that the overall regional economy, which includes the coal mining operations along the river, will greatly benefit from Plan No. 1. The benefit to the Lower Monongahela economy would be less since it would adversely affect some companies, but is still believed to be positive because of the number of river-using industries in the area. The effect on the economy of some of the local communities and individuals may in fact be negative because of the need for relocations. While recognizing the negative impacts on individuals, businesses, and communities at the local level, the District believes they are worth the tradeoff of positive impacts in terms of employment and income at the regional and national level.

The official comment period of 45 days (September 27 - November 12, 1991) was not formally extended. However, late comments received through the month of November were accepted and included in the report.

All owners of permitted shoreside facilities were notified of the proposed project during the planning phase to obtain their estimates for relocations. During this phase, the District also notified municipal interests adjoining Monongahela River Pools 2 and 3, the City of Pittsburgh Department of City Planning, the Allegheny County Planning Department, the Pennsylvania Department of Community Affairs, the Southwestern Pennsylvania Regional Planning Commission, and the Turtle Creek Council of Governments. Meetings were also held at the request of the communities of West Elizabeth, Elizabeth, and Glassport.

No additional formal public meeting was held subsequent to the October 22, 1991 meeting. However, at that meeting the District committed to meeting with any requesting groups or individuals to discuss their specific concerns. Additional meetings with Lincoln Borough residents and/or officials were held on November 8, 18 & 19, 1991, and with Forward Township residents and/or officials on October 29, and November 4 & 18, 1991.

Plan No. 1 is the District's recommended plan based on greater net economic benefits, and on the endorsement of the majority of industry, municipalities and community planners along the river.

The District has committed to evaluate other alternative disposal sites following project authorization. The intent of these evaluations is to identify other disposal sites or options which would reduce social and environmental impacts without increasing disposal costs.

Judy Krauss & David Pugh
2120 Wightman Street
Pittsburgh, PA 15217
(412) 421-2269

Col. Alvord
U.S. Army Corps of Engineers
1900 Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222

November 6, 1991

Dear Sir,

This is a copy of a petition with 568 signatures collected over an eight (8) day period between October 29th and November 5th 1991.

Please put it in the public record for the Lower Monongahela River Navigation System Study. The originals of this petition are in our safe-keeping and are available for viewing upon request.

Additional signed petitions will be arriving at your office soon from other people in the Mon Valley Area. Please include them in the public record for the Lower Monongahela River Navigation System Study also. The originals of these later arrivals will also be available for viewing upon request.

Sincerely,
Judy Krauss & David Pugh
Judy Krauss & David Pugh

P.S.--We can also be reached at the following address:

Judy Krauss & David Pugh
c/o Clare Krauss
P.O. Box 165
Bunola, PA 15020

and messages for us can be left with Clare Krauss at (412)384-6147

November 8, 1991

Col. Alvord
U. S. Army Corps of Engineers
1900 Federal Bldg.
1000 Liberty Ave.
Pittsburgh, PA 15222

Dear Sir,

Please include these signed petition sheet copies in the public record concerning the Lower Monongahela River Navigation System Study. The originals will be available for viewing upon your request. Also, please note that other petition sheets of signatures have been sent to you for inclusion in the public record also.

Judy KRAUSS & DAVID Pugh
Judy Krauss &
David Pugh

5120 Wightman ST.
Pittsburgh, PA 1521
(412) 421-3269

We can also be reached through the following address:

c/o Clare Krauss
Box 165
Bunola, PA 1502
(412) 384-6147

David Pugh
2120 Wightman St.
Pittsburgh, PA 15217
(412) 421-2269

Colonel Alvord
US Army Corps of Engineers
1900 Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222

Dear sir:

Enclosed are copies of a petition that has been circulating concerning the Lower Monongahela River Navigation System Feasibility Study. There are 16 sheets, containing 182 signatures. Please enter these copies in the public record of the river system study. The originals can be examined by contacting me at the above address.

Thank you,

David Pugh

The US Army Corps of Engineers recommended plan for renovating the locks and dams along the lower Monongahela river, called plan '1' or "2 for 3" plan, will tear down Lock and Dam 3 at Elizabeth and renovate or replace locks and dams 2 and 4. This will change the water levels along a 30 mile stretch of the Monongahela river, forcing utility companies, area businesses and private land owners to spend over $100 million in modifications such as changing water intakes, docks, cooling systems, etc. It will also force the US Army Corps of Engineers to dredge the Monongahela river between Charleroi and Elizabeth in order to keep the river open for barge traffic.

