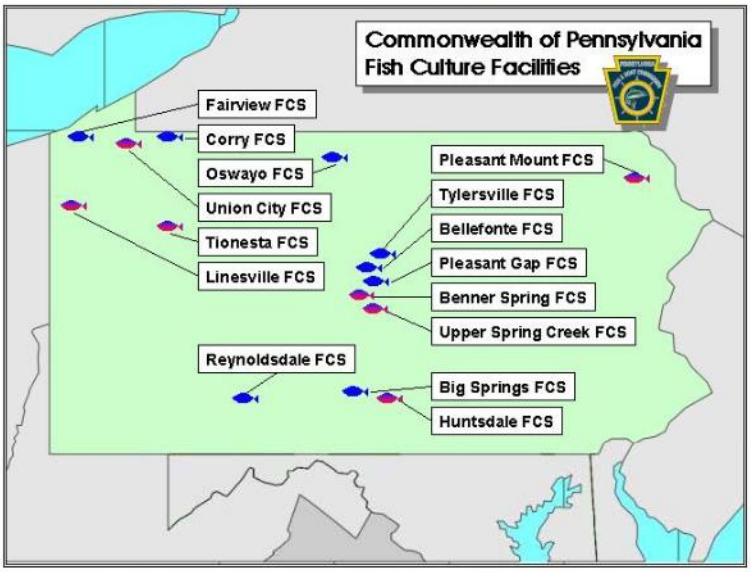
EXECUTIVE SUMMARY REPORT

JUNE 2002

Pennsylvania
Commonwealth

Fish Culture Station



EVALUATION

Prepared by

FISHPRO

5201 South Sixth Street Road
Springfield, IL 62703-5143
(217) 585-8300
FAX (217) 585-1890

REPORT TABLE OF CONTENTS

Page

About This Document....1
Preface....1
Project Description & Study....2
State Hatchery System Production and Stocking Overview....3
System Infrastructure Overview....5
Coldwater Fish Production System Overview....5
Cool/Warmwater Fish Production System Overview....7
Future Fish Production and Stocking Summary....7
Facility Operation Cost & Production Cost Summary....9
Hatchery Wastewater and Effluent Analysis....10
Biological Assessments....12
Privatization Analysis....14
Recommendations, Improvements and Opinions of Probable Cost....14
Implementation Plan....22
Implementation Plan Benefits....23
Action Needed by PFBC....24
Acknowledgments....24

List of Tables

Table 1. PFBC Fish Culture Stations
Table 2. PFBC Fish Culture Station Infrastructure Summary
Table 3. PFBC Cool/Warmwater 2000-2001 Production
Table 4. Relative Priority of Importance for Cool/Warmwater Fish Production and Fish Trading
Table 5. A Comparison of DMR Exceedences from 2000 through 2001 and Impairment of Receiving Streams Identified by DEP Bioassessments
Table 6. Wastewater Treatment Tiers In Place and Proposed at PFBC Fish Culture Stations
Table 7. Opinions of Probable Cost for PFBC Fish Culture Station Improvements/Renovation

List of Figures

Figure 1. PFBC Fish Culture Station Locations
Figure 2. Total Coldwater Production for F.Y. 2000-2001 Compared to the Maximum and Minimum Values from 1996-2001
Figure 3. Average Annual Expenditures for All PFBC Fish Culture Stations for F.Y. 2000-2001
Figure 4. Tier 1 & Tier 2 Existing PFBC Effluent Treatment
Figure 5. Proposed Tier 3, 4 & 5 Effluent Treatment Enhancement
Figure 6. Typical Fish Hatchery Improvement Project Flow Chart

Improvement Drawings

I. INTRODUCTION

About This Document

In March of 2001, the Pennsylvania Fish & Boat Commission (PFBC) contracted FishPro/Cochran & Wilken, Inc., Consulting Engineers and Scientists of Springfield, IL to complete a Commonwealth Cold and Cool/Warmwater Fish Culture System Evaluation. This Executive Summary Report provides a brief overview of the study, and summary of findings and recommendations contained within the **Pennsylvania Fish & Boat Commission, Commonwealth of Pennsylvania Fish Culture Station Evaluation.** This Executive Summary Report is intended to highlight the findings contained within the report; however, the reader is strongly encouraged to review the main document for clarification of details.

It is recommended that the PFBC use this document and its supporting information as a framework and guideline to direct the capital improvements to the Pennsylvania Fish Culture Station system. This is a planning tool and is not intended to be used as a substitute for Construction Phase Documents, which provide detailed drawings, specifications, and opinions of probable cost, and are developed as a component of the Planning and Design Phase of each project. Construction documents must be developed to specifically define construction details, as-built conditions and to be in full compliance with all applicable Commonwealth and local codes, permitting requirements, and Pennsylvania Department of General Services (DGS) and PFBC guidelines.

Preface

Recreational fishing in the United States has grown to become the most popular recreational activity in the country, second only to swimming. According to a 1996 National Survey conducted by the U.S. Department of the Interior, Fish and Wildlife Service, and the U.S. Department of Commerce, Bureau of the Census, 35.2 million U.S. residents 16 years of age and older engaged in fishing activities throughout the country. Of the 35.2 million, 1.35 million residents and nonresidents enjoyed fishing activities throughout the Commonwealth of Pennsylvania. Approximately 1.1 million (81%) of those fishing the state were Pennsylvania residents, while 260,000 (19%) were nonresidents. Those fishing the Commonwealth averaged 15.6 days per angler and almost 21.1 million total fishing days.

The popularity of recreational fishing has increased the demand for goods and services by an estimated 37 percent nationwide between 1991 and 1996. In Pennsylvania alone, anglers spent approximately $649 million on fishing related items that included $296 million on trip related expenditures, $124 million on equipment, and $229 million in other expenses such as magazines, club memberships and tours. These expenditures translated to over 16,677 Pennsylvania jobs in 1996 (American Sportfishing Association, 1996). Therefore, it is very important to protect, manage, and enhance the fisheries resources throughout Pennsylvania.

Fisheries management programs utilize fish stocking from Pennsylvania Fish & Boat Commission (PFBC) operated fish culture stations as one of several essential tools to provide fisheries resource management throughout the Commonwealth. The major objectives of public fish culture stations include:

- Production of fingerling fish for stocking new waters open to public fishing and fish Co-ops
- Supplementation of existing fish populations in public waters where natural recruitment is low
- Restoration of populations following fish kills
- Production of selected predatory sport fishes in order to control over-abundant forage species and provide additional recreational opportunities
- Restoration of various fish populations where human-influenced factors caused declines in fish abundance

These produced fish must meet very specific requirements including species, numbers, size, genetic integrity, disease-free status, and proper timing for stocking. Stocking requires significant knowledge of Commonwealth aquatic resources and a high degree of coordination between fish culturists and fisheries management biologists to successfully raise, transport and stock high-quality, healthy fish.

For more than one hundred years, Game and Fish agencies across the country have successfully integrated fish stocking requirements with the operation of public fish hatcheries. All fifty states and the Federal government operate public hatcheries that are designed and operated to provide a highly flexible, but also consistent, wide variety of fishes.

Project Description & Study

The **Commonwealth of Pennsylvania Fish Culture Station Evaluation** consisted of a review and analysis of identified major problems and potential solutions at fifteen (15) PFBC fish culture stations. The areas of critical review included water supply and treatment, effluent management, supplemental dissolved oxygen management of the aquaculture water supplies, rearing unit improvements, rearing unit expansion, general hatchery operations, and a variety of selected infrastructure improvements including expansion potential. The fish production program was evaluated utilizing historical and current (2000-2001) production numbers and projected future requirements. Potential solutions and possible options to the hatchery infrastructure problems and deficiencies were also provided. Construction cost opinions and projected time frame requirements for implementation were included. Operational constraints associated with effluent treatment systems and water supplies were reviewed.

The project scope, as specified in the contract, focused on items within each of the following broad tasks.

Task 1. Data Collection

A. Orientation Meeting & Initial Transfer of Data, Drawings & Reports with Q&A session.
B. Field Inspection of Facilities
C. Facility Infrastructure Data Collection & Questionnaires
D. Data Collection - Historical System-Wide Fish Production Data & Cost of Operation & Report / Document Review
E. Privatization Questionnaire & Data Collection on Commercial Aquaculture Capabilities

Task 2. Review and Evaluation

A. Review of Current & Future Fish Production Requirements
B. Cost of Operations & Cost Efficiency Analysis and Review of Personnel Needs
C. Facility Infrastructure Assessment, Documentation & Potential Repairs & Improvements (wastewater, infrastructure cost analysis)
D. Facility Effluent Assessment & Potential Treatment & Costs. Discharge License Compliance Recommendations

Task 3. Findings

A. Objective Presentation of Study Findings & Evaluation Criteria & Recommendations

Task 4. Alternatives / Options Analysis

A. Options to Meet Current & Future Production Needs Efficiently & Effectively
B. Opportunities to Utilize Private Sector Aquaculture in Meeting PFBC Fish Requirements.
C. Options to Improve Operation, Effectiveness & Efficiency of the Statewide PFBC Hatchery System

Task 5. Management Recommendations

A. Recommendations & Implementation Plan, Costs & Benefits (monetary, social, political, resource mgt.)

Task 6. Report Preparation / Review Coordination, Project Control & Staff / Legislative Presentations

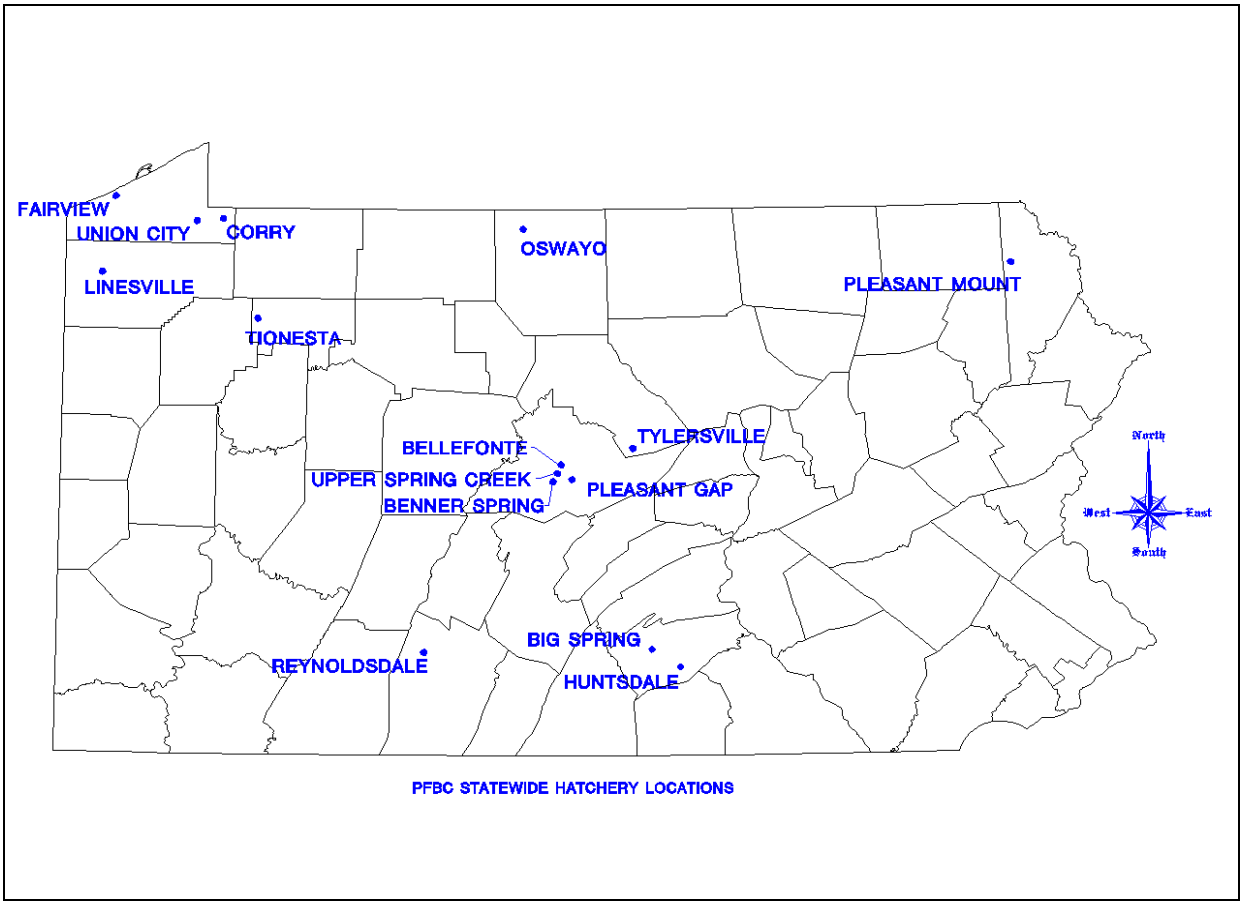
State Hatchery System Production and Stocking Overview

The Pennsylvania Fish & Boat Commission (PFBC) operates a total of fifteen (15) fish culture stations (9 coldwater FCS and 6 cool/warmwater FCS). The fish culture stations maintained throughout the Commonwealth of Pennsylvania are listed alphabetically in Table 1 and depicted geographically in Figure 1. In addition, the PFBC operates the Van Dyke Shad Restoration Hatchery in Juniata County on a seasonal basis.

Table 1. PFBC Fish Culture Stations

- Bellefonte (coldwater)
- Benner Spring (cold and cool/warmwater)
- Big Spring (coldwater)
- Corry (coldwater)
- Huntsdale (cold and cool/warmwater)
- Oswayo (coldwater)
- Pleasant Gap (coldwater)
- Reynoldsdale (coldwater)
- Tylersville (coldwater)
- Fairview (coldwater and cool/warmwater)
- Linesville (coldwater and cool/warmwater)
- Pleasant Mount (coldwater and cool/warmwater)
- Tionesta (coldwater and cool/warmwater)
- Union City (cool/warmwater)
- Upper Spring Creek (coldwater and cool/warmwater)

Figure 1. PFBC Fish Culture Station Locations



The major objectives of these facilities are to produce the requested amount of freshwater species needed to support fisheries management in the Commonwealth. The PFBC has produced a wide variety of fishes including brook trout, rainbow trout, brown trout, golden (palomino) trout, steelhead trout, lake trout, coho salmon, northern pike, purebred muskellunge, tiger muskellunge, walleye, sauger, saugeye, striped bass, striped bass hybrid, brown bullhead catfish, emerald shiner, black crappie, bluegill, channel catfish, fathead minnows, largemouth bass, paddlefish, redear sunfish, smallmouth bass, white crappie, yellow perch, chain pickerel, golden shiner, white sucker, and American shad.

Fish production can be optimized both by repairing and renovating existing fish culture stations and/or by constructing new fish culture stations. Therefore, a comprehensive evaluation of the current infrastructure and operational regime was needed to determine whether the hatcheries are functioning at maximum efficiency and production capacity, given the constraints set forth in the National Pollution Discharge Elimination System (NPDES) permits administered by the Pennsylvania Department of Environmental Protection (DEP).

Stocking of propagated fish requires a detailed knowledge of Pennsylvania waters and is a critical component of the PFBC Commonwealth-wide fisheries management program. In addition, stocking and transport include a substantial expenditure of manpower and equipment by each of the PFBC fish culture stations. Stockings are defined as all instances where the transport truck stops and distributes a portion of or its entire load to Pennsylvania waters. A total of 439,521 cold, cool and warmwater transport truck stocking miles were completed during the 2001 production year. Coldwater (trout) stocking efforts resulted in 1,920 trips covering 372,518 miles (85% of total PFBC stocking miles) while cool/warmwater stocking resulted in 398 trips covering 67,303 miles (15% of total PFBC miles).

System Infrastructure Overview

Table 2 provides a comparative infrastructure summary of the fifteen (15) Pennsylvania Fish and Boat Commission fish culture stations evaluated in this study regarding the water supply, wastewater discharge, fish rearing facilities, hatching facilities, support facilities, staffing, electrical supply and site conditions.

Improvement recommendations and implementation opinions for all of the PFBC fish culture stations were evaluated based upon the critical needs of fish production, effluent treatment requirements, and PFBC staff recommendations.