Over 2 million cubic yards of dredged and excavated material will, according to the current plan, be dumped on inhabited property in Bunola and Coursin Hollow.

Another plan studied by the US Army Corps of Engineers plan '4' or the "3 for 3" plan is identical to the "2 for 3" plan except that it rebuilds Lock and Dam 3 with modern 84' x 720' locks instead of tearing it down. According to the US Army Corps of Engineers, the net cost of the "3 for 3" plan is estimated to be only 3% higher than that of the "2 for 3" plan and the "3 for 3" plan saves residents and companies in this economically depressed lower Monongahela valley $100 million in rebuilding costs. Both plans modernize the locks and dams along the lower Monongahela river, reducing the chance of failure and greatly improving river navigation.

THE UNDERSIGNED URGE THAT THE US ARMY CORPS OF ENGINEERS ADOPT THE "3 for 3" PLAN INSTEAD OF THE "2 for 3" PLAN, AND, NO MATTER WHICH PLAN IS ADOPTED, FIND UNINHABITED LAND ON WHICH TO DUMP THE DREDGE AND EXCAVATED MATERIAL.

1. Jan Blasioli	13. Mary Strayer
2. Vicky Higgins	14. [illegible]
3. [illegible]	15. Mary Jean Constantine
4. [illegible] M.D.	16. Joseph Constantine
5. Charlotte Long	17. Mary Charlotte Constantine
6. [illegible]	18. Gerald Albert Constantine
7. Kathryn A Bake	19. Charles Constantine
8. Scarlett Francis	20. David Neal
9. Sandy Coff	21. Maria Neal
10. Kristen Ya[illegible]	22. Mary Grace Constantine
11. Joanne Agapito	23. Mrs Lucy Zello
12. Joan Ryan	24. Mr. Nick Zello

attached a petition sign by people representing Coursin Hollow

Judy Krauss and
David Pugh/Petition

Letters of November 6 & 8, 1991
and undated letter received on
November 29, 1991

The signed petition reproduced on the previous page is one of 74 sheets enclosed with three transmittal letters from Judy Krauss and David Pugh dated November 6, 8 and 29, 1991. A total of 817 signatures were received under this petition, in addition to 338 signatures contained in a similar petition submitted by the Borough of Lincoln (see their letter dated November 27, 1991). All pages of these petitions have been placed in the District's project files. Over 400 of the 1,155 total signatures were noted as representing Lincoln Borough.

Response to Comments:

While it is true that Plan No. 1 requires over $100 million in adjustments by residents and businesses along the Lower Monongahela River compared to about $10 million for Plan No. 4, it should be realized that the majority of these costs are borne by the waterway users for dredging and making adjustments to their docks. These companies are also the principal direct beneficiaries of the recommended plan. While it is true that other business and individuals will also have cost under Plan 1 with little corresponding benefit, the benefits to the region as a whole of Plan 1 were felt to be sufficiently great to compensate for these costs. The expectation is that the region as a whole, even with the additional shoreside adjustment costs, will be better off in the long run under Plan 1 as compared to Plan 4.

The proposed disposal sites identified in the report are included in the recommended plan (Plan No. 1, the NED plan). However, as a result of comments received during the public review process, the District has committed to study alternative sites after project authorization. These studies will evaluate alternative sites or uses for the disposal material which would have less social and environmental impacts without increasing project costs. The District will also be receptive to further recommendations from the local communities.

26 November 1991

Colonel Harold Alvord
U.S.Army Corps of Engineers
1000 Liberty Ave.
Pittsburgh,Pa.

Dear Colonel Alvord:

Having been unable to attend any previous meetings concerning a proposed National Economic Development Plan relating to THE Monongahela River lock and dam system, I am grateful for the extended deadline that I may expressmy humble opinion for what it may be worth.

Our family residence since 1947 has been on Church St in Elizabeth,Pa and subject to flooding conditions four times requiring the removalof all furnishings from the cellar. The last time in November 1985 was the only time(a man made flood) water rose to and 17" above our first floor. Not only expensive but uncalled for.

My concern with the current proposal is seen as primarily providing another measure of flood control for the benefit of the city of Pittsburgh with the communities and areas between the two proposed locks being a sort of sacrificial lamb.