Coldwater Fish Production System Overview

Coldwater species produced in 2000-2001 included brook trout, brown trout, rainbow trout and the phenotypic variation of the rainbow trout, the golden trout. Two anadromous coldwater species, steelhead trout and coho salmon, were also produced in 2000-2001 and are used in the management of Lake Erie. While these species are coldwater, they have been traditionally

Table 2. PFBC Fish Culture Station Infrastructure Summary

	Bellefonte	**Benner Springs**	**Big Spring**	**Corry**	**Huntsdale**	**Oswayo**	**Pleasant Gap**	**Reynoldsdale**	**Tylersville**	**Fairview**	**Linesville**	**Pleasant Mount**	**Tionesta**	**Union City**	**Upper Spring Creek**
Water Supply															
Source	Spring / 2 Production Wells	Spring / Creek / 2 Production Wells	Spring	3 Springs / 3 Pumped Wells / Recirc.	12 Springs	2 Springs / Recirc.	5 Springs / Creek / Quarries / 2 Production Wells / Recirc.	Spring / Partial Recirc.	Spring	2 Springs / Creek "Recirc."	2 Pumps at Reservoir / 4 Production Wells	River / 3 Production Wells / Recirc.	3 Production Wells / Creek	Reservoir / Creek / Production Well	2 Production Wells
Water Flow Available	3,000 gpm / 1,850 gpm	5,000 gpm / 350 gpm/ 1,500 gpm	8000 gpm	950 gpm / 325 gpm / 1,000 gpm	12,000 gpm	2,100 gpm / 1,200 gpm	2,250 gpm / 1,000 gpm / 500 gpm / 300 gpm / 600 gpm	1,350 gpm / 600 gpm	16,500 gpm (peak) (4,000 to 6,000 gpm available *)	900 gpm / 350 gpm	3,000 gpm / 600 gpm (only 1,500 gpm at once from reservoir)	1,700 gpm / 580 gpm / 400 gpm	1,200 gpm / 300 gpm	Peak 1,050 gpm / 60 gpm / 25 gpm	950 gpm combined (only 365 gpm currently available)
Potential for Additional Water															
Water Quality	High Dissolved Gas	High Dissolved Gas	High Dissolved Gas	Sediment and High Dissolved Gas	Sediment and High Dissolved Gas	"Gray Beard"	Warm Water, and High Dissolved Gas	High Dissolved Gas	Sediment, Variable Temps, and Whirling Disease	Sediment, and Variable Temps.	Variable Temps.	High Temps., low pH, and low hardness and alkalinity	Variable Temps., and Pathogens in Creek Water	Variable Temps., and Sediment	Variable Temps.
Condition of Water Supply Lines / Yr. Installed	Good / 19??	Good / 1952	Good	Good / 1973	Fair / 19??	Fair / 1970	Fair / 1903	Fair/ 1928	Good / 1998	Good / 1976	Fair / 1940 and 1984	Poor / 1977	Fair / 1973	Fair/ 19??	Good / 19??
Water Treatment / Yr. Equipment Installed	GS, PSA AGs, and LH CCs	GS, AD in Aeration Tower, LH CC, PCs, UV, and LOX	LH CCs, LOX, PF, and UV	GS, LOX, and LH CCs	PF, PC, SC, PSA AGs, Boilers, and UV	AD in aeration tower, PSA AGs, and LH CCs	AD in Aeration Tower, PCs, and LOX	PC, and MA	GS, LOX, PSA AG, Drum MS, and UV	GS, PSA AG, and LH CC	AD in aeration basin, LH CC, PSA AG, Heat Exchangers, and UV	GS, PC, LH CC, UV, and Boiler	Iron and Sand Filter, AD Aeration Tower, PSA AG, LH CC, UV, and Boilers	GS, PF, UV, Boiler, LOX in Canisters, LH CC, Low-Pressure Air to Ponds	GS, and PC
Wastewater Discharge															
Type of Receiving Water	Spring Creek	Spring Creek	Big Spring	South Branch of French Creek and Spencer Creek	Yellow Breeches Creek	Oswayo Creek	Logan Branch	Stone Creek and Dunning Creek	Big Fishing Creek	Trout Run	Pymatuning Reservoir	Lackawaxen River	Tubbs Run	Bentley Run	Spring Creek
Discharges and Total Discharge Flow	2 / 5.357 MGD (2000 Avg.) or 3,720 gpm	2 / 8.22 MGD (2000 Avg.) or 5,700 gpm	1 / 8.046 MGD (2000 Avg.) or 5,600 gpm	2 / 1.885 MGD (2000 Avg.) or 1,300 gpm	2 / 13.752 MGD (2000 Avg.) or 9,500 gpm	1 / 3.110 MGD (2000 Avg.) or 2,150 gpm	2 / 4.919 MGD (2000 Avg.) or 3,400 gpm	2 / 1.978 MGD (2000 Avg.) or 1,375 gpm	1 / 16.384 MGD (2000 Avg.) or 11,500 gpm	1 / 1.471 MGD (2000 Avg.) or 1,025 gpm	16 / 1.243 MGD (2000 Avg.) or 865 gpm	1 / 1.150 MGD (2000 Avg.) or 800 gpm	4 / 1.982 MGD (2000 Avg.) or 1,375 gpm	7 / 0.881 MGD (2000 Avg.) or 615 gpm	3 / 0.309 MGD (2000 Avg.) or 215 gpm
Existing Type of Treatment	Clarifier and 2 Settling Ponds	Clarifier and 2 Settling Ponds	Clarifier	Modified Raceways "Clarifiers"	Clarifier and Settling Pond	Clarifier and Settling Pond	Clarifier and Settling Pond	Settling Ditches	Clarifier and Settling Pond	Clarifier and Settling Pond	Varies -- Direct Discharge into Reservoir & Multiple Settling Ponds	Clarifier and Settling Pond	Clarifier and Settling Pond	Varies -- Direct Discharge into Bentley Run & Multiple Settling Ponds	Varies -- Direct Discharge into Spring Creek & Multiple Settling Ponds
Fish Rearing Facilities															
Type / Description	79 Concrete RWYs and 3 Display Silos	104 Concrete RWYs and 4 Ponds	80 Concrete RWYs	50 Concrete RWYs and 4 Ponds	164 Concrete RWYS and 11 Ponds	48 Concrete RWYs and 1 Pond	20 Concrete Raceways	103 Concrete RWYs, 35 Earthen RWYs/Ponds	50 Concrete RWYs	16 Concrete RWYs	9 Concrete RWYs, 44 Ponds, and 3 Silos	46 Concrete RWYs, and 22 Ponds	40 RWYs and 8 Ponds	7 Production Ponds	25 Concrete RWYs and 4 Ponds
Acres / Cubic Feet	108,900 CF	133,824 CF and 2.0 Acres	120,000 CF	106,400 CF and 7.0 Acres	224,400 CF and 6.0 Acres	57,600 CF and 1 Acre	70,000 CF	44,700 CF and 3.0 Acres	80,000 CF	24,000 CF	9,700 CF and 26 Acres	57,000 CF, and 112 Acres	32,000 CF and 8.0 Acres	5.0 Acres	7,500 CF and 3.0 Acres
Condition	Fair	RWYs -- Good and Ponds -- Fair/Poor	Good	Rwys -- Good/Fair and Pond -- Fair/Poor	Rwys -- Good and Ponds -- Good	RWYs -- Fair/Good and Pond Fair	Fair	Fair/Poor	Good	Good	RWYs -- Fair/Poor and Ponds -- Fair	RWYs -- Fair and Ponds -- Fair	RWYs -- Good and Ponds -- Good	Fair/Poor	RWYs - Poor and Ponds -- Good
Problems	Replace Standpipes, Concrete Repairs, Install Bird Predation Protection, and Install Flow Baffles	Concrete Repairs, Install Flow Baffles, and Repair and Line Ponds	Closed Fall 2001	Concrete Repair and Renovate Ponds	Replace Standpipes, Install Flow Baffles, and Line Ponds	Concrete Repairs, Replace Standpipes, Install Flow Baffles, Install Bird Predation Protection over Lower RWYs, Repair and Line Pond	Replace Lower RWYs, Install Bird Predation Protection, Install Flow Baffles,	Renovate All RWYs and Ponds, and Install Bird Predation Protection	Install Flow Baffles, Replace Standpipes, and Install Bird Predation Protection	Install Flow Baffles	Reconstruct Concrete RWYs, Construction of New Ponds, Regrade, Reslope, and Line Ponds, and Concrete Repairs	Construct New Ponds at Hankins Site, Pond Repairs, Repair and/or Construct New Inlet and Outlet Structure in Ponds, Consolidate Some Ponds, and Redesign and Reconstruct RWYs	Regrade, Reslope, and Line Ponds, Renovate Tubbs Runs RWYs, Replace Standpipes, Install Flow Baffles,	Dredge, Regrade, Reslope, and Line Ponds, Construct Harvest (Outlet) Structures, Replace Gates with Valves,	Remove RWYs and Install Either New RWYs or Circular Tanks, Replace Harvest Structures, Subdivide Warming Pond for Production
Hatching Facilities															
Type / Description	14 Concrete, 12 Stainless Steel, 4 Fiberglass Tanks, 12 Circular Tanks, 4 Egg Jars, and 120 Egg Trays	20 Concrete, 24 Fiberglass Tanks, 28 Circular Tanks, 48 Egg Jars, and 118 Egg Trays	39 Fiberglass Tanks and 144 Egg Trays	16 Concrete Tanks and 16 Egg Jars	68 Concrete and 32 Fiberglass Tanks, 60 Egg Jars, and 80 Egg Trays	32 Fiberglass Tanks, 60 Egg Jars, and 192 Egg Trays	16 Concrete and 31 Fiberglass Tanks, and 120 Egg Trays	27 Concrete and 5 Fiberglass Tanks and 56 Egg Trays and Light House Controll for Broodstock	20 Concrete Tanks, and 216 Egg Trays	None	22 Concrete and 12 Fiberglass Tanks, 128 Egg Jars, and 64 Egg Trays	26 Concrete and 27 Fiberglass Tanks, 128 Egg Jars, and 24 Egg Trays	8 Concrete and 30 Fiberglass Tanks, 12 Circular Tanks, and 128 Egg Jars	52 Fiberglass Tanks, and 48 Egg Jars	8 Fiberglass Tanks, 8 Egg Trays, and Spawning Jars
Condition	Good	Good	Good	Good	Good	Fair/Poor	Fair/Poor	Good	Good	NA	Tanks -- Good and Egg Units -- Poor	Concrete Tanks -- Poor and All Other Units -- Good	Circular Tanks and Egg Units -- Poor and All Other Units -- Good	Egg Incubation Units -- Poor and Fiberglass Tanks -- Good	Fair/Poor
Problems	Additional HB Rearing Space Required	NA	Closed Fall 2001	NA	Double Rearing Units in Coldwater HB and Additional water and HB Space Required and Security Lighting	Repair/Replace Fiberglass Units, Additional Egg Incubation Units	Repair/Replace Fiberglass Units	NA	Whirling Disease in Water and Low Water Temps.	NA	Replace Egg Incubation Units	Replace Concrete Tanks with Fiberglass Tanks	Renovate Circular Tanks for Phase I Fingerlings and Replace Egg Incubation Units	Replace Egg Incubation Units and Piping	Install New Early Rearing Tanks and Egg Incubation Units (Trays)
Other Support Facilities															
Type / Description	Multi-Purpose Bldg., PSA AG Bldgs, Generator Bldgs, Bulk Feed Silos, Pump House, Lower HB, Pole Bldg, and Spring House	Main Office Bldg (Lab and Research), Storage Bldg, Feed Bldg, Bulk Feed Storage Bins, Generator Bldg, Garage, and Pole Bldg	Multi-Purpose Bldg, Sewage Treatment Bldg, Chemical Storage Bldg, Pump House, Vehicle Storage, and Bulk Feed Bins	HB, Office and Garage, Pole Bldg, Lower HB, Foster Generator Bldg, Annex Generator Bldg, Main Generator Bldg, Bulk Feed Bins	Multi-Purpose Bldg, Coldwater and Cool/Warmwater HBs, Pole Bldg, Feed/Shop Bldg, Generator Bldgs	HB, Generator Bldg, Electrical Bldg, Oxygen Bldg, Recirc. Pump House, Storage Barn, Feed and Chemical Storage Bldg	HB, Chemical Storage Bldg, Oxygen Bldg, Generator Bldg, Plumbing Shop, Mixing Bldg, Spring House, Garage, and Lower Generator Bldg	Multi-Purpose Bldg, HB, Barn, Vehicle Storage Bldg, Generator Bldg, Storage/Chemical Bldg	HB, Drum Filter and UV Bldg, Garage and Maintenance, Bulk Feed Bins, Oxygen Bldg, Pole Bldg, and Dry Beds	HB, Generator Bldg, Recirc. Pump House, and Aeration Bldg	HB, Maintenance Bldg, Aeration Bldg, Four Production Well Bldgs, Reservoir Pump House, Generator Bldgs, Storage Buildings, and Oxygen Bldg	Two HB (Coldwater and Coolwater Production), Maintenance Garage, Production Well Bldg, Generator Bldg, Barn, Pole Bldg, and Small Barn	HB, Garage/Workshop, Oxygen Bldg, Generator Bldgs, Pole Bldg, Sludge Drying Bldg, Feed and Chemical Storage Bldg, Tubbs Run Pump House, Office/Visitor's Center, and Maintenance Garage	HB, Pole Bldg, Barn, and Sand Filter House	HB
Problems	Expand Garage, Pole Bldg, and HB Rearing Space	Improve Feed Storage and Pole Bldgs, Replace Bulk Feed Bins	Closed in 2001	New Equipment/Storage Bldg, Additional Bulk Feed Bin, Install Underdrain near lower RWYs	Renovate Residence, Construct New Storage Bldg w/ Chemical and Feed Storage, Repair Pole Bldg, Replace Bulk Feed Bins, and Renovate Multi-Purpose Bldg	Construct New Storage Bldg, Replace Roof HB, Sump Pump in Residence, Renovate HB, and Expand HB to Support Increased Production	Replace Roof on Garage, Construct New Storage Bldg, Remove Plumbing Shop, Expand Feed and Chemical Storage, Renovate HB, Replace Bulk Feed Bins, and Construct Shelter over Intake	Replace Roof on Multi-Purpose Bldg, and Renovate HB	Remove Drying Bed, Replace Residence Garage, and Renovate Bldgs	Expand Pole Bldg, (Chemical and Feed Storage), Replace HB Roof, and Renovate Residence	Remove and Replace Storage Bldgs, Replace Roof on HB, and Renovate HB	Demolish Old Barn, Construct New Vehicle and Feed Bldg, Renovate Coldwater Production HB, and Renovate Residences	Construct Filter and UV Bldg at Tubbs Run, Replace Fiberglass on Drying Bldg	Replace/Expand Garage, Renovate HB, Improve Sand Filter Bldg, Additional Chemical Storage and Office Space, Repairs/Renovations to Garage, Barn, and Residence	Renovate HB, and Additional Space for Chemical and Feed Storage
Residence / Condition	None	None	1 (1,200 SF) Good	1 (2,040 SF) Poor	1 (2,000 est. SF) Fair	1 (1,600 SF) Good	1 (1,250 SF) Good	1 (2,200 SF) Fair	1 (1,800 SF) Good	1 (1,200 SF) Fair	1 (1,250 SF) Good	2 (2,000 and 1,100 SF) Fair and Good	None	1 (1,250 SF) Good	None
Annual Public Visitation	6,000	2,000	NA	5,000	5,000	1,000	500	17,500	500	300	80,000	7,500	1,700	100	None
Staffing															
Number of Employees	11 FT and 1 PT	12 FT	11 FT and 1 PT	7 FT and 1 PT	17 FT and 1 PT	8 FT and 1 PT	10 FT and 1 PT	8 FT and 1 PT	12 FT and 1 PT	6 FT and 1 PT	10 FT	10 FT and 1 PT	8 FT and 1 PT	5 FT and 1 PT	None
Electrical Supply															
Available Electric Power	Three Phase	Three Phase	Three Phase	Three Phase	Three Phase	Three Phase	Three Phase	Three Phase	Three Phase	Three Phase	Three Phase	Three Phase	Three Phase	One and Three Phase	One and Three Phase
Utility $ (2000)	$32,736	$20,745	$118,084	$64,577	$63,710	$32,826	$18,472	$35,477	$33,884	$17,959	$59,143	$35,527	$32,622	$12,194	$0
Instrumentation / Generator	Good / Good	Good / Fair	Good/Good	Poor / Good	Fair / Good	Good / Good	Good / Good	Poor / Fair	Good / Fair	Good / Good	Good / Good	Fair / Good	Good / Fair	Fair / Fair	Poor / Poor
Site Conditions															
Flooding	Partial	Partial	Minimal	Partial (Annex Property)	Partial	Partial	Partial	Partial	Partial	Partial	Partial	Most	Partial	Minimal	Partial
Available Space for Expansion	Poor	Poor	Poor	Good (Annex Propoerty)	Good	Good	Poor	Excellent	Poor	Fair	Excellent	Good	Poor	Fair	Excellent
Suitable Adjacent Land for Expansion	Poor	Poor	Poor	Good	Fair	Fair	Poor	Good	Poor	Fair	Fair	Fair	Poor	Fair	Fair