You are aware of the deterrent affect of the Youghiogheny and Kinzu Dams have had on their respective water courses and I strongly feel the same type of consideration should be a number one priority at the headwater of the Monongahela. This would at least be some assurance the affected area concerns were being considered. Even so the projected costs to the communities to be affected will be very expensive and for what purpose?

I question the economic benefits suggested in the newspaper accounts I have read other than those of a recreational nature because of the environmental concerns and govermental regulationa that are and will continue to be expanded and enforced. The questionable future of the Monessen and Clairton coke facilities, each of whose diminishing needs at the present could be adequately served by the railroads that are now on either side of the river gives me further cause to wonder.

I can understand the concern for the city of Pittsburgh but aside from that cannot see any long lasting benefit in the proposal as presented and as I understand it.

If it is to be lets first address that added measure of insuramce that would be in the building of a flood control dam at the headwaters of the Monongahela.Thats the way I see this question and I am not from Missouri. In its present presentation I wouldnt buy the package if I didnt live where we do,for it does in no way have any consideration for those people now living in areas where a rise in the present water level causes problems.

Yours truly,

Response to Comments:

With respect to flooding problems in Elizabeth and at other locations along the Monongahela River, the navigation locks and dams do not provide flood control. They are designed and constructed for the purpose of providing year-round navigation on the river.

The Corps of Engineers presently has two existing flood control reservoirs in the headwaters of the Monongahela River, Tygart Lake on the Tygart River and Stonewall Jackson Lake on the West Fork River. Although these projects are located in West Virginia, they reduce flood flows along the Monongahela River. The Pittsburgh District is continuing to study the headwaters area for additional opportunities to provide needed flood control.

In response to the comments on the economic benefits of the proposed navigation improvement project, please refer to the response to the Duquesne Light Company letter on Page J-101, where we have addressed similar concerns.

SIERRA CLUB

THE ALLEGHENY GROUP

Address reply to:

Marilyn Skolnick
109 South Ridge Drive
Monroeville, PA 15146

Les Dixon, Chief of Planning Divsion
Corps of Engineers, Pittsburgh District
Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222

11/29/91

Dear Mr. Dixon,

The Sierra Club, Allegheny Group, an environmental organization, with approximately 400 members in Southwestern Pennsylvania, believes that it is important to have navigable waterways with the least environmental impact for our region. We have read volume 1, the Draft Interim Report of the Lower Monogahela River Navigation System Feasibility Study September 1991 and have the following comments for your consideration.

In general, it has been the Sierra Club's experience that it is wise to include residents from the area in the decision making process before a proposal is made. In this instance in particular, where there is so much unemployment and poverty, people believe that they have been abandoned, and are to be "dumped upon" once more. It is not a surprise that there is so much opposition to your first choice and second choice sites and the sooner such a committee is formed the better.

Because of the importance of the project and in an effort to expedite the effort, the Sierra Club recommends that you immediately ask each affected municipality to select two representatives to serve on a Citizens Advisory Committee and to meet on a regular basis. The Corps will discuss the progress of the project with them; You will be amazed how much good will and information can be exchanged.

Now for the response to the Draft E.I.S.

Your Traffic Demand Forecasts appear to be very optimistic. The demand for steel has dropped dramatically. There does not appear to be a rosy outlook for an improved or increased demand in the near future. Industries that make use of steel have been downsizing dramatically annually. As you know, coke and coal are an essential component for steel making. It would follow that the demand for these would decrease also. Another aspect of demand, is that because of the downsizing of industries and their products, there is a decreased demand for electricity. In fact, Duqune Light is now in the process of attempting to sell its surplus electricity to the east coast. To forecast an increase in production of electricity is, at this time, a bit optimistic.

The need for the projects on the lower Mongahela should not be based upon over optimistic estimates of usage. The projects are needed regardless of the usage be it increased or status quo.

The selected plan ("2 for 3") replacement alternative has some serious consideration to be examined. You itemize the fish and wildlife concerns on page 7-5. In addition to these concerns, the Sierra Club is concerned with the Coursin Hollow site for disposal of the construction materials and the dredged materials.

The Allegheny Group of the Pennsylvania Chapter
Box 8241, Pittsburgh, PA 15217

RECYCLED PAPER

First we expect that you will, as a minimum, conform to the regulations of the Pennsylvania Department of Environmental Resources and, at a maximum, exceed the requirements where ever possible.

Coursin Hollow is located directly across the river from the USX Clairton Coke Works. This area is responsible for a number of air quality violations. It is in non compliance with the minium standards for PMI10 as regulated by the Clean Air Act of 1990. Part of the Allegheny County Bureau of Air Pollution's study indicates a portion of the problem may be due to dustfall. The proposed landfill area will add to an already bad situation because the materials destined for the landfill will be trucked in. There is no question that trucks will add to the dust fall problem.

In this heavily industrial area, Coursin Hollow represents a natural wooded area. The woods are mature with little ground or shrub cover. There is also a perennialstream present. What is unique is that it has been subject to little if any human disturbance with the efforts to preserve what little is left of natural wooded areas long the river fronts, the Sierra Club urges this site not be selected. This concern also exists for the Bunola site.

We strongly urge that an alternate site be selected. Residents of the area have recommended the Pangborn Hollow area be considered before deciding on one of the two "preferred" sites.

We are also concerned with the analysis of the sediments that will be landfilled due to the dredging. From your reports, it appears that there is an increase in metals the deeper the samples are taken. The corps claims that these samples are not typical. We are particularly concerned about the increased levels of lead. found at Site # 1, just below the Ashland Oil Company that had readings of 30 mgs at core depth of 1.0.' This is located near your preferred deposit area. All core samples indicated a lead content. EPA has been talking about tightening lead standards, and we urge you to further study the impact of lead content in the possible fill material. Page 9 of the United States Department of the Interior statement in Volume 6 of 6 states, "None of the other contaminant residues exceeded published guidelines, however levels of lead and cadmium may be high enough to suggest a chronic problem."

From your own report there will be (pages 7-7 to 7-14) many adjustments because of the rise in elevation in Poal 2. This fact further emphasizes the need for the formation Citizens Advisory Committee.

We are concerned about the effects upon the Turtle Creek Flood Protection Project. There has been a history of insufficient funds to maintain the channel. Someone must make a financial commitment to maintain the channel. Unless this is obtained before the Corps undertakes the modernization of the locks and dams, there will only be a temporary solution to the Turtle Creek Channel flooding. Here too it is necessary to directly involve the affected municipalities in order to establish an ongoing maintenance program.

This is, as the Corps discovered, a very controversial project. The Sierra Club, Allegheny Group urges you to avoid any takings. If this cannot be avoided, then the Corps should replace a house with a house. If no mortgage exists, the the Corps should replace the "taking" with a no mortgage replacement of equal value.

While the Corps is taking the users of the river interests as their first concern, it is equally important to consider the irreparable environmental harm the various alternatives will produce. To ignore or minimize the impact of the latter, will only incur and encourage lawsuits or other disruptive actions by interested parties.

From the discussions on pages 7-20 -21, it is impossible to see how the Corps determined that there were no significant archaeological materials at the Coursin Hollow site. Test probes will need to be done. We remind the Corps of the various cultural areas discovered when the I 279 highway project began due to the poor archaeological and superficial investigation that was made.

We call to your attention to the remarks made by the Pennsylvania Department of Environmental Resources in the letter to you dated August 26, 1991 where they support Plan 4 rather than the Corps Plan 1. They site many environmental problems connected with Plan 1. They present very compelling arguments against the implementation of Plan 1. The Sierra Club, Allegheny Group, in conclusion, voices many concerns connected with plan 1. Our members want the environmental issues to be weighed equally with the commercial benefits. At a time when, a business first attitude has overwhelmed our development considerations, we must rethink the way decisions are made. Too often, too late, the country has realized that minimizing environmental impacts has resulted in disasters. (Witness the many superfund sites; what to do with high and low level spent radioactive materials, to cite just two.)

The Allegheny Group urges that if no minimum environmental impact site can be found then, the Corps select the no action alternative. Your estimates of need are overstated and there will result improvements, with no environmental impacts.

We would be most happy to help in any way we can.

Sincerely Yours,

Marilyn Skolnik

Marilyn Skolnik
Chair, Sierra Club, Allegheny Group

Response to Comments:

The suggestion for the formation of a Citizens Advisory Committee has merit. Throughout the continued planning and design of the Lower Monongahela River Navigation project the Corps will coordinate with all interested local communities and organizations.