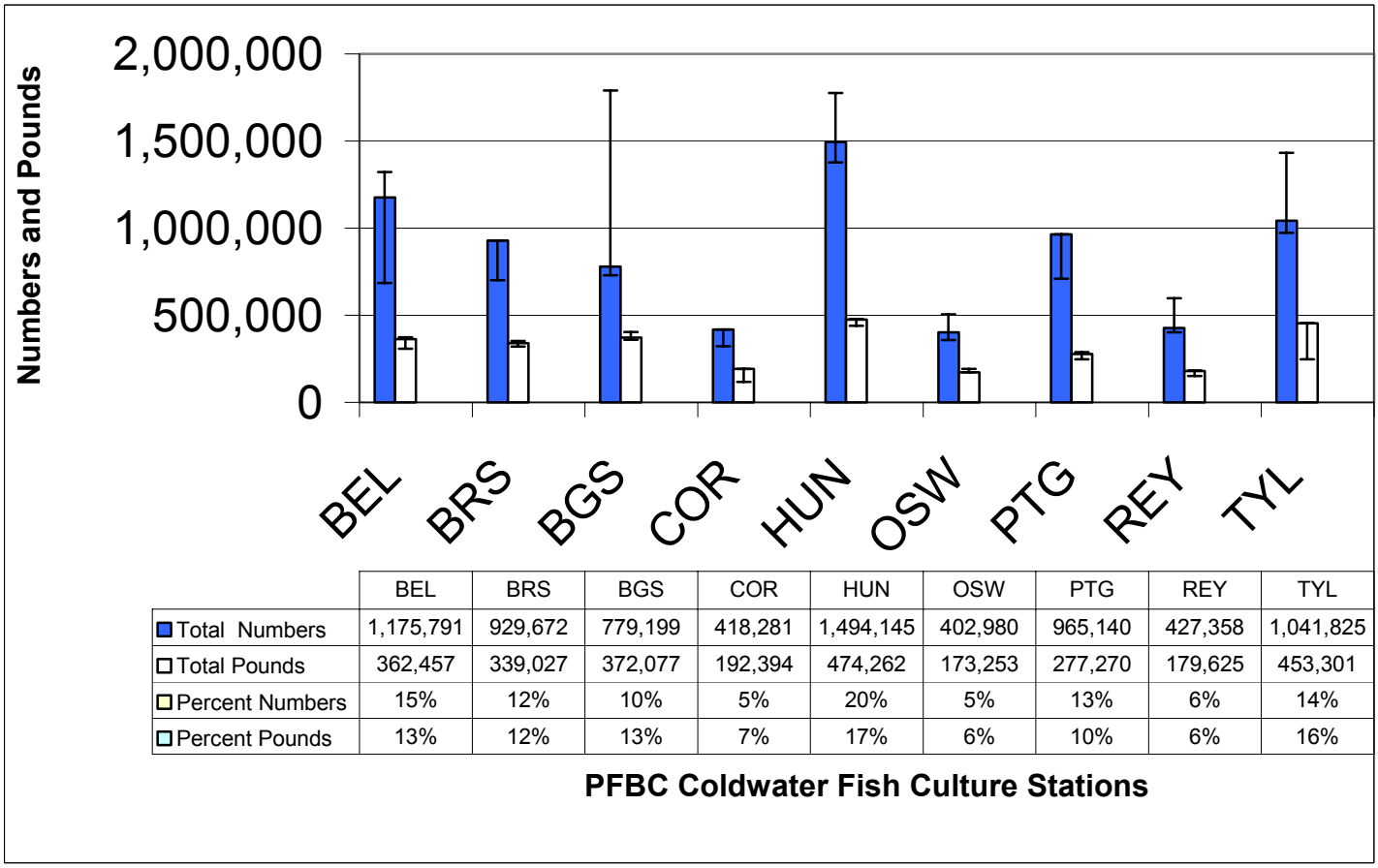
Key
HB = Hatchery Building, RWY = Raceway, A/D = Aeration/Degassing, UV Ultraviolet Disinfection, PF = Pressure Sand Filtration, PSA AG = Pressure Swing Absorption Air Generators, LH CC = Low Head Contact Chambers, GS = Gross Debris Screening, PC = Packed Columns, LOX = Liquid Bulk Oxygen, SC = Sealed Columns, Recirc. = Recirculation, MA = Mechanical Aerators, MS = Microscreen……..

* Interagency Agreement limits flow used within facility.

categorized under the cool/warmwater stations that are producing them and will therefore be discussed under the cool/warmwater production section (see below).

Approximately 5.2 million catchable trout were produced at PFBC fish culture stations during the 2000-2001 production year. These 5.2 million fish averaged two fish per pound totaling approximately 2.7 million pounds of production total. In a typical production year, 98 percent of the coldwater production (pounds) is for catchable size trout while two percent of the total production (pounds) is for fingerling trout. Figure 2 displays species produced within the PFBC system during the 2000-2001 production year. Dark bars represent the total number produced, while the light bars represent the total pounds produced. Range bars on both the numbers and pounds reflect the historical range of production (maximum and minimum) from 1996 through 2001. In some cases, the maximum historical range is the 2001 production level. The PFBC in 2000-2001 also produced 1.1 million fingerling trout for cooperative nurseries within the Commonwealth of Pennsylvania.

Figure 2. Total Coldwater Production for F.Y. 2000-2001 Compared to the Maximum and Minimum Values from 1996-2001



	BEL	BRS	BGS	COR	HUN	OSW	PTG	REY	TYL
Total Numbers	1,175,791	929,672	779,199	418,281	1,494,145	402,980	965,140	427,358	1,041,825
Total Pounds	362,457	339,027	372,077	192,394	474,262	173,253	277,270	179,625	453,301
Percent Numbers	15%	12%	10%	5%	20%	5%	13%	6%	14%
Percent Pounds	13%	12%	13%	7%	17%	6%	10%	6%	16%

Cool/Warmwater Fish Production System Overview

The cool/warmwater program is completed at seven of the fifteen PFBC stations. These stations include Benner Spring, Huntsdale, Fairview, Linesville, Pleasant Mount, Tionesta, and Union City. Six of the seven also currently produce or have historically produced coldwater species in addition to the cool/warmwater species. Where possible, a separation of coldwater production versus cool/warmwater production efforts was made. Historically, cool/warmwater species have included black crappie, bluegill, brown bullhead, chain pickerel, channel catfish, emerald shiner, fathead minnows, golden shiner, largemouth bass, northern pike, paddlefish, purebred muskellunge, redear sunfish, rock bass, sauger, saugeye, smallmouth bass, striped bass, striped bass hybrid, tiger muskellunge, walleye, white crappie, white sucker, and yellow perch. In addition to the above species, two (2) anadromous coldwater species, steelhead trout and coho salmon, and one warmwater anadromous species, American shad, have all been produced within these eight stations. Lake trout have also been produced in limited numbers historically. Table 3 lists the 2001 production year totals by fish culture station for all size classes.

During the 2000-2001 production year, 19 different species of cool/warmwater fish were produced at PFBC fish culture stations. These species were divided into three (3) main size classes including fry, fingerlings, and adults. Approximately 77 million fry, 2 million fingerlings, and 500,000 adults were produced within the system. Overall, cool/warmwater species produced approached or even exceeded the level requested for fry and fingerling but fell short of the adult production requested in both the 2001 production year and the 1996-2001 average period analyzed. Cool/warmwater production is highly variable making historical comparisons difficult. In most years, several species must be obtained from other state sources in order to complete the stocking requests. These species include channel catfish, striped bass, hybrid striped bass, saugeye, sauger, lake trout, white crappie, redear sunfish, paddlefish, smallmouth bass, white bass, emerald shiner, spotfin shiner, and golden shiner. Limited extensive (pond) production space and high demand for larger cool/warmwater fish species necessitate the transfer/trading of fish with other state programs. While this type of species acquisition is difficult to manage, many agencies in other states (including PFBC) engage in fish trading activities in order to meet State/Commonwealth stocking requests. Table 4 provides a summary of cool/warmwater production (by species) and the relationship of fish trading activities to the PFBC production program.

Future Fish Production and Stocking Summary

Coldwater

Several factors significantly influence the future adult trout production program of the PFBC. First, the ongoing fisheries management assessment of the resource, management goals, and stocking requirements, and second, the PFBC will be hosting a multi-state Trout Summit in mid-2002 to re-evaluate trout management in the Commonwealth. This effort will involve the PFBC, other State fisheries management agencies, angler groups, and other entities. The results of the

Table 3. PFBC Cool/Warmwater 2000-2001 Production

	2000-2001 Numbers	2000-2001 Pounds	Max 1996-2001 Numbers	Min 1996-2001 Numbers	Max 1996-2001 Pounds	Min 1996-2001 Pounds
Benner Spring	80,860	650	138,853	45,350	3,319	650
Fairview	402,481	44,271	818,424	332,666	52,897	40,486
Huntsdale	35,087	772	15,657,375	35,087	2,380	66
Linesville	28,434,444	17,739	40,304,812	28,434,444	18,779	16,322
Pleasant Mount	29,290,982	13,652	30,263,393	14,215,587	20,470	7,976
Tionesta	13,602,715	61,014	15,387,835	13,602,715	78,733	57,114
Union City	1,866,337	836	3,882,040	1,739,335	1,422	605
Totals	73,712,906	138,934				

Data includes all size and age classes.

TABLE 4. RELATIVE PRIORITY OF IMPORTANCE FOR COOL/WARMWATER FISH PRODUCTION AND FISH TRADING

RANK	SPECIES	A. PFBC BROODSTOCK & REARING SPACE AVAILABLE	B. OUT-OF-STATE EGGS/FRY REQUIRED & PFBC REARING SPACE AVAILABLE	C. OUT-OF-STATE ALL LIFESTAGES REQUIRED
1	Walleye	X		
2	Channel Catfish			X
3	Striped Bass			X
4	Hybrid Striped Bass			X
5	Muskellunge	X		
6	Tiger Muskellunge	X		
7	Saugeye		X	
8	Sauger		X	
9	Lake Trout		X	
10	White Crappie			X
11	Bluegill	X		
12	Black Crappie	X		
13	Redear Sunfish			X
14	Largemouth Bass	X		
15	Paddlefish		X	
16	Chain Pickerel	X		
17	Smallmouth Bass			X
18	Northern Pike	X		
19	White Bass			X
20	Emerald Shiner			X
21	Spotfin Shiner			X
22	Fathead Minnow	X		
23	Golden Shiner			X
24	White Sucker	X		

A. Broodstock and rearing units are available at PA Fish Culture Stations at current levels of production requested by Division of Fisheries Management.
B. Eggs and fry must be imported, but rearing units are available.
C. All lifestages requested must be imported.

Data provided by PFBC, 2002.

Trout Summit will help define trout production and stocking requirements for the future. The final significant factor is the ability of the PFBC system to meet both the effluent water quality standards and the evolving benthic invertebrate bioassessments. Enhanced effluent treatment will require significant resources. It should be noted that the three (3) adult trout production scenarios evaluated during the study as directed by the PFBC (4,500,000 fish and 2,250,000 pounds; 3,800,000 fish and 1,900,000 pounds; and 3,500,000 fish and 1,750,000 pounds) are all significant decreases from the historical PFBC adult trout production levels. By comparison to the Year 2000-2001 production (5.2 million fish and 2.7 million pounds), the three (3) production scenarios reflect a 17%, 30%, and 35% decrease in numbers and 19%, 31%, and 37% decrease in pounds. The impact of these decreases to Commonwealth-wide trout management and angling quality will be important topics discussed at the upcoming Trout Summit.

Several issues have dramatically impacted adult trout production capability within the PFBC fish culture stations. The closure of the Big Spring Fish Culture Station in 2001 resulted in the loss of the third largest trout production facility (14%, 733,083 trout, 397,093 lbs. in 2000). Tylersville Fish Culture Station, the second largest facility (15%, 825,252 trout, 453,948 lbs. in 2000), has been limited to a peak biomass of 525,000 adults, 262,000 lbs. (a 34% decrease). These two reductions resulted in over 1,000,000 adult trout (500,000 lbs.) impact to production capacity. In total, PFBC efforts to directly reduce the effluent impacts of the hatchery system in 2001-2002 resulted in a reduction of trout production to approximately 3.8 million trout weighing 1.9 million pounds annually.

The long-term status of Big Spring Fish Culture Station should be revisited with PA DEP in light of new effluent treatment, reevaluation of the benthic invertebrate bioassessments, and evaluation of numeric TMDL (Total Maximum Daily Load) discharge criteria for Big Spring Creek. Pilot testing of disc microscreening at Tylersville, as well as the similar production level operations of the new Oden State Fish Hatchery in Michigan involving total effluent microscreening of hatchery discharge water, state-of-the-art solids capture, and effluent quality should be evaluated. The Big Spring Fish Culture Station has, next to Huntsdale, the best water supply of the PFBC trout production facilities. The Big Spring FCS also has valuable, highly viable production infrastructure that should not be abandoned. The replacement value of the facility is between $12 and $15 million based on today's construction costs.

Cool/Warmwater

Most cool/warmwater facility operations do not require the constant flow and discharge associated with the production of coldwater species and therefore have not been subject to the effluent impact-related voluntary reduction scenarios. While not a constant discharging operation, the cool/warmwater program can have some effluent-related impacts primarily during draining and harvest of extensive production ponds. From 1996 through 2001, the cool/warmwater facilities combined produced an annual average of 79 million fish (including fry, fingerling, and adults), 143,000 pounds. The existing cool/warmwater PFBC system is capable of meeting current and anticipated future stocking requirements with the implementation

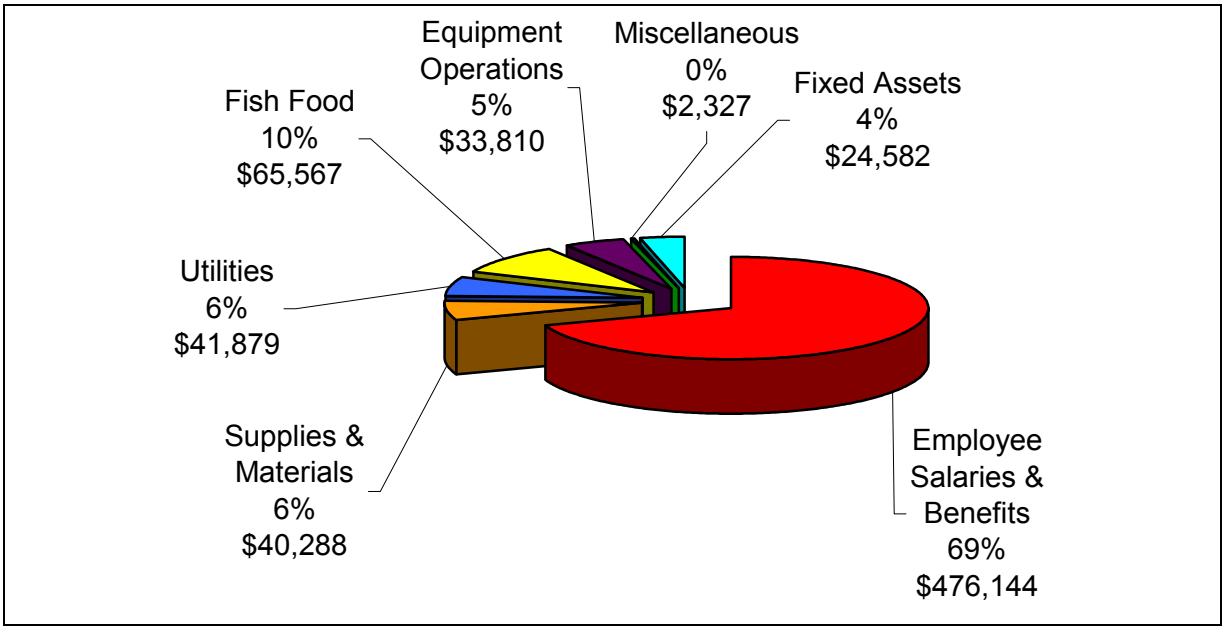
of some pond, water supply and existing infrastructure improvements outlined in the report. These improvements can be phased in over time as funding becomes available.