Our traffic demand forecasts were based on detailed analyses of waterway using industries, the particular circumstances of the companies within the study area, and surveys with government and private sector specialists in each industry. The effort is described in a two volume report entitled "Forecast of Future Ohio river Basin Waterway Traffic: 1986 - 2050" published in May of 1990. A summary of the report is provided in Volume 5, Navigation System Analysis, of the Lower Monongahela River Navigation Feasibility Study. In summary, downsizing of the steel industry was recognized and factored into the forecasts. However, coke is expected to continue to be produced in significant volumes in the areas as it remains among the low-cost production areas in the country. In contrast to the past when the coke was consumed by mills in the Pittsburgh area, most of the coke now is shipped to plants in other states. The Clairton plant in Pool 2 is the largest coke plant in the country. In addition to upgrades to allow the Clairton plant to comply with new Clean Air Regulations, two batteries were recently reopened that increased its maximum coal consumption by nearly 1.5 million tons per year.

Closure of the steel mills and the loss of other industry has led to a decline in the consumption of electricity in the area. Again, this was recognized when the forecasts were being developed. Much of this surplus electricity is being marketed on the East Coast where it is cheaper than generating electricity from the oil-fired plants typical of that area. Sales to the East Coast are significant and expected to increase in the future, as evidenced by the attempt of Duquesne Light to reopen its Phillips station and market the electricity in the Philadelphia/New Jersey area.

Coal shipments to plants outside traditional marketing areas are expected to increase in the future, principally through the use of barge/rail terminals in the Pittsburgh area. Ontario Hydro of Canada currently barges coal down the Monongahela River to Duquesne Wharf, where it is off-loaded to rail for shipment to Lake Erie. There it is loaded onto lake vessels for delivery to its Nanticoke station. The annual volume is several million tons. Similar types of movements to domestic coal-fired power plants are being investigated by the East Coast power companies and are expected to occur with increased frequency in the future.

The forecasts used in the analysis were developed based on the best information available. The traffic demand forecasts are our best estimate of the most probable level of long-term traffic on the river.

The Sierra Club's concerns with air quality and habitat quality at the proposed disposal sites are noted. Alternative disposal sites to Coursin Hollow and Bunola will be investigated after project authorization in the interest of reducing social and environmental impacts without increasing project costs. The feasibility of the Pangburn Hollow site will be reexamined as well as sites which may become available after project authorization. The District will also be receptive to suggestions for alternative disposal sites/methods from continuing local coordination.

The District will continue to coordinate with the Pennsylvania Department of Environmental Resources on the testing and analysis of dredged material for EPA designated priority pollutants. Material that does not qualify as "clean fill" will be placed in permitted disposal sites.

The Pittsburgh District has been authorized to restore the Turtle Creek Flood Protection project in cooperation with Allegheny County, the project sponsor. Construction is expected to be completed in the 1992-1994 time frame. The Turtle Creek design water surface would continue to be contained within the stream banks provided the channel of the restored flood protection project is maintained.

With Pool 2 raised to elevation 723.7 NGVD in the selected plan, slack water would extend an additional 3,500 feet up the Turtle Creek channel. The difference in channel siltation with the raised pool was analyzed and the results indicate that, under present conditions, 56,000 cubic yards of sediment would accumulate in the 3,500 foot channel reach in five years. With the proposed new Pool 2, the computations show that 47,000 cubic yards could accumulate in only three years. These effects have been coordinated with Allegheny County, the local sponsor of the restoration project. It is estimated that the additional cost of channel cleanout necessitated because of the increase in the proposed pool would be approximately $100,000 annually.

With regard to the Corp's acquisition policy, please refer to the response to a similar inquiry on page J-84.

We agree with the comment on the importance of giving equal consideration to environmental issues in project planning. We believe that we have identified the significant environmental impacts of the project alternatives and that decision makers now have adequate information to consider the environmental impacts of this recommendation.

Our present evaluation of cultural resources is in terms of the potential for affecting significant resources. Studies to identify and evaluate all significant resources in the project impact area will be undertaken following project authorization. These studies will conform to guidelines established in a programmatic agreement with the Pennsylvania Bureau for Historic Preservation and the Advisory Council on Historic Preservation.

A number of commenting individuals have recommended Plan 4 over Plan 1 for economic and/or environmental reasons. We acknowledge these concerns and would reiterate that we recognize that Plan 1 is not the environmentally preferred alternative. Our economic and environmental studies were conducted in conformance with current Federal and Corps of Engineers policy guidelines. Environmental impacts have been identified and evaluated and been given equal consideration in the formulation of project alternatives.

Duquesne Light
One Oxford Centre
301 Grant Street
Pittsburgh, PA 15279

(412) 393-6000

VIA MESSENGER

December 2, 1991

Lester S. Dixon, Ph.D., P.E.
Chief, Planning Division
Department of the Army
Pittsburgh District
Corps of Engineers
William S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, Pennsylvania 15222

RE: Comment Period For The Lower Monongahela River Navigation System Draft Feasibility Study And Environmental Impact Statement

Dear Mr. Dixon:

Enclosed for consideration by the Corps and inclusion in the administrative record is a copy of Duquesne Light Company's comment package for the Lower Monongahela River Navigation System Draft Feasibility Study and Environmental Impact Statement, the availability of which was published in the September 27, 1991 edition of the Federal Register. In addition to the enclosed documents, we request that copies of all the documents which were previously submitted to the Corps also be included in the administrative record. These documents include, but are not limited to, the Written Statement of Duquesne Light Company ("DLCO") which was submitted at the Public Meeting on October 22, 1991, and the following correspondence:

1. Letter from R. Holderbaum (Gannett Fleming Water Resources Engineers, Inc.) to J. Clark (DLCO), dated July 24, 1986.

2. Letter from J. Clark (DLCO) to R. Holderbaum (Gannett Fleming Water Resources Engineers, Inc.), dated August 15, 1986.

3. Letter from J. Purdy (Corps) to S. Pernick (DLCO), dated March 14, 1991.

4. Letter from K. Shaffer (DLCO) to J. Hoey (Corps), dated March 22, 1991.

5. Letter from S. Pernick (DLCO) to J. Purdy (Corps), dated April 5, 1991.

6. Letter from J. Carey (DLCO) to L. Dixon (Corps), dated September 4, 1991.

7. Letter from W. Costelnock (Allegheny Power System) to C. Weiser (Corps), dated September 4, 1991.

8. Letter from J. Carey (DLCO) to L. Dixon (Corps), dated November 8, 1991.

We also take this opportunity to re-emphasize several of the major points which are presented in the enclosed and referenced documentation.

Thermal Conditions In The Lower Monongahela River

The Corps has, on several occasions, questioned the existence of "zones of passage" or thermal stratification zones used as the basis for the DLCO Elrama Power Station's Section 316(a) thermal variance. The stated basis for this question is the purported mixing that occurs from barge traffic moving between the Elrama Power Station and Lock and Dam No. 3. It is important to note in this regard that the modeling upon which the thermal variance is based is, itself, based on actual in-stream temperature profiles observed during thermal studies conducted by DLCO's consultant in 1977-78. The validation was performed under typical river conditions including, but not limited to, on-going barge traffic. Therefore, while it is obvious that barge traffic tends to have a mixing effect in the river, thermal stratification or zones of passage still occur in the relevant pool (Pool No. 3) and are still protective of the aquatic community.

Indeed, a recent study conducted in late 1990, pursuant to a Department of Environmental Resources-approved workplan, demonstrates that the variance as implemented through the Thermal Discharge Control Strategy ("TDCS") is protective of the aquatic community and has, in fact, resulted in an improvement in the sport fishery in Pool No. 3. The improvement in the fishery is largely a result of the significant improvement in the water quality during the study period. A copy of the study is contained in the enclosed comment package.

All of the available scientific evidence indicates that the variance and the TDCS are having the expected results; i.e., protecting and maintaining the existence of a balanced, indigenous, aquatic community in the lower Monongahela River. These facts refute the Corps' unsubstantiated suspicions that mixing caused by barge traffic somehow undermines the basis of the Section 316(a) variance and the TDCS. To the contrary, we fully anticipate that the variance and the TDCS will be implemented in future NPDES permits for the Elrama Power Station.

Accordingly, we strongly disagree with the Corps' speculation that cooling towers and/or a loss of the Section 316(a) variance is inevitable during the operating life of the Elrama Power Station, if river conditions are maintained as they exist with the current Locks and Dams configuration.