Facility Operation Cost & Production Cost Summary

The entire PFBC system was analyzed for cost of operations. From 1996 through 2001, the total cost to operate the PFBC program averaged approximately $9.1 million and ranged from a low of $8.5 million to a high of $9.5 million. The size and complexity of each fish culture station varied greatly, making station-to-station comparisons and system-wide generalizations difficult. Despite this difficulty, the average facility operation cost was estimated to be $655,128 per station. Individual facility operational costs ranged from a low of $234,414 to a high of $1.1 million.

Fiscal Year 2000-2001 data provided by the PFBC was grouped into seven (7) categories for the purpose of analysis: Employee salaries and benefits; supplies and materials; utilities; fish food; equipment operations; miscellaneous; and fixed assets. Figure 3 is a pie chart that displays F.Y. 2000-2001 expenditures by category. For comparison, the six-year average (1996-2001) expenditures were similar to F.Y. 2000-2001. Employee salaries and benefits accounted for 71% of total fish culture station expenditures historically, with fish food making up 10%, utilities 6%, supplies & materials 5%, equipment operations 3%, miscellaneous 2%, and fixed assets 3%. On a per station basis, the operating costs of the PFBC system is comparable to the average operational cost of facilities in other states.

Figure 3. Average Annual Expenditures for All PFBC Fish Culture Stations for F.Y. 2000-2001



Hatchery Wastewater and Effluent Analysis

Hatchery Wastewater Summary

All fish culture stations discharge wastewater that contains a limited set of metabolically generated waste products. The major waste products include phosphorus, nitrogen, solids and carbon dioxide. Fish metabolic activity also consumes oxygen and increases the biochemical oxygen demand in the wastewater. While these potential sources of waste generation have been a source of concern within the PFBC system, technologies and management practices designed to reduce the impact are being utilized at each of the fifteen PFBC stations. These treatment technologies and management practices include diet manipulation, feeding regimes, quiescent zones, flow baffles, clarifiers, and settling ponds. Table 6 provides a summary of the wastewater treatment practices that are currently in place and proposed for within the PFBC system. These practices have allowed the PFBC system to operate within the numeric criteria set forth in the NPDES permits. While some instantaneous and isolated concentration exceedences have occurred, continuous violations of numeric permit limits have not been observed (see Table 5). Annual mass loading to receiving streams is well under the permitted criteria for all facilities. However, benthic impacts to the receiving streams (discussed later in this document) remain a concern.

Treatment technologies and management practices can be divided into five tiers or levels. Table 6, Figure 4 and Figure 5 illustrate the treatment tiers. The first tier utilizes detailed data from the hatchery to develop best management practices (BMP's) aimed at producing a high quality fish while reducing potential waste. Tier 1 targets the solids produced in the rearing units and their collection and separation from overflow water. Included in the first tier are diet manipulation, feeding regimes, flow baffles, quiescent zones, and solids clarification systems. Tier 1 effluent management practices in place within the PFBC fish culture system typically reduce metabolic waste in the overflow water by 30-50% in traditional coldwater facilities utilizing linear raceways. The first treatment tier also involves the capture and processing of solids from quiescent zones (QZ) during rearing unit cleaning. The solids capture process already employed at PFBC coldwater stations is the utilization of rectangular and (in one case) circular clarifiers. Clarifiers receive wastewater from the QZ via wastewater piping, settle the solids via gravity settling, and then further concentrate the waste for disposal. The separated overflow water from the Tier 1 solids capture treatment is allowed to pass on to Tier 2 treatment (see below). Solids collected by the clarification process require further handling to remove the solid waste from the gravity clarification units. These processes include pumping and/or vacuuming solids to sludge drying beds, sludge storage systems, and land application vehicles designed to remove the waste from the facility and apply it to local lands under landowner agreements. Tier 1B (Table 6) provides a listing of proposed sludge storage systems at PFBC stations to accommodate frequent cleaning of clarifiers and winter non-land application periods. The clarification processes can remove from 60% to 90% of the quiescent zone settled solids.

Table 6. Wastewater Treatment Tiers In Place and Proposed at PFBC Fish Culture Stations

	Tier 1 -- Rearing Unit Cleaning Solids Collection, Clarification, & Disposal	Tier 1B -- Sludge Storage [1]	Tier 2 -- Overflow Water Settling Pond	Tier 3 -- Microscreening of Overflow Water [1]	Tier 4 -- Aeration of Settling Pond (BOD Reduction) [1]	Tier 5 -- Filtration of Overflow Water & High Technology Treatment [1]
Bellefonte	BMPs, QZ, CL	*	SP	*	*	*
Benner Spring	BMPs, QZ, CL	*	SP	*	*	*
Big Spring	BMPs, QZ, CL					* (Recirculation System)
Corry	BMPs, QZ, Municipal System	*	SP	*	*	*
Huntsdale	BMPs, QZ, CL	*	SP	*	*	*
Oswayo	BMPs, QZ, CL	*	SP	*	*	*
Pleasant Gap	BMPs, QZ, CL	*	SP	*	*	*
Reynoldsdale [2]	BMPs, * (New Rearing System)	*		*	*	*
Tylersville	BMPs, QZ, CL		SP	* (Pilot Testing Ongoing)	*	*
Fairview	BMPs, QZ, CL		SP			
Linesville	BMPs		SP			
Pleasant Mount	BMPs, QZ, CL		SP			
Tionesta	BMPs, QZ, CL	*	SP	*	*	
Union City	BMPs		SP			
Upper Spring Creek			SP			

Best Management Practices (BMPs) -- diet manipulation, enhanced feeding regimes, flow baffles, vacuuming and/or cleaning of rearing units, quiescent zones, clarifiers, and settling ponds
Quiescent Zones (QZ)
Wastewater Clarifier (CL)
Microsreening Overflow (MS)
Settling Pond (SP)
Aerated Settling Pond (ASP)
Bed filtration (BF)

* Proposed Wastewater Treatment

(1) Tiers 1B, 3, 4, and 5 are enhanced wastewater treatment technologies that are proposed for incremental installation and evaluation at PFBC fish culture stations. Cooperative evaluation of enhanced wastewater treatment performance by PFBC and DEP including numeric effluent parameter reductions and biological integrity of benthic invertebrate communities, and receiving stream impacts will be required for each tier.

(2) New rearing system is proposed.

The second tier (Table 6) involves the treatment of overflow water that was not impacted by the quiescent zone solids settling and removal. This water typically includes 50% of the solids load that was generated by the feeding process and also includes the entire proportion of dissolved chemical constituents and finer non-settling type particles. Tier 2 type processes currently in place within the PFBC system involve the use of overflow water settling ponds. Currently, all PFBC stations employ settling ponds as a form of Tier 2 treatment. However, these types of settling techniques can produce varied results. The variability of the conditions (algae and accumulated solids) within the ponds can add to the effluent concentrations observed (i.e., organic enrichment). Improvements to the settling ponds have been completed by the PFBC at several facilities. These improvements include plastic membrane basin lining, floating baffles to improve flow patterns and enhance settling, and basin cleaning.

The Tier 3 proposed effluent treatment enhancement (Table 6) involves the use of microscreening with fine mesh drum or disc rotary microscreens and high-pressure backwashing system. Mesh size openings typically range from 10 to 40 microns. Tier 3 proposed treatment will provide for total facility discharge flow microscreening prior to further treatment in settling ponds. Microscreening solids removal efficiencies are variable and range from 20% to 70% depending upon the application, solids concentration, and flow rates. Pilot microscreen testing at Tylersville FCS is now being completed and evaluated by the PFBC as well as other aquaculture microscreening systems now in operation.

Tier 4 proposed effluent treatment enhancement (Table 6) involves aeration in the settling ponds to provide for biological treatment of effluent via microorganisms (algae and bacteria). This proposed aeration settling pond treatment is targeted toward biochemical oxygen demand (BOD) reduction and further improvement in effluent quality beyond solids settling. The addition of aeration systems to the existing PFBC settling ponds is relatively simple to implement using floating jet aspirator and/or other mechanical aerators.

Tier 5 proposed effluent treatment enhancement (Table 6) involves filtration to remove solids remaining from the Tier 4 aerated settling pond microorganism treatment process and other treatment tiers. Media (sand) filtration is often used for removal of residual suspended solids. Sand filtration can be completed in pressure filters, gravity beds, traveling bridge filters, and/or sand seepage ponds with under drains. Removal efficiencies of 80% to 90% for selected parameters are typical for media filtration. Traveling bridge bed filters with air scour media washing are commonly used for final effluent filtration. These systems involve considerable construction and operating cost. Other high technology effluent treatment such as ultraviolet disinfection (UV), ozonation, biofiltration, and chemical treatment are technically feasible but are very expensive to construct and operate.

It is recommended that effluent treatment improvements for each fish culture station be completed incrementally by tier with detailed performance evaluations by the PFBC and DEP to access numeric effluent parameter reductions and benthic invertebrate impacts in the receiving streams. Pilot studies of each treatment tier are recommended to evaluate the efficiency and expected reductions in wastewater impacts within the PFBC system.

Figure 4. Tier 1 & Tier 2 existing PFBC Effluent Treatment

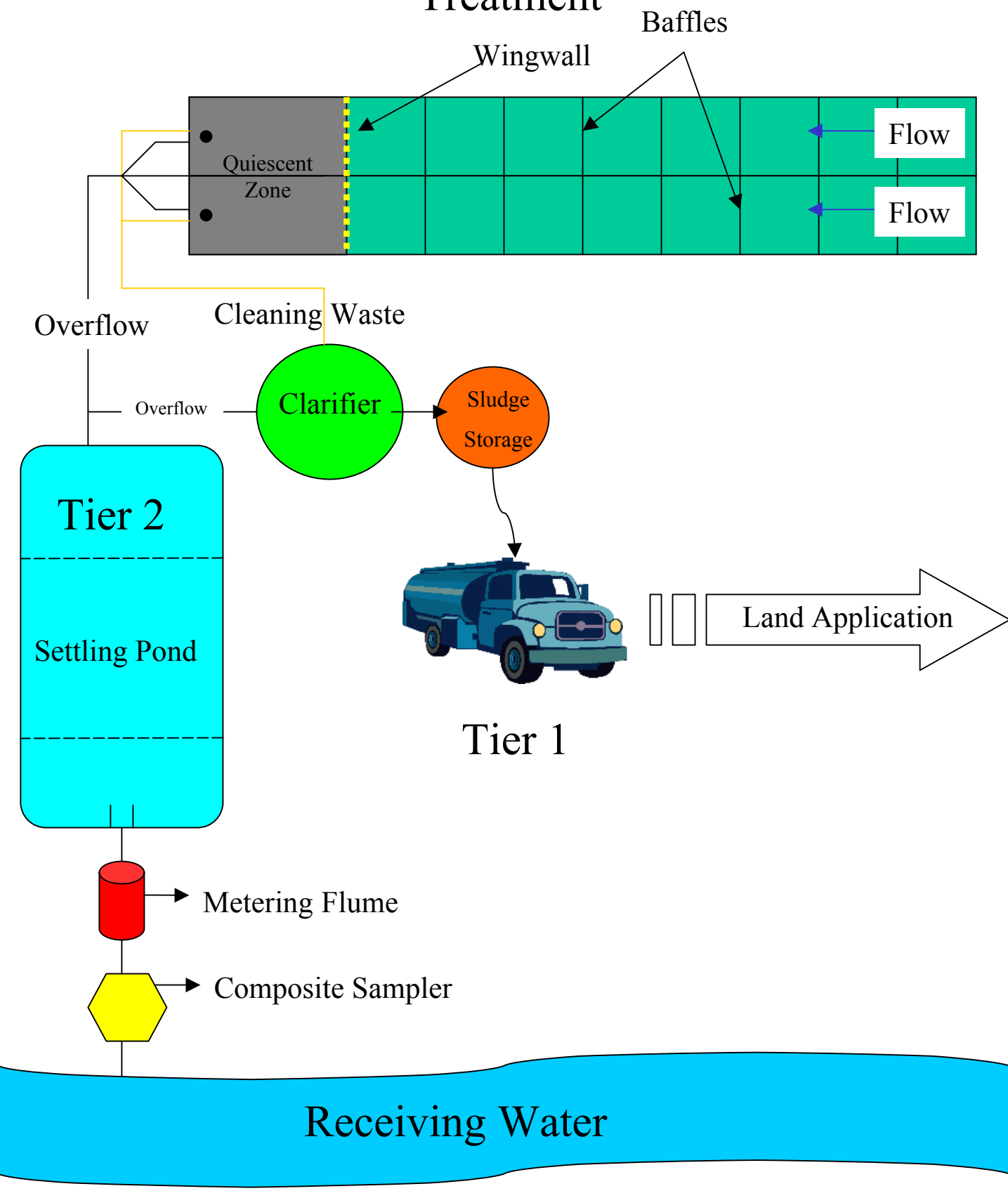
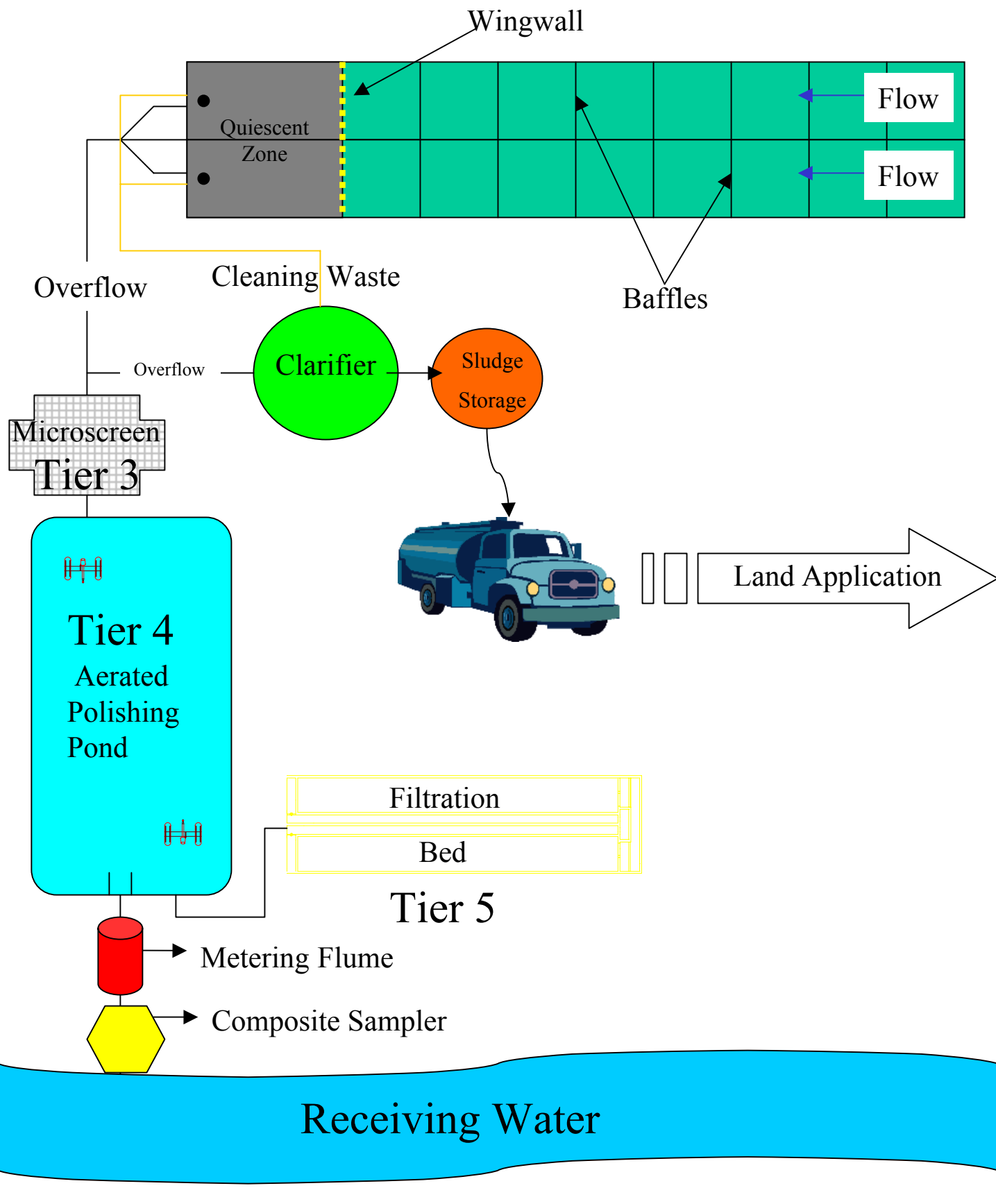


Figure 5. Tier 3,4 & 5 Effluent Treatment Enhancement



Wastewater Modeling & Analysis

Chemical changes in the water utilized by a fish culture station are primarily the result of fish metabolism. Two exceptions are the case-by-case use of therapeutic chemicals or sanitizing chemicals for disease control and the quality of the background water used within the station. The magnitude of fish metabolism depends ultimately upon the amount of the fish (biomass) and the amount of food utilized by the fish. Therefore, the water quality impacts (i.e., effluent by-products) are in direct proportion to the amount of fish food introduced to the system.

Despite some limitations and necessary assumptions outlined in the main report, coldwater fish culture stations were modeled to calculate predicted effluent levels and were compared to the observed results (2001 NPDES discharge data). The wastewater modeling was intended to assess the current wastewater treatment ability and to project future treatment requirements (treatment tiers) necessary to reduce the total mass loading (kilograms) to receiving waters. In general, all stations are discharging less than the model predicted mass loadings of wastewater parameters. Measured discharge less then the predicted number was attributed to effluent treatment processes already in place. While these numbers are believed to be reasonable estimates, slight variations between fish culture stations, feed composition and the effects of background water chemistry produced variations between the predicted and the observed numbers. Additionally, some instantaneous measurements observed by PFBC staff exceeded the monthly average and predicted concentrations (mg/l). These observed "spikes" are attributed to anomalies at the time of sampling and are not indicative of the total mass loadings to the receiving water. Due to the fact that concentration data and not mass loading has been used to develop the new DEP discharge license for PFBC facilities, we believe that a comparison to the food-calculated parameter mass and concentrations is necessary to determine validity and accuracy of the methods used. It is the belief of the consultant that mass based permits more accurately represent and monitor the conditions at each station when compared to the highly variable concentration based permits.

Biological Assessments

Historically, NPDES permits have been written to limit the discharge of conventional and toxic pollutants on a chemical-specific (i.e. parameter) basis. This approach is usually straightforward, but sometimes can result in overprotective, as well as underprotective, permit limits. In the last decade, State agencies have begun utilizing additional measures to assess the overall health of a water body. These measures have centered around the presence and/or the absence of specific species, and habitats upstream and downstream. Known commonly as "Biological Assessments," these measures attempt to accomplish the following:

- Set protection and restoration goals;
- Assess water quality and identify impaired waters;
- Identify stressors to a water body;
- Set restoration priorities through Total Maximum Daily Loads (TMDLs);

- Track restoration progress;
- Support water quality permits and permitting activities; and
- Generally, to protect the watershed.

Simply controlling the substances discharged does not assure the biological integrity of water resources, because that integrity depends on a combination of chemical, physical, and biological processes. Successful protection of watershed quality requires monitoring and assessment tools that measure the interacting processes. Chemical analyses, whole effluent toxicity testing, physical habitat assessment, and bioassessment are four (4) assessment tools that have a unique role in the NPDES permitting process. The information provided from the integrated use of all four assessment tools strengthens permitting decisions and should be used in the evaluations and determinations of NPDES permit compliance (USEPA, 2000).

Several regulatory agencies across the country are utilizing or developing biological methods for waterbody health assessments. These biological methods include fish, benthic macroinvertebrates and algae. A fourth category is the combined use of all three biological methods. Currently (2001), twenty-nine (29) states are utilizing fish biological assessment while forty-four (44) states utilize benthic macroinvertebrates and four (4) utilize algae. A total of twenty-nine (29) state agencies are utilizing a combination of more than one category. Deviations from the USEPA Rapid Bioassessment Protocol (RBP) method have occurred in several states developing biological assessment criteria; however, the careful development of acceptable standards, the use of pilot studies and the development of precise collection methods are common components of each program prior to its use for assessment in state waters.

While some merit has been demonstrated in other states utilizing biological assessments, it does not appear that DEP is applying this method of assessment to other point and non-point sources in the various watersheds. Additionally, the apparent targeting of biological surveys associated with PFBC fish culture stations is concerning. The use of biological standards is ultimately used to make adjustments to the numeric standards outlined in the NPDES permit process. To date, biological assessments are not components of the NPDES program but rather are tools that enhance the classification of waterbodies as impaired or not impaired. In some cases, the assessment process can lead to a 303(d) classification of the Clean Water Act. This classification requires development of a Total Maximum Daily Load (TMDL) watershed model, which ultimately requires a thorough investigation of all watershed sources (point and non-point) of impairment to the reach of the water in question. The end result of the TMDL is the re-development of numeric discharge permit standards. The Pennsylvania Department of Environmental Protection is strongly encouraged to review its biological assessment program and to work cooperatively with PFBC personnel in the development of numeric standards prior to the classification of a waterbody as impaired. Consideration of the combined fish, benthic macroinvertebrate and algae biological assessment technique is also suggested. While some impairment to the receiving waterbodies directly downstream of a fish production facility is inevitable, the PFBC has demonstrated a strong desire to continue as good stewards of the Pennsylvania water resources by implementing wastewater treatment practices to minimize the

impact of FCS operation on receiving streams. This mission and effluent improvement efforts are being overshadowed by the premature classification of a waterbody as impaired. At the present time, it is not known what numeric discharge permit criteria is required to eliminate benthic impairment associated with fish hatchery wastewater.

Privatization Analysis

The subject of privatization of activities traditionally completed by government agencies has received a great deal of attention in the last decade with the current political trend to attempt to downsize government and reduce costs. In an attempt to determine and evaluate private aquaculture's interest, willingness, and capability to produce trout for the Commonwealth's stocking program, a privatization questionnaire was developed. On December 20, 2001, the questionnaire was mailed to one hundred and fifteen (115) private aquaculture facilities within Pennsylvania as well as select facilities in neighboring states. As of May 2002, seventeen (17%) percent (19 of 115) of the private facilities surveyed returned responses. Of the returned responses, only eight (8) private facilities stated that they would be interested in or would consider producing trout for the PFBC's stocking program.

Combined, the eight respondents claimed that they would be willing to produce 943,000 adult trout (number) and 469,500 pounds. It should be noted that about half of the trout were from private aquaculture facilities outside of the Commonwealth. Compared to the PFBC 2000-2001 adult trout production of 5.2 million number and 2.7 million pounds, the private trout producers could account for approximately 18% of the adult trout produced by the PFBC in 2000-2001. Other private facilities stated that they either did not have the water quality required to produce trout (coldwater species) or exclusively produced forage/bait fish. It should be noted that NPDES permit and biological assessment may also be a future issue for private growers.

Recommendations, Improvements and Opinions of Probable Cost

The study provides a series of possible facility improvements including conceptual level improvement drawings and opinions of probable cost for each individual recommendation (see end of this document).

Minor to major infrastructure improvements were identified at all stations and a prioritized list of improvements was developed. Recommended improvements for each fish culture station have been categorized into three (3) priority groups (Priority 1, 2, and 3). A not recommended category (Priority 4 or NR) includes potential improvements evaluated but not recommended.

Priority 1 Items. These improvements are considered essential to the station's ability to meet assigned PFBC fish production goals and compliance with the Commonwealth's operational codes and permits. Enhanced effluent treatment is a system-wide Priority 1 improvements item. Renovation of these systems is generally required to repair deteriorated components and

restore operational performance requirements and/or provide for expansion opportunities.

Priority 2 Items. These are recommended hatchery infrastructure improvements that are needed but are less critical than Priority 1. These items can be constructed in the future given that provisions for their completion are included in design engineering of Priority 1 items.

Priority 3 Items. Priority 3 items can be added at some future date without major disruption of ongoing fish production.

A variety of infrastructure exists within the system ranging in age from infrastructure put in place in 1903 to that put in place in 2002. Some improvements and renovations address needed renovation of items past their useful service life due to age and improved technologies, while other improvements are intended to enhance the most recent improvements already made.

The topic of Pennsylvania Department of Environmental Protection NPDES permitting requirements, compliance, and enhanced effluent treatment at PFBC fish culture stations is a recurring improvement recommendation at all facilities. The inconsistency of Pennsylvania Department of Environmental Protection NPDES numeric effluent criteria, and the use of rapid biological assessment (RBP) protocols, and criteria for therapeutic chemical residuals remains a concern throughout the system. Water supply system reliability, integrity and treatment improvements are also a recurring recommendation at most facilities.

The following discussion outlines a brief summary of the recommendations and prioritized list for each of the fifteen (15) facilities. Table 7 outlines cost opinions associated with each fish culture station's recommended improvements by priority group. Improvement items recommended in each priority group have been prepared and reviewed by the PFBC staff and consultant team but should be considered as a "flexible list" that can be adjusted to address critical needs and funding availability.

Bellefonte Fish Culture Station

Bellefonte Fish Culture Station produces 13.2% of trout numbers and 12.9% of the trout pounds. Major improvement issues include long-term maintenance of water supply volume, hatchery building water supply treatment needs, raceway covers/netting system, conversion to bulk liquid oxygen (LOX) and effluent treatment system improvements. Significantly improved effluent treatment, such as microscreening, aerated lagoon polishing, and possibly media filtration, may be required to eliminate benthic impairment immediately below the station's discharge point. Improvement/renovation items and cost estimates for Bellefonte Fish Culture Station are Priority 1 = $5,506,302 (which includes $2.5 million in raceway covers for fish predation control and shade), Priority 2 = $2,224,049, and Priority 3 = $18,590 (Table 7).

Table 7. Opinions of Probable Cost for PFBC Fish Culture Station Improvements/Renovation

Section	Fish Culture Station	Priority 1	Priority 2	Priority 3
IV	Bellefonte	$4,219,302	$2,224,049	$18,590
V	Benner Spring	$4,215,671	$1,074,365	$17,875
VI	Big Spring (from Recir. Study Opt. 3B)	$10,829,752	na (1)	na (1)
VII	Corry	**$2,635,631**	$351,395	$2,618,988
VIII	Huntsdale	**$3,671,859**	$2,482,466	$1,306,710
IX	Oswayo	**$2,039,053**	$548,989	$1,870,197
X	Pleasant Gap	$2,127,366	$950,109	$511,551
XI	Reynoldsdale	**$5,572,648**	$1,291,414	$3,919,276
XII	Tylersville	**$1,971,245**	$1,828,606	$193,086
XIII	Fairview	$1,104,686	$911,002	$1,171,638
XIV	Linesville	$3,393,998	$4,686,289	$1,857,863
XV	Pleasant Mount	$3,224,740	$828,832	$526,378
XVI	Tionesta	$2,184,540	$486,674	$74,058
XVII	Union City	$2,893,072	$374,897	$75,675
XVIII	Upper Spring Creek	$1,033,504	$1,476,210	$0
(for general comparison of renovation costs to new facility construction costs)				
XIX	New Facility (Raceways)	$13,862,326		
XIX	New Facility (Circular Tanks)	$18,092,724		
XIX	New Facility (Pond Complex)	$16,132,205		

2002 Proposed Capital Budget Projects: $15,890,436 (highlighted in bold type)

na (1) The 3B Recirculation Option for Big Spring FCS has been "tentatively" identified by DEP as an approved effluent treatment technology for this station. No Priority 2 or 3 Items have been identified.

Benner Spring Fish Culture Station

Benner Spring Fish Culture Station produces 10.7% of trout numbers and 12.5% of the trout pounds. Benner Spring Fish Culture Station also produces 0.1% of the warmwater fish numbers and 1.3% of the warmwater fish pounds. Major improvement issues include water supply system improvements, installation of dissolved oxygen management technology using LOX source, rearing pond improvements, effluent treatment improvements and a potential pumped recirculation system to augment the primary water supply. Like Bellefonte, significantly improved effluent treatment, such as microscreening, aerated lagoon polishing, and media filtration, may be required to eliminate benthic impairment immediately below the station's discharge point. Improvement/renovation items and cost estimates for Benner Spring Fish Culture Station are Priority 1 = $4,215,671, Priority 2 = $1,101,205, and Priority 3 = $17,875 (Table 7).

Big Spring Fish Culture Station

Big Spring Fish Culture Station historically produced 13.3% of trout numbers and 14.1% of the trout ponds. The facility was closed (temporarily) on November 15, 2001 pending resolution of the issuance of a new Pennsylvania Department of Environmental Protection (PA DEP) NPDES discharge permit that had expired in 2001. Permit issuance (if granted) will likely involve more stringent numeric effluent criteria that would require enhanced effluent treatment technology and/or water recirculation. This facility's production program and its effluent discharge has been the subject of three detailed engineering studies completed by PFBC for PA DEP. The application of rapid biological assessment protocol (RBP) to the facility's effluent discharge permitting has never been resolved, TMDL based standards and/or NPDES discharge criteria have never been received from PA DEP.

If permitted by PA DEP and reopened by PFBC, major improvement issues will minimally include effluent treatment improvements and/or some level of pumped water recirculation. Improvement/renovation items and cost estimates for Big Spring Fish Culture Station previously studied and discussed in the 1998 and 2000 engineering studies were $1,750,988 Option 1A, $4,438,322 Option 1B, and $10,829,752 Option 3B (Table 7). It appears that the semi-recirculating Option 3B is the only acceptable option, although no proposed discharge license criteria were developed by DEP and provided to PFBC.

Corry Fish Culture Station

Corry Fish Culture Station produces 4.9% of the trout numbers and 5.4% of the trout pounds. Major improvement issues at Corry Fish Culture Station include water supply volume and treatment, improved aeration/dissolved oxygen management, improved wastewater effluent treatment for therapeutic chemical residuals and a variety of general site infrastructure renovation items. The construction of improved rearing ponds at the on-site Corry Annex property was analyzed and opinions of cost are outlined in this study. Although technically possible, we suggest this complicates the water supply and effluent treatment issues facing the

facility and recommend that its primary mission of trout culture be addressed first. Improvement/renovation items and cost estimates for Corry Fish Culture Station are Priority 1 = $2,635,631, Priority 2 = $351,395, and Priority 3 = $2,618,988 (Table 7).

Huntsdale Fish Culture Station

Huntsdale Fish Culture Station produces 20.3% of the trout numbers and 17.2% of the trout pounds. The facility also produces 3.4% of the warmwater/coolwater numbers and 0.8% of the warmwater/coolwater pounds. The facility is an essential component of the PFBC production program and has the largest volume and highest quality water supply source in the system.

Major improvement items include precise identification and immediate resolution of the elevated PCB levels that appear to be differentially coming somewhere from the groundwater resources of the facility. A detailed PCB sampling program is being conducted by PFBC to locate the source of PCB's. Included are significant effluent treatment enhancements to ensure compliance with Pennsylvania Department of Environmental Protection NPDES permitting. This facility is within its numeric discharge license but has been assessed with benthic impairment. System-wide liquid oxygen based water supply aeration/degassing and dissolved oxygen management should also be given high priority. A variety of water supply improvements, extensive and intensive rearing unit improvements, and general site renovation items are also included. The Huntsdale improvement/renovation items and cost estimates are Priority 1 = $3,671,859, Priority 2 = $2,482,466, and Priority 3 = $1,306,710 (Table 7).

Oswayo Fish Culture Station

Oswayo Fish Culture Station produces 5.3% of the trout numbers and 6.7% of the pounds in the PFBC system. Major improvement issues include long-term maintenance/enhancement of spring water supply volume, reuse water treatment to control the significant water bacteria/fungus problems, conversion to a bulk liquid oxygen system and effluent treatment enhancements. Several effluent treatment improvements at Oswayo Fish Culture Station are defined in a consent agreement with PA DEP and have been engineered and are ready for construction. Further effluent treatment improvements previously discussed may be required to eliminate benthic impairment. A variety of general site and building renovation/improvement items are also included in the proposed Oswayo Fish Culture Station improvements. Improvements to the existing pumped recirculation system at Oswayo could address water supply limitations at peak biomass periods. Improvements/renovation items for Oswayo Fish Culture Station are Priority 1 = $2,039,053, Priority 2 = $548,989, and Priority 3 = $1,810,197 (Table 7).

Pleasant Gap Fish Culture Station

Pleasant Gap Fish Culture Station produces 10.7% of the trout numbers and 9.8% of the trout pounds produced in the PFBC system. Major improvement items include long-term maintenance/enhancement of the facility's water supply sources now adversely impacted by area

watershed development. Expansion of dissolved oxygen management to the lower raceways and hatching building should be given high priority. Pavilion covers with netting are recommended for the lower raceways and replacement of the intermediate nursery raceways is also recommended. A variety of general site, building and effluent treatment improvements are included (although this facility currently meets PA DEP discharge requirements). This facility has recently been cited for benthic impairment by PA DEP and may require improved effluent treatment, such as microscreening, aerated lagoon polishing, and potentially media filtration, to alleviate benthic impacts. Pumped recirculation system with treatment could help address decreasing water supply volumes but involves substantial construction and operating costs. The Pleasant Gap site includes several PFBC administrative offices and support functions in addition to its fish culture responsibilities. Visitor improvements could address multiple PFBC programs in an area of relatively high public visitation (State College area). Improvement/renovation items and cost estimates for Pleasant Gap Fish Culture Station are Priority 1 = $2,127,366, Priority 2 = $950,109, and Priority 3 = $507,976 (see Table 7).