<u>DLCO's Costs Should Be Included As "Federal Project Costs"</u>

As discussed in the enclosed and referenced documentation, DLCO anticipates that it will incur significant adjustment costs as a result of the Corps' proposed actions. DLCO strenuously disagrees with the Corps' statement that these costs are not "project" costs. Even if the Corps is correct in its assumption that "[a]ll of the alternative plans . . . will modify the conditions under which the Pennsylvania Department of Environmental Resources issued thermal variances,"[1] it necessarily follows that all of the costs caused by such changes would be "directly or indirectly incurred as a result of the implementation" of the relevant plan. As such, the costs are clearly "project" costs and should be included in the Corps' analysis. This alone justifies reconsideration of the project.

[1]DLCO does not agree with the Corps' implied conclusion that a change in "the physical configuration of the navigation structures" would necessarily require reconsideration of the thermal discharge variance. To the contrary, the variance would have to be reconsidered <u>only</u> if the plan resulted in a change to the aquatic population or the thermal discharge. See, 44 Fed. Reg. 32894 (1979). DLCO believes that a "Three-for-Three" plan could be implemented such that there would be no adverse impact on either the aquatic population or the thermal discharge.

Moreover, given the unique nature of DLCO and the fact that it performs a governmental function, these costs should be designated as "federal project costs" pursuant to 33 U.S.C. § 633. DLCO requests that the Corps reconsider its draft position regarding this issue and include DLCO in Table 7-6 of the Draft Feasibility Study.

The Corps Should Implement A Three-For-Three Plan

The Draft Feasibility Study and Draft Environmental Impact Study recommend "Plan No. 1" as the National Economic Development plan and the "Selected Plan." Although DLCO is in favor of renovating Locks and Dams Nos. 2, 3, and 4, it cannot support Plan No. 1 and we strongly urge the Corps to reconsider its recommendation.

Instead of pursuing Plan No. 1, and the faulty assumptions upon which it is based, the Corps should focus its attention on one of the "Three-for-Three" plans which would rebuild Lock and Dam No. 3 in its present location, or in a downstream location. Such a plan would not only satisfy the planning objectives, it also would eliminate many of the significant public and private sector costs (financial, environmental, and otherwise) associated with Plan No. 1. DLCO Company likely would be in a position to support such a plan, if it were chosen by the Corps.

Conclusion

Duquesne Light Company appreciates the opportunity to submit this comment package. Please do not hesitate to contact me if you have any questions.

Sincerely,

James K Coal for SLP

S. L. Pernick, Jr.
Manager, Environmental Affairs

SUMMARY OF MEMORANDUM DATED NOVEMBER 27, 1991 PREPARED BY EA ENGINEERING, SCIENCE, AND TECHNOLOGY FOR DUQUESNE LIGHT COMPANY ON LOWER MONONGAHELA RIVEP. NAVIGATION STUDY

EA's concerns focused on three general areas:

1. Fish and wildlife,

2. Hydrology and water quality, and

3. Economic analysis.

The conclusions of their analyses in these three areas were as follows:

1. Fish and wildlife - They do not believe that an accurate comparison was made of resource losses and mitigation value. Specifically, they considered the environmental features of the recommended plan (design features in new Dam 2 and Locks 4 to enhance reaeration; increase in shallow water habitat) to be inadequate to compensate for the loss of the tailwater habitat with the removal of Dam 3.

2. Hydrology and water quality - They believe that the report is deficient in evaluating the environmental and economic impacts of removing of Dam 3. Specifically, removal of Dam 3 or rebuilding it 0.8 miles upstream could jeopradize the present thermal discharge variance at the company's Elrama power plant, and result in substantial expenditures for discharge control measures.

3. Economic analysis - They believe that the study is deficient because the analysis underestimated costs by not considering cooling towers and overestimated benefits by using optimistic and incorrect traffic growth forecasts and aged data.

Duquesne Light Company's letter of December 2, 1991 contained two enclosures, a memorandum from EA Engineering, Science and Technology prepared for Duquesne Light Company dated November 27, 1991, and a copy of *Elrama Power Station Section 316 (a) Variance Supplement*, September 1991, prepared for Duquesne Light Company by Energy & Environmental Management, Inc. These enclosures are retained in their entirety in the District's project files. The written statement of Duquesne Light Company submitted at the October 22, 1991 public meeting is in the District's files and is reproduced in the Feasibility Report Public Involvement Appendix.