Reynoldsdale Fish Culture Station

Reynoldsdale Fish Culture Station produces 6.1% of the trout numbers and 6.1% of the pounds in the PFBC system. Major improvement items include total renovation of outdoor earthen production ponds to covered raceways or covered circular tank system, installation of liquid oxygen (LOX) based dissolved oxygen management, and effluent treatment system improvements. Currently, there are no formal effluent treatment systems beyond pumping solids to earthen containment areas at Reynoldsdale FCS, so improvements to effluent treatment are included in the proposed improvements.

Improvements also include a variety of site and building renovation issues including improved visitor access (ADA compliant) to the hatchery building and proposed new covered fish production system. Land ownership at Reynoldsdale could theoretically support extensive pond construction from 2 to 16 acres, but would require reuse of trout production water and/or the use of Dunning Creek, a local warmwater stream for pond water supply. The need for warmwater/coolwater pond production capability at this location requires PFBC staff evaluation and concurrence with the feasibility outlined in the report.

If outdoor production system replacement is completed, the Reynoldsdale Fish Culture Station could assume 200,000 lbs/year. The proposed circular tank production system with recirculation is similar in design concept to the system proposed to be constructed at Big Spring Fish Culture Station (see Recirculation Study, 2001). Improvement/renovation items and cost estimates for Reynoldsdale Fish Culture Station are Priority 1 = $5,572,648, Priority 2 = $1,291,414, and Priority 3 = $3,919,276 (Table 7).

Tylersville Fish Culture Station

Tylersville Fish Culture Station historically produced 14.5% of the numbers of trout and 13.8% of the trout pounds. In 2001, PA DEP issued a draft NPDES permit that places water use

restrictions and a peak biomass adult trout production level at 262,000 pounds annually. The PA DEP will re-evaluate the draft NPDES Permit given recommendations in this report and the results of pilot microscreening tests being conducted and evaluated. This biomass restriction is about 200,000 fish and 100,000 pounds less than the historical average production of 724,161 fish and 372,782 pounds.

Major improvement issues include effluent treatment improvements to maintain discharge license compliance, rearing unit improvements including pavilion covers with netting and a variety of general site improvements/enhancements. Enhanced effluent treatment, such as microscreening, aerated lagoon polishing, and media filtration, may be required to eliminate benthic impairment immediately below the station's discharge point. Pumped recirculation with treatment is a method to restore water supply flows to former rates, but requires substantial construction costs. Pilot testing of effluent microscreening is being conducted by the PFBC staff at the facility and hopefully will provide effluent treatment enhancement to achieve proposed NPDES discharge permit requirements. Improvements/renovation items and cost estimates for Tylersville Fish Culture Station are Priority 1 = $1,971,245, Priority 2 = $2,543,606, and Priority 3 = $193,086 (Table 7).

Fairview Fish Culture Station

Fairview Fish Culture Station produces 0.1% of the trout numbers and 0.1% of the trout pounds. This facility is primarily assigned the production of coho salmon and steelhead trout, which are classified and grouped with the cool/warmwater production in the PFBC system. The station is producing anadromous coldwater steelhead trout and coho salmon, although a few other species have been produced there historically. In our opinion, the facility suffers from a water supply system that is substantially below acceptable criteria for salmonid culture. Variable flows, high turbidity, pathogens, and variable temperatures need to be addressed. We suggest that water supply improvement can be addressed by installing pumped production wells and their related infrastructure rather than attempting to improve surface spring water collection and treatment. Cost for both improvement approaches are included. The use of therapeutic treatment chemicals should be significantly reduced if water supply system water quality and quantity is improved. The production rearing system infrastructure is good and worth providing a water supply system that would allow all phases of anadromous coho salmon and steelhead trout to occur at this facility.

Improvement issues include water supply system improvements, effluent treatment improvements, a variety of general site and building renovation items and enhanced visitor facilities at the station. Improvement/renovation items and cost estimates for Fairview Fish Culture Station are Priority 1 = $1,104,686, Priority 2 = $911,002, and Priority 3 = $1,171,638 (Table 7).

Linesville Fish Culture Station

Linesville Fish Culture Station produces 41% of the numbers and 8.5% of the pounds of warmwater/coolwater fishes produced within the PFBC system. Improvement items include lake and well water supply system and treatment enhancements, a variety of site and building renovation issues and effluent settling pond improvements for pond complex operation. The facility provides a good mix of egg incubation/hatching, early rearing, extensive pond and intensive advanced fingerling rearing capability. Expansion appears to be technologically possible if required. Pond improvements are a major suggested improvement item at Linesville Fish Culture Station as the present ponds are somewhat less than current state-of-the-art technology. Replacement of the old antiquated double ditch ponds and northern ponds with fish aquaculture production ponds is recommended. Land area exists at the northern end of the facility to construct additional new ponds, but topographic mapping, geotechnical soils and lake hydrogeolgical investigations must be completed to confirm pond design requirements. The facility has an excellent indoor visitor facility and a few enhancements for ADA (restrooms and access) and other related visitor support amenities are suggested (walking trail, site observation tower, picnic pavilion and parking). Improvement/renovation items and cost estimate for Linesville Fish Culture Station are Priority 1 = $3,393,998, Priority 2 = $4,046,793, and Priority 3 = $1,857,863.

Pleasant Mount Fish Culture Station

Pleasant Mount Fish Culture Station historically produced a small amount of trout, 1% of the number and 1.3% of the trout pounds. The lake fed, creek water supply is poorly suited for trout culture. Variable flows, variable temperatures (most outside the proper temperature for trout culture), pathogens and debris/turbidity are significant problems. We do not recommend trout culture beyond the existing indoor lake trout program at this facility. Any expanded water use will require Delaware River Basin Commission approval. The facility produces warmwater/coolwater fish effectively and produces 33% of the warmwater number and 45.2% of the pounds of warmwater/coolwater fish produced by the PFBC system. The facility operation includes the management of two off-site watershed rearing ponds, Hankins Pond (70 acres +/-) and Douglas Pond (approximately 12 acres +/-), that are capable of rearing significant numbers of crappie, forage minnows and other advanced fall fingerlings reared concurrently with forage in these watershed ponds.

Major improvement items include water supply system improvements, hatchery buildings #1 and #2 improvements, a variety of pond improvements and enhancements including consolidation, new outlet/harvest structures, water supply and drainage piping. The facility's improvements include demolition of an old barn, which is structurally deficient, and construction of a new storage building. A variety of site and general building maintenance issues are also included in the cost estimates. Although studied and opinions of probable cost are provided in this report, we do not recommend the construction of ponds at the upper end of the Hankins Pond site without some better understanding of water supply potential, geotechnical soils and lake

hydrology. Expansion of the main lake into this "marsh-like" area for increasing lake production is suggested as an option to new pond construction. Improvement/renovation items and cost estimates for Pleasant Mount Fish Culture Station are Priority 1 = $3,224,740, Priority 2 = $828,832, and Priority 3 = $562,378 (see Table 7).

Tionesta Fish Culture Station

Tionesta Fish Culture Station produces both coldwater anadromous trout (steelhead RBT) and a variety of coolwater/warmwater species. The major portion of the facilities production is steelhead with over 63,000 pounds annually. Tionesta produces 18.3% of the coolwater/warmwater fish species and 45.2% of the pounds. Major improvements proposed for Tionesta Fish Culture Station include water supply improvements, aerator modifications, conversion to LOX based dissolved oxygen management, replacement of Tubbs Run rearing units and renovation of production ponds and enhanced effluent treatment. A number of electrical system improvements are also included. Improvement/renovation items and cost estimates for Tionesta Fish Culture Station are Priority 1 = $2,184,696, Priority 2 = $486,674, and Priority 3 = $74,058 (Table 7).

Union City Fish Culture Station

Union City Fish Culture Station produces 3.5% of the coolwater/warmwater fish numbers and 0.8% of the pounds. Major improvement items proposed for Union City include several water supply volume and treatment improvements, major renovation/consolidation of extensive rearing ponds and some effluent treatment improvements. A variety of general building, road and electrical system modifications are also proposed. We believe the Union City Fish Culture Station staff does a remarkable job in producing fish under significantly less than optimum water supply resources and with very antiquated rearing ponds. Major renovation of this facility needs to be addressed by PFBC along with other options for meeting its important role in northern pike and tiger muskellunge production. To control red spot disease in northern pike and possible spreading of zebra mussels, Union City's role in production must be maintained. Improvement/renovation items and cost estimates proposed for Union City Fish Culture Station are Priority 1 = $2,893,072, Priority 2 = $374,897, and Priority 3 = $75,675 (Table 7).

Upper Spring Creek Fish Culture Station

The existing Upper Spring Creek Fish Culture Station site was inspected by the consultant team and a variety of potential improvements to restore culture activities were reviewed. Some use of existing American shad production ponds by the Benner Spring Fish Culture Station for walleye fingerling culture has been completed in recent years. No PFBC personnel are currently assigned to this location.

Major improvement/renovation items proposed for this site include two different production areas. Pond renovation and enhancement is proposed to increase the extensive cool/warmwater pond production acreage managed by the Benner Spring Fish Culture Station using essentially

the existing pond layout with some consolidation and water supply, drainage, outlet/harvest structure modifications. The ponds will be used for walleye production and possible forage production. We concur with this approach to continue cool/warmwater production at this location. A second substantially more technically advanced enhancement of the site involves the renovation of the existing building and renovation of the well water supplies to provide support of coldwater production including the brown trout broodstock and rainbow trout fingerling program currently completed by the Tylersville Fish Culture Station staff. This work involves significant water supply, rearing system, electrical and alarm construction and although technically feasible, is complex and expensive. We suggest other options at Tylersville be explored and compared to the cost and management requirements of completing this portion of the brown trout broodstock and rainbow trout fingerling program at Upper Spring Creek. We suggest that maintaining these activities at Tylersville FCS with the required infrastructure enhancements to accomplish them is preferable to re-creating them from the limited existing resources at Upper Spring Creek FCS. Estimation of probable costs for proposed Upper Spring Creek renovations are Priority 1 = $1,033,504, Priority 2 = $1,476,210, and Priority 3 = $0 (Table 7).

Implementation Plan

The Planning, Design, and Construction Phases for each project will involve direct participation and involvement of PFBC Fisheries and Engineering staff in conjunction with the Consultant Design Team and Contractors throughout the execution of each project. Some improvements (those identified with A on the opinion of probable cost summaries (see end of this document)) can be completed by PFBC directly. Those identified with C are contracted improvements that will most likely require design and DGS/PFBC contracted construction.

Factors influencing the hatchery improvements implementation sequence and priority of selected improvements should be evaluated annually during the development of the PFBC capital construction budget. The following issues should be included in the annual evaluation of infrastructure improvements and implementation priorities:

- Infrastructure Need (critical versus non-critical) Effluent treatment improvements essential to discharge license compliance are considered as critical needs.
- Fish Production Requirements (Broodstock Programs, Rearing Unit Replacement and Fish Health Water Quality/Quantity Issues)
- Construction Impacts to Ongoing Production Programs and Possible Mitigation of Those Impacts
- Available Construction Funding
- Relatively Long Project Lead Time (2 to 3 year average/project see Figure 6)

- Concurrent Project Funding, Design Engineering and Construction can reduce overall time duration to complete the system wide improvements.
- Cost Escalation of 3% to 4% per year should be expected.

Figure 6 illustrates a typical fish hatchery improvement project flow chart, which defines work task activities completed over a 2 -to 3-year project duration. This plan assumes that funding and execution of planning, engineering, and construction by project can be completed in 2- to 3-year increments. It is technically feasible to allow concurrent project design and/or construction if PFBC funding and capital construction priorities permit. The proposed implementation plan should be considered flexible and can be adjusted to meet PFBC needs. A long-term (15 to 25 year period) will be required to implement system-wide improvements to the PFBC fish cultural system that includes a reliable, consistent source of funding.

It is important to state that this Implementation Plan must accompany continued funding of day-to-day maintenance and repair items essential to station operation. Critical components of fish culture station infrastructure may continue to break or fail, requiring repair before the major renovation outlined in this report can be completed. The PFBC must provide funding for these repairs as well as the long-term capital improvements program. Due to the design and construction complexity and cost, we recommend that many of the improvements outlined in this report be completed as capital improvement projects and not as day-to-day station maintenance projects.

Implementation Plan Benefits

The Pennsylvania Fish Culture Station system will benefit from the proposed renovation and modernization program. Implementation Plan Benefits include:

Fish Production Capability to Meet Stocking Requirements Commonwealth-Wide

The proposed improvements to the PFBC Fish Culture Station system will provide long-term fish production capability needed to meet Commonwealth-wide fisheries management requirements. The proposed improvements outlined in this report will provide long-term fish rearing capabilities at all fifteen (15) stations, including broodstock programs.

Facility Maintenance

Facility infrastructure improvements will reduce the amount of staff time and annual operating dollars associated with maintenance work needed to repair and operate antiquated systems. However, note periodic annual preventative maintenance will always be required, which includes new or renovated systems.

Figure 6- PENNSYLVANIA FISH & BOAT COMMISSION
PENNSYLVANIA COMMONWEALTH FISH CULTURE STATION EVALUATION

TYPICAL HATCHERY RENOVATION PROJECT FLOW CHART

REFERENCE DOCUMENTS & APPROVED PLAN
- COMPREHENSIVE COMMONWEALTH-WIDE FISH HATCHERY ENGINEERING AND PLANNING STUDY

CONSULTANT INTERVIEWS AND SELECTION
2 MONTHS
CONSULTANT SELECTION & DESIGN CONTRACT AWARD

KICK-OFF MEETING
- PROGRAM REQUIREMENTS
- SCOPE-OF-WORK CLARIFICATIONS
- FISH PRODUCTION GOALS & HATCHERY REQUIREMENTS
- REVIEW ANNUAL FISH PRODUCTION PROGRAM
- WATER SUPPLY REQUIREMENTS & DESIGN COORDINATION
- HATCHERY DESIGN REQUIREMENTS
- PROJECT ADMINISTRATION. & COMMUNICATION ISSUES
- DESIGN OPTIONS & ALTERNATIVES
- IDENTIFY PERMITS NEEDED
- REVIEW CODES AND DESIGN REQUIREMENTS
- REVIEW OF SITE ISSUES AND EXISTING CONDITIONS

3 MONTHS *
SCHEMATIC DESIGN PHASE

SITE SURVEY & INVESTIGATIONS
- FIELD SURVEY, AERIAL TOPOGRAPHY & MAPPING
- GEOTECHNICAL INVESTIGATIONS
- INTAKE STRUCTURAL INVESTIGATIONS
- SITE INSPECTIONS: ELECTRICAL SERVICE DOMESTIC WATER/WASTEWATER WELLS AND WATER SUPPLY
- WATER QUALITY SAMPLING
- HYDROLOGIC ANALYSIS
- REVIEW DESIGN REQUIREMENTS
- FLOOD PLAIN ISSUES
- ENVIRONMENTAL ISSUES
- EASEMENTS
- UTILITY ISSUES
- DOMESTIC WATER, SEWAGE AND EFFLUENT ISSUES & PERMITTING

STUDY REPORT WITH ALTERNATIVES
- WATER SUPPLY & DISTRIBUTION
- DRAINAGE & FISH HARVEST ISSUES
- SPECIAL NEEDS
- WATER SUPPLY TREATMENT/SCREENING
- WASTEWATER SYSTEM & EFFLUENT STANDARDS
- CONCEPTUAL HATCHERY LAYOUT & DESIGN
- COST ESTIMATES CONSTRUCTION OPERATION

SCHEMATIC DESIGN DRAWINGS & SPEC. OUTLINE
- CONFIRM HYDRAULIC PROFILE
- CONFIRM MAJOR FEATURES & SYSTEM LAYOUTS
- MATERIALS
- FIXED EQUIPMENT
- MOVABLE EQUIPMENT
- COST OPTIONS

FINAL SCHEMATIC DESIGN
- UPDATE COST ESTIMATES
- DESIGN DATA
- FINAL DESIGN DEVELOPMENT DRAWINGS & SPECIFICATIONS LIST
- SCHEDULE
- OPERATIONAL COST
- LIFE-CYCLE COSTS
- PHASING RECOMMENDATIONS
- FINALIZE RECOMMENDATIONS FOR FINAL DESIGN PHASE
- COORDINATE INTER-AGENCY DESIGN REQUIREMENTS FOR FINAL DESIGN PHASE
- PRESENETATION OF RECOMMENDATIONS TO PFBC
- ENVIRONMENTAL ASSESSMENT (E.A.)

APPROVAL OF PROGRAM AND BUDGET
PFBC & COMMISSION

* TIME REQUIREMENT MAY BE REDUCED DEPENDING ON SCHEDULE REQUIREMENTS

AUTHORIZE FINAL DESIGN PHASE

3 TO 6 MONTHS
CONSTRUCTION DOCUMENTS

DRAWINGS
- CONSTRUCTION DRAWINGS FOR ALL FEATURES OF PROJECT 35%, 65%, 95% AND 100% SUBMITALS
- FINAL DESIGN BID DOCUMENTS
- CONFIRM COST ESTIMATE
- FINAL PERMIT DRAWINGS & COORDINATION (PLANS AND SPECIFICATIONS.)
- FINAL PERMIT APPLICATIONS SUBMIT TO ALL AGENCIES
- REVIEW BY COMMONWEALTH CONSTRUCTION OFFICE

SPECIFICATIONS
- SPECIFICATIONS
- BID DOCUMENTS
- CONTRACT DOCUMENTS

3 MONTHS
BIDDING PHASE

BID INVITATION
- PUBLICATION
- PRE-BID MEETING
- SITE INSPECTION

BIDDING
- PREPARE REVISIONS
- ADDENDUMS
- ANSWER QUESTIONS
- REVIEW & REVIEW BIDS

CONST. CONTRACT AWARD
1 MONTH
- BID RECOMMENDATION
- ADVISE ON BID OPTIONS
- MOBILIZATION

9 TO 18 MONTHS
CONSTRUCTION PHASE

CONSTRUCTION
- SITE VISITS
- PRE-CONSTRUCTION MEETING
- SHOP DRAWINGS
- REVIEW INFORMATION CONTRACTORS' PROPOSALS
- RECORD DRAWINGS
- O & M MANUALS

INSPECTION
- CONSTRUCTION INSPECTION
- QUALITY & CONFORMANCE
- MATERIALS TESTING

CONTRACT ADMINISTRATION
- ADVISE & CONSULT WITH OWNER
- PROGRESS REPORTS
- PROCESS CHANGE ORDERS
- SUBSTANTIAL COMPLETION
- PAYMENT REQUESTS
- CODE INSPECTION
- FINAL INSPECTION

POST-CONSTRUCTION PHASE AND PROJECT STARTUP
1 MONTH
- MECHANICAL START-UP
- ELECTRICAL START-UP
- HYDRAULIC WATER SUPPLY TESTING AND OPERATION - 7 DAYS
- CONTRACTOR O & M MANUALS
- FISH CULTURE SYSTEMS
- O & M MANUALS & TRAINING
- WASTEWATER SYSTEM AND SAMPLING
- AS-BUILTS
- FINAL PROJECT CLOSE-OUT

HATCHERY OPERATION
- ASSIST OWNER IN OPERATIONAL PROBLEMS
- WARRANTY ISSUES
- FUTURE EXPANSION
- STAFF TRAINING

PROJECT TIME REQUIREMENTS:

DESIGN PHASE	6 TO 9 MONTHS
BIDDING AND CONTRACT AWARD	3 MONTHS
CONSTRUCTION PHASE	9 TO 18 MONTHS
TOTAL	18 TO 36 MONTHS

NOTE - EXISTING CONDITIONS DRAWINGS WERE GENERATED USING AERIAL PHOTOGRAPHY FOR GRAPHICAL PRESENTATION PURPOSES ONLY. DRAWINGS SHOULD NOT BE USED FOR SCALED ENGINEERING DESIGN.

FISHPRO
Consulting Engineers and Scientists
5201 South Sixth Street Road
Springfield, Il 62703-5143
(217) 585-8333

PENNSYLVANIA FISH & BOAT COMMISSION

TYPICAL STUDY PROJECT FLOWCHART

PENNSYLVANIA STATEWIDE FISH CULTURE STATION STUDY

FP/CWI: 01001
APRIL 2002
SHEET:
FIG. 6

Efficient Use of Manpower

The improvements to the PFBC Fish Culture Station system outlined in the study will result in more efficient use of manpower by providing higher fish production efficiency, less system maintenance time requirements, and reduced labor for some culture tasks.

Better Product and Cost Efficiency

Modernization of the PFBC Fish Culture Station system will result in consistent, high-quality fish produced cost effectively. Improvements outlined in this report will enable the PFBC hatchery system to meet coldwater and cool/warmwater production needed to meet the Commonwealth-wide fisheries management programs.

Long-Term Operation

Facility modernization ensures long-term, reliable operation of the PFBC Fish Culture Station system (i.e., Infrastructure Reliability). Many of the recommended improvements address aging and deteriorated infrastructure repair needs.

Discharge License Compliance

Minimizing the impact of PFBC Fish Culture Station operation on the water resources of the Commonwealth is a major goal of the system modernization program. The recommended improvements will ensure that long-term compliance with required USEPA and Pennsylvania Department of Environmental Protection (DEP) effluent treatment requirements. Continual coordination and cooperation with PA DEP will be required in the future.

Action Needed by PFBC

In order to implement the fish culture station system improvements plan as outlined in this report, the Pennsylvania Fish and Boat Commission needs to perform the following generalized tasks:

- PFBC to seek funding for long-term Fish Culture Station Modernization Program.
- PFBC to develop implementation schedule that reflects annual funding and internal facility requirement priorities. Priorities should address known infrastructure problems or immediate fish production needs that are likely to fail and potentially cause adverse production impacts.
- Continue the Planning, Engineering and Construction Phase of all projects.

Acknowledgments

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Pennsylvania Fish & Boat Commission

Mr. Dennis Guise	PFBC Deputy Executive Director/Chief Counsel
Mr. Tom Ford	PFBC Policy & Planning Director
Mr. Delano Graff	PFBC Bureau of Fisheries Director (Retired)
Mr. Rickalon Hoopes	PFBC Bureau of Fisheries Director
Mr. Martin Marcinko	PFBC Warm/Coolwater Production Chief
Mr. James Harvey	PFBC Trout Production Chief
Mr. David Bumann, P.E.	PFBC Engineer
Mr. Amos Ferguson	PFBC Engineer
Mr. Bryan Hall	PFBC Fisheries
Mr. David Truesdale	PFBC Research
Mr. Tom Cochran	PFBC Research
Mr. Jeffrey Weaver	Bellefonte FCS Station Manager
Mr. Paul Martis	Benner Spring FCS Station Manager
Mr. Terry Farner	Big Spring FCS Station Manager
Mr. Dennis Theuret	Corry FCS Station Manager
Mr. Ray Youngs	Fairview FCS Station Manager
Mr. Paul Drumm	Huntsdale FCS Station Manager
Mr. William Shuey	Linesville FCS Station Manager
Mr. Kenneth Martin	Oswayo FCS Station Manager
Mr. Robert Wilberding	Pleasant Gap FCS Station Manager
Mr. Thomas Pekarski	Pleasant Mount FCS Station Manager
Mr. Clyde Welsh	Reynoldsdale FCS Station Manager
Mr. Larry Hines	Tionesta FCS Station Manager
Mr. Kenneth Slogaski	Tylersville FCS Station Manager
Mr. Dennis Theuret	Union City FCS Station Manager

FishPro

Mr. Tom Johnson	Senior Fisheries Biologist
Mr. Gary Wilken, P.E.	Civil Engineer
Mr. Matt Cochran	Fisheries Biologist
Mr. Ryan Keith	Environmental Biologist
Mr. Troy Talsma, P.E.	Mechanical Engineer
Ms. Terra McParland, P.E.	Environmental Engineer
Mr. Kevin Kreipe, P.E.	Civil Engineer
Mr. Doug McQueen	CAD Technician
Mr. Michael Grove	CAD Technician

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U.S. Department of Commerce, National Climatic Data Center

U.S. Department of Commerce, Bureau of the Census

Bellefonte FCS Summary of Opinions of Probable Cost

	Summary - Opinions of Probable Cost		
	ITEM	**DRAWING I.D. #**	**TOTAL COST ****
	PRIORITY 1		**$4,219,302**
C	Improve Yields of Production Wells	A1	$35,750
C	Improve Spring Collection System	A4	$143,000
A	Install Spring Water Flow Meter and Meter Pit	A5	$25,025
C	Pump Replacement for Production Well #2	A7	$21,450
A	Replace or Repair Existing Raceway Standpipes	B1	$28,243
C	Raceway Concrete Repair or High-Bond Epoxy Coating	B2	$112,970
C	Install Permanent Bird Predation Protection	B3	$1,287,000
A	Install Flow Baffles in Raceways	B5	$204,204
C	Design and Construct New Bridge Across Spring Creek	D1	$411,840
C	Install Sludge Storage System	E1	$228,800
C	Re-Design and Construct Additional Clarifier	E2	$243,100
C	Regrade and Line Settling Ponds (Two, 0.33-Acre Ponds)	E3	$47,332
C	Install High Flow Capacity Disc Filter	E4	$255,184
A	New Effluent Flow Measurement Device and Composite Sampler	E5	$58,630
C	Electrical and Emerg. Service to all Water/Wastewater Improvements	F6	$135,850
C	Traveling Bridge Sand Media Filter	E7	$947,100
A	Aeration System For Polishing Pond	E8	$33,825
	PRIORITY 2		**$2,224,049**
C	Install Bulk Liquid Oxygen Tank	A2	$100,100
C	Install Filter Systems and UV Systems for Hatchery Buildings	A3	$481,066
A	Additional Degassing Devices	A6	$14,300
C	Additional Early Rearing and Egg Incubation Units	B4	$858,000
C	Construct New or Expand Current Garage	C1	$225,885
C	Pole Barn Expansion	C2	$97,185
A	Update the Lower Hatchery Bldg or Convert to Additional Storage Space	C3	$7,150
A	Siding Multi-Purpose Building	C4	$30,030
C	Bituminous Road Surface	D2	$241,318
C	Convert Retention Pond to a Chemical Retention/Detoxification Basin	E6	$41,745
C	Additional Security Lighting	F2	$35,750
C	Heating in Garage and Upper Hatchery Building	F3	$17,160
A	Upgrade Air Compressors and Oxygen Generators	F5	$74,360
	PRIORITY 3		**$18,590**
A	Handicapped Parking	D4	$715
A	Visitor I & E Display Improvements	G1	$14,300
A	PENN DOT Signage	G2	$3,575
	Items Not Recommended for Prioritization at This Time		
A	Siding Multi-Purpose Building	C4	$30,030
A	Visitor Walking Trail from Footbridge into Facility	D3	$14,300
A	Upper Emergency Generator Conversion (Completed)	F1	$0
A	Renovation of Elec. System & Additional Telephone Line (Completed)	F4	$0

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

C = Improvement Recommended to be Completed by Contracted Construction
A = Improvement Recommended to be Completed by PFBC Construction Crews

Benner Spring FCS Summary of Opinions of Probable Cost

	Summary - Opinions of Probable Cost		
	ITEM	**DRAWING I.D. #**	**TOTAL COST ****
	PRIORITY 1		**$4,215,671**
C	Additional Water Supply/Recirculation Water Pump Station	A1	$944,749
A	Complete Bulk Liquid Oxygen System and LHO Contacting Chambers	A2	$317,625
C	Ultraviolet (UV) Disinfection for Hatchery Building	A3	$194,920
C	Install Filter & UV Systems for Spring Creek Water	A6	$393,762
A	Install Flow Baffles within Raceways	B4	$217,360
A	Hoists to Maneuver 55-Gallon Drums within Chemical Storage Building	C4	$1,430
C	Install Sludge Storage System	E1	$228,800
A	Install Baffles within Settling Pond	E2	$3,432
C	Regrade and Line the Reconstructed Settling Pond	E3	$88,821
C	Install High Flow Capacity Disc Filter	E4	$240,486
A	Install New Effluent Flow Measurement Device and Composite Sampler	E5	$56,166
C	Convert Polishing Pond to Chemical Retention/Detox Basin	E6	$41,745
C	Traveling Bridge Sand Media Filter	E7	$1,082,400
A	Aeration System For Polishing Pond	E8	$33,825
C	Upgrade Alarm Systems	F1	$135,300
C	Electrical and Emerg. Service to all Water/Wastewater Improvements	F2	$234,850
	PRIORITY 2		**$1,074,365**
A	Mechanical Aerators for Ponds	A5	$21,450
C	Repair and Line Cool/Warmwater Production Ponds	B1	$178,875
C	Installation of Permanent Bird Predation Protection	B2	$85,800
A	Raceway Concrete Repairs	B3	$139,568
C	Pole Building Expansion (Three Additional Bays)	C1	$143,550
A	Bulk Feed Storage Bin Replacement	C2	$33,248
A	Siding Replacement on All Buildings	C3	$50,244
C	Addition to Maintenance Building	C5	$61,270
C	Sandblast and Paint Bridges	D1	$143,000
C	Bituminous Road Surface	D2	$217,360
	PRIORITY 3		**$17,875**
A	Visitor I & E Display Improvements	G1	$14,300
A	PENN DOT Signage	G2	$3,575
	Items Not Recommended for Prioritization at This Time		
C	Improve Yield of Production Well #2 (Completed)	A4	$0

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

C = Improvement Recommended to be Completed by Contracted Construction
A = Improvement Recommended to be Completed by PFBC Construction Crews

Big Spring FCS Summary of Opinions of Probable Cost

FISHPRO
Engineers & Scientists
5201 South Sixth Street Road
Springfield, IL 62703-5143
(217) 585-8333 FAX (217) 585-1890

Project: Big Spring Recirculation Study
Option: 3-B
By: Team **Date:** 4/18/2001

Detailed Opinion of Probable Costs					
	ITEM				TOTAL COST
1	**Pre-Engineered Production Building (Inclding Facility power)**				**$3,004,480**
2	**Culture Tank (24 Units, 3 Modules)**				**$1,195,200**
3	**Swirl Separator**				**$360,000**
4	**Drum Filter**				**$450,000**
5	**Pumping**				**$309,000**
6	**Fluidized-Sand Biofilters**				**$202,800**
7	**Combined Stripper/LHO**				**$127,050**
8	**LHO Sump Tank**				**$117,000**
9	**UV Filter**				**$927,000**
11	**Ozone Generation System**				**$345,750**
12	**Final Solids Capture**				**$181,500**
13	**Fish Handling and Harvest**				**$53,000**
14	**Demolition**				**$374,000**
15	**Mobilization Bonds & Insurance**				**$229,403**

Subtotal Construction Costs	**$7,876,183**
10% Estimating Contingency	$787,618
Total Construction Costs	**$8,663,802**
10% Construction/Change Order Contingency	$866,380
8% Design Phase Engineering	$693,104
7% Construction Phase Engineering	$606,466
Option 3-B Total:	**$10,829,752**

(Note: This Table was taken directly from Big Spring FCS Recirculation Study, April, 2001)

Table VII-8. Corry FCS Summary of Opinions of Probable Cost

	Summary - Opinions of Probable Cost		
	ITEM	**DRAWING I.D. #**	**TOTAL COST ****
	PRIORITY 1 (Capital Budget)		**$2,635,631**
CB,C	Replace Foster Spring Water Collection Gallery	A1	$143,000
CB,C	Water Disinfection System, Ozone and UV	A2	$718,403
CB,C	Replace Influent Pipeline to Raceways E-H	A11	$59,345
CB,C	Microscreen and UV Disinfect Influent to Rwys I-L	A12	$439,070
CB,C	Replace Main Property Spring Water Collection Gallery	A14	$71,500
CB,C	Optional Wastewater Treatment System	E2	$595,023
CB,A	Install New Effluent Flow Measurement Device and Sampler	E3	$56,705
CB,C	New Chemical Retention Basin	E4	$439,725
CB,C	Provide Elec. Service & Emerg. Power to Water/WW Impr.	F6	$112,860
	PRIORITY 2		**$351,395**
A	Modify Existing Aeration Tower	A3	$14,300
C	Well Metering System	A7	$49,665
C	Rehabilitate Production Wells	A8	$53,625
C	Construct Lower End Recirculation Pump Station	A13	$167,310
C	Repair Concrete Raceways at Main Hatchery	B3	$57,200
A	Install New Drainage System along Raceway I	D3	$9,295
	PRIORITY 3		**$2,618,988**
C	Construct Annex Pond Pump System	A9	$151,702
C	Construct New Production Ponds in Annex	B1	$1,761,581
C	Demolish Annex Property Raceways	B2	$7,150
A	Install Sun/UV Protection for Historical Visitor Exhibits	C1	$7,150
C	Construct Equipment/Vehicle Storage Building	C2	$171,600
A	Install Fire Detection Systems in Hatchery Buildings	C3	$14,300
C	Resurface Roadways and Parking Areas	D1	$311,740
A	Install Additional Bulk Feed Storage Bin	D2	$11,083
C	Upgrade Alarm Systems	F3	$143,000
A	Install Additional Telephone Line	F2	$358
C	Rewire Hatchery Building and Residence	F4	$21,450
A	Visitor I & E Display Improvements	G1	$14,300
A	Install PA DOT Signage	G2	$3,575
	Items Not Recommended for Prioritization at This Time		
A	Install Low Head Contact Chambers in HB (In Progress)	A4	$0
C	Install Sand Filtration and UV Disinfection for HB (In Progress)	A5	$0
A	Replace HB Water Supply System to Tanks (In Progress)	A6	$0
C	Alternative Water Supply Source to Ponds	A10	$21,450
A	Replace Foster's Property and Annex Spring Pumps (Completed)	A15	$0
A	Replace Interior Walls within Foster's Property Pump Bldg. (Completed)	C4	$0
A, #	Convert Unused Raceways to Chemical Retention Basin	E1	$78,588
C	Install Control Systems for Foster and Annex Pumps	F1	$21,450
C	Replace Hatchery Building Lighting (Completed)	F5	$0

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

C = Improvement Recommended to be Completed by Contracted Construction
A = Improvement Recommended to be Completed by PFBC Construction Crews
CB = Capital Budget Items

This item is a historic hatchery rearing area but it is incorrectly designated as a wetland.