Response to Comments:

The District does not believe that the utilities' future retention of their thermal variances is solely dependent on continuation of the existing navigation system configuration, nor that the necessity for cooling towers or load reductions can be attributed to any of the project alternatives. None of the alternatives including the No Action Alternative would have an effect on flow or thermal loading in the Lower Monongahela River. Therefore, we do not consider the proposed changes to the river that result from the alternatives to be the deciding factor in the renewal of the Elrama plant's thermal discharge variance. Consequently, the costs of cooling towers if the variance was not renewed was not considered as project costs. Furthermove, if they were included as a project cost, they would not qualify for adjustment at Federal expense under the criteria set forth in Section 111 of Public Law 85-500, as amended.

The letter and attached documents also commented on other aspects of the study, including the fish and wildlife analysis and the economic analysis. A response to a similar comment on the fish and wildlife analysis is included in the response to a letter dated November 14, 1991 from the Pennsylvania Department of Environmental Resources. A response to the comments concerning the economic analysis are provided below.

The development of the traffic demand forecasts is discussed in Navigation System Analysis Appendix (Volume 5) of the Lower Monongahela River study, and a much more detailed and expansive discussion of the methodology and findings is available in a separate, two volume report entitled, "Forecast of Future Ohio River Basin Waterway Traffic, 1986 - 2050" (referred to from hereon as ORS Forecasts). This report is available for review in the Huntington and Pittsburgh District offices of the U.S. Army Corps of Engineers. As described in Section 3 of the Navigation System Analysis Appendix, traffic demand forecasts relied on historic traffic patterns to establish base year traffic levels, industry forecasts for short term growth rates for relevant commodities, and the U.S. Department of Commerce's OBERS population and economic forecasts for long term growth rates. Adjustments to these market driven forecasts were based on results of extensive industry and shipper surveys conducted as part of detailed industry analysis that is described in Part I of the ORS Forecasts. The methodology employed in forecasting system traffic demands did not involve the use of econometric, predictive models of any sort. It has been the Navigation Center's experience that, at least in the short run, shippers are the best and most reliable source of predictive information. In summary, the Navigation Center relied heavily on industrial associations and individual companies for short term growth rates and judged these short term forecasts to be reasonable.

Long run forecasts were based on the 1985 OBERS publication and, as noted, more recent OBERS forecasts became available in 1990. These forecasts were not, however, available when the traffic demand forecasts were prepared by the Navigation Center. Comparisons where made to determine how OBERS' forecasts were performing relative to actual trends and were found to be consistently lower than actual rates of growth.

It should be pointed out that population forecasts, while important, were not the principal variable used in developing long term utility forecasts. Values for historic OBERS variables in each utilities' service area were compared to each utilities' electricity generation in establishing proportional relationships between generation (by market sector) and an appropriate OBERS variable. For example, while residential electricity consumption might be tied to population growth, commercial and industrial consumption were more likely to be related to economic variables.

Traffic forecasts have a definite impact on delays expected in future years. Current delays are not high because there is sufficient capacity to handle current levels of traffic. Delays in future years are expected to increase significantly, but not until the year 2030, some 40 years from now. Simulation analysis performed by the Navigation Center indicates that at the traffic levels predicted for 2030, delays will become a serious problem. Because traffic level and delay relationships are best described by hyperbolic functions, traffic delays do not grow rapidly until that critical point where each additional ton of traffic causes exponential increases in traffic congestion. Traffic forecast for the year 2030 is that critical point for the Lower Monongahela projects. A series of curves representing this function and the relationship between traffic levels and tow delays is displayed in Attachment II of the Navigation System Analysis Appendix.

Benefits are also affected by transportation rate savings. As discussed in Section 5 of the Navigation System Analysis Appendix, a re-analysis of the 1982 transportation rate data was completed in 1989 in order to have more current rate information for the final feasibility report. A total of 1601 movements, roughly one of every five Ohio River System movements, were rated for the 1982 study, a time consuming and costly study. For the update, 701 of those movements were submitted to rate analysts for re-analysis. Wherever possible rates were obtained from shippers, however, transportation rates are not public information. In the absence of shipper-provided rates, the analysts used rail and barge costing models and published tariff rates in determining current rates. No rates were forecast. The 1989 rate update is adequate for use in long range planning.

The congestion fee alternative was analyzed based upon the most probable without condition, including the forecast and rates, as described. The analysis adequately considers the viability of this non-structural alternative.