Huntsdale FCS Summary of Opinions of Probable Cost

	Summary - Opinions of Probable Cost		
	ITEM	**DRAWING I.D. #**	**TOTAL COST ****
	PRIORITY 1 (Capital Budget)		**$3,671,859**
CB,A	Oxygen Supplementation System	A4	$381,095
CB,A	Aeration/Degassing of Spring Water	A6	$107,250
CB,A	Repair Leaking Standpipes at Raceways	B6	$58,630
CB,C	Install Sludge Storage System	E1	$228,800
CB,A	Extend Standpipes at B-Series Raceways (See B6)	E2	$0
CB,C	Regrade and Membrane Line Settling Pond	E4	$89,196
CB,C	Repair Wastewater Line near B-Series Raceways	E5	$163,735
CB,C	Bypass B-Series with A-Series Wastewater	E6	$70,463
CB,A	Additional Bulkhead in Settling Pond	E7	$10,725
CB,A	Clarifier Enhancement	E8	$108,240
CB,C	Overflow WW Microscreening System	E9	$396,835
CB,C	Convert Settling Lagoon to Chemical Retention Basin (see E4)	E10	$0
CB,A	Sludge Transfer Piping from Clarifier to Sludge Storage (see E8)	E11	$0
CB,C	Control Valves and Piping to Divert to Chem. Ret. Basin	E12	$50,050
CB,C	Install Pipeline for Clarifier Overflow to Microscreen	E13	$4,059
CB,C	Install Microscreen Backwash System to Existing Clarifier	E14	$2,706
CB,C	Traveling Bridge Sand Media Filter	E15	$1,716,000
CB,A	Aeration System For Polishing Pond	E16	$71,500
CB,C	Provide Elec. Service & Emerg. Power to Water/WW Impr.	F4	$212,575
	PRIORITY 2		**$2,482,466**
A	Irishtown Run Intake Screen	A1	$35,750
C	Heat Exchangers for West Side of Cool/Warm Bldg.	A2	$260,975
C	Pressure Filtration and UV Disinfection for H. Bldgs.	A3	$619,891
A	Increase Water Supply to Cool/Warmwater Ponds	A7	$111,612
C	Bucher Spring Water Collection Gallery	A8	$143,000
C	Subdivide Pond #1 and New Harvest/Outlet Structures	B1	$254,040
C	Membrane Line Ponds #1-#4 and #6-#11	B2	$424,424
A	Repair/Improve Bird Protection System	B3	$350,350
A	Replace Smoke Alarms	C7	$14,300
C	Improve Security and Facility Lighting	D1	$60,775
C	Upgrade Alarm Systems	F1	$143,000
C	Upgrade Electrical Service to A- and B-Series Raceways	F2	$28,600
C	Emergency System & Redundant Pump at McManus Spr.	F3	$35,750
	PRIORITY 3		**$1,306,710**
A	Additional Egg Incubation Units	B4	$39,325
A	Remove Unused Broodfish Transfer System	B5	$14,300
A	Replace Cool/Warmwater Bldg Rearing Units	B8	$128,700
A	Renovate Residence or Convert to Office Space	C1	$128,700
C	Construct Additional Storage Building	C2	$186,780
A	Construct Additional Feed and Chemical Storage	C3	$136,290
A	Replace Siding and Guttering on Pole Barn	C4	$24,453
A	Replace Bulk Feed Storage Bins	C5	$22,165
A	New Windows & Update Displays of Multi-Purpose Bldg.	C6	$71,500
C	Resurface Floor in Cool/Warmwater HB	C8	$36,969
C	Bituminous Road Surface	D2	$478,203
A	New Bridge for Bucher Spring	D3	$7,150
A	Upgrade Visitor Displays and Wayside Exhibits	G1	$14,300
A	Install Wayside Visitor Kiosk and Visitor's Facilities	G2	$14,300
A	Install PA DOT Signage	G3	$3,575
	Items Not Recommended for Prioritization at This Time		
A	Increase Water Supply to Coldwater HB	A5	$232,375
A	Install Flow Baffles within Raceways (In Progress)	B7	$0
A	Install Baffles in Settling Pond (Completed)	E3	$0

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

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A = Improvement Recommended to be Completed by PFBC Construction Crews
CB = Capital Budget Items

Oswayo FCS Summary of Opinions of Probable Cost

	Summary - Opinions of Probable Cost		
	ITEM	**DRAWING I.D. #**	**TOTAL COST ****
	PRIORITY 1 (Capital Budget)		**$2,039,053**
CB,A	Install Spring Water Flow Meters and Meter Pit	A2	$35,750
CB,C	Water Treatment System for Hatchery Building	A3	$228,951
CB,A	Pumped Recirculation Flow Meter and Meter Pit	A6	$28,600
CB,A	Install Bulk Liquid Oxygen System	A8	$100,100
CB,A	Repair Concrete on Upper Aerator Structure	A9	$21,450
CB,C	Replace Piping Between Upper and Lower Rwys	A10	$73,073
CB,A	Repair or Replace Indoor Early Rearing Units	B1	$8,809
CB,A	Install Flow Baffles within Raceways	B3	$109,824
CB,C	Replace Roof on Hatchery Building	C2	$37,645
CB,C	Renovate Exterior Walls & Windows of Multipurpose Bldg.	C3	$57,200
CB,C	Waterproof Residence Basement	C4	$3,575
CB,A	Fencing around Wastewater Improvements	D4	$18,876
CB,C	Install Sludge Storage System	E1	$228,800
CB,C	Overflow WW Microscreening System	E2	$147,612
CB,C	Convert Settling Lagoon to Chemical Retention Basin	E3	$55,323
CB,C	Sludge Transfer Piping from Clarifier to Sludge Storage	E4	$42,900
CB,A	Install New Effluent Flow Measurement Device and Sampler	E5	$56,705
CB,C	Pump System to Transfer Clarifier OW to Settling Pond	E7	$127,985
CB,C	Traveling Bridge Sand Media Filter	E8	$500,500
CB,A	Aeration System For Polishing Pond	E9	$35,750
CB,C	Provide Elec. Service & Emerg. Power to Water/WW Impr.	F1	$119,625
	PRIORITY 2		**$548,989**
C	Microscreening System for Serial Reuse Water	A4	$150,657
C	Repair and Resurface Concrete Raceways	B4	$48,620
C	Resurface Roadways and Parking Areas	D1	$162,668
C	New WW Piping from HB to Clarifier and Chem. Basin	E6	$30,030
C	Upgrade Alarm Systems	F2	$143,000
C	Replace Garage Lighting	F3	$14,014
	PRIORITY 3		**$1,870,197**
C	Improve Underground Spring Collection Galleries	A1	$286,000
C	Disinfection of Serial Reuse and Recirculated Water	A5	$905,946
C	Membrane Lined Minnow Pond	B6	$84,715
C	New Concrete Outlet/Harvest Structure for Minnow Pond	B7	$22,094
C	Permanent Bird Protection over Lower Raceways	B8	$163,020
C	New Equipment Storage Building	C1	$366,080
C	New Access Roads	D2	$20,177
A	Bulk Feed Storage Bins	D3	$22,165
	Items Not Recommended for Prioritization at This Time		
C	Rehabilitation of Water Recirculation Pumping System	A7	$57,200
A	Additional Egg Incubation and Early Rearing Units	B2	$197,340
A	Replace or Repair Existing Raceway Standpipes (Completed)	B5	$0
C	Addition to Hatchery Building	C5	$536,250
A	Upgrade Visitor Displays (Completed)	G1	$0
A	Visitor I & E Kiosk	G2	$14,300

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

C = Improvement Recommended to be Completed by Contracted Construction
A = Improvement Recommended to be Completed by PFBC Construction Crews
CB = Capital Budget Items

Pleasant Gap FCS Summary of Opinions of Probable Cost

	Summary - Opinions of Probable Cost		
	ITEM	**DRAWING I.D. #**	**TOTAL COST ****
	PRIORITY 1		**$2,127,366**
C	Recirculation and Water Treatment Options	A1	$676,838
A	Replace or Repair Early Rearing Units	B1	$6,206
A	Renovate Feed Storage Facility	C3	$1,012
A	Replace Bulk Feed Storage Bins	C6	$31,202
A	Construct Shelter over Main Intake	C7	$25,740
C	Connect Facility to Municipal Water	D1	$12,375
C	Install Sludge Storage System	E1	$216,480
C	Replace Liner within Settling Pond	E2	$38,324
C	Install a High Flow Capacity Disc Microscreen	E3	$203,990
A	New Effluent Flow Measurement Device	E4	$35,750
C	Traveling Bridge Sand Media Filter	E6	$811,800
A	Aeration System For Two Polishing Ponds	E7	$67,650
	PRIORITY 2		**$950,109**
C	New Water Distribution Box for Lower Raceways	A2	$28,600
C	Install Pressurized Sand Filters and UV Disinfection for HB	A4	$412,044
C	Repair or Replace Lower and Nursery Raceways	B3	$28,600
C	Construct Multiple-Bay Pre-Engineered Metal Storage Bldg	C1	$133,155
A	Plumbing Shop Removal	C2	$7,150
A	Expand Existing Chemical Storage Capabilities	C4	$11,385
A	Hatchery Building Window Replacement	C5	$38,610
A	Improve Footbridge from Visitor's Parking Lot to Facility	D2	$6,765
C	Electrical and Emerg. Service to all Water/Wastewater Improvements	F1	$135,850
C	Alarm and Control Systems Renovation	F2	$126,500
C	Outdoor Hatchery Lighting Enhancement	F3	$21,450
	PRIORITY 3		**$511,551**
C	Install Permanent Bird Predation Protection	B2	$214,500
A	Visitor's Center Renovation	C8	$143,000
A	Provide ADA Parking	D3	$715
C	New Settling Pond and Utilize Existing Pond for Chem. Ret.	E5	$135,461
A	Upgrade Visitor Displays and Exhibits	G1	$14,300
A	PENN DOT Signage	G2	$3,575
	Items Not Recommended for Prioritization at This Time		
A	Bulk Liquid Oxygen and Oxygen Contacting (Completed)	A3	$0
A	Replace Roof on Existing Garage (In Progress)	C9	$0

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

C = Improvement Recommended to be Completed by Contracted Construction
A = Improvement Recommended to be Completed by PFBC Construction Crews

Reynoldsdale FCS Summary of Opinions of Probable Cost

	Summary - Opinions of Probable Cost		
	ITEM	**DRAWING I.D. #**	**TOTAL COST ****
	PRIORITY 1 (Capital Budget)		**$5,572,648**
CB,A	LOX and Oxygen Supplementation System	A1	$163,020
CB,C	Recirc. Pump Station, Microscreening, & UV Disinfection System	A2	$1,326,969
CB,C	Replacement of Outdoor Rearing Units	B1	$3,498,433
CB,C	Predation Protection (See B1)	B2	$0
CB,C	Repair or Demolish the Remaining Raceways #13-#108	B6	$29,387
CB,C	Building for Recirculation System (See A2)	C5	$0
CB,A	Ditch Renovation and Drainage Improvements	D4	$4,290
CB,C	Clarifier and Sludge Transfer Pumps to Sludge Storage Tank	E1	$185,900
CB,C	Solids Microscreening System (See A2)	E2	$0
CB,A	New Effluent Flow Measurement Device	E3	$35,750
CB,C	Install Sludge Storage System	E4	$228,800
CB,C	Upgrade Electrical Systems & Service	F8	$100,100
	PRIORITY 2		**$1,291,414**
C	Repair/Cover a Portion of Raceways #1-#60 to Support Broodstock Program	B5	$324,610
A	Replace Hatchhouse Tanks	B7	$246,774
C	Bituminous Road Surface and Site Repairs	D1	$296,571
C	New Emerg. Generator to Provide Elec. Service to All Existing Bldgs.	F1	$250,250
C	Electrical and Emerg. Service to all Improvements (See F1)	F2	$0
C	Rewire and Replace Lighting within Hatchery Bldg.	F4	$30,209
C	Upgrade Alarm Systems	F7	$143,000
	PRIORITY 3		**$3,919,276**
A	Enclosure Improvements at Spring Water Source	A3	$7,722
C	Provide Water Supply Source for Ponds at Dunning Creek	A4	$133,261
C	New Production Ponds	B3	$3,220,825
A	Ceiling Repair and Ventilation within Hatchery Bldg.	C2	$68,640
A	Siding Multi-Purpose Bldg.	C3	$63,063
C	ADA Access to Visitor's Center	C4	$112,970
C	New Domestic Water Supply to Visitor's Center from Local Municipality	D2	$123,750
A	Walkway from Visitor's Parking Area Around Facility	D3	$715
A	Fencing Around Proposed Coolwater Production Ponds	D5	$94,380
C	New Effluent Diversion Box	E5	$18,876
C	Provide Electrical Service to Vehicle Storage Building	F3	$35,750
C	Rewire Storage/Chemical Bldg.	F5	$21,450
A	Upgrade Visitors Displays & Wayside Exhibits	G1	$14,300
A	PENN DOT Signage	G2	$3,575
	Items Not Recommended for Prioritization at This Time		
A	Flow Baffles within New Raceways (In Conjunction w/ Option B1b)	B4	$57,200
A	Replace Roof on Multi-Purpose Bldg. (Completed)	C1	$0
A	Install Air Conditioners on Multi-Purpose Bldg. (Completed)	F6	$0

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

C = Improvement Recommended to be Completed by Contracted Construction
= Improvement Recommended to be Completed by PFBC Construction Crews
CB = Capital Budget Items

A

Tylersville FCS Summary of Opinions of Probable Cost

	Summary - Opinions of Probable Cost		
	ITEM	**DRAWING I.D. #**	**TOTAL COST ****
	PRIORITY 1 (Capital Budget)		**$1,971,245**
CB,C	Remove Easternmost Drying Bed & Enclosure	C1	$25,025
CB,C	Cast-in-Place Square Overtopping Intercept Manhole	E1	$18,876
CB,C	Install High Flow Capacity Disc Filter	E2	$236,369
CB,C	Install Alternate Pipeline for Clarifier Overflow to Microscreen	E3	$3,861
CB,C	Install Microscreen Backwash System to Existing Clarifier	E4	$2,574
CB,C	Convert Polishing Pond to Aeration / Chemical Retention/Detox Basin	E8	$40,040
CB,C	Service to all Water/Wastewater Improvements	F1	$35,750
CB,C	Emergency Power to all Water/Wastewater Improvements	F2	$107,250
CB,C	Traveling Bridge Sand Media Filter	E10	$1,430,000
CB,A	Aeration System For Polishing Pond	E11	$71,500
	PRIORITY 2		**$1,828,606**
A	Install Fencing Around Spring Water Source	A2	$8,580
C	Recirculation Water Pump Station	A6	$271,789
C	Install Ultraviolet Disinfection System for Pumped Recirculation Water	A7	$553,300
C	Installation of Bird Predation Protection	B3	$715,000
A	Concrete Flooring within Storage/Pole Building	C2	$35,750
A	Siding on the Gable Ends of all Buildings	C3	$14,300
C	Paving & Site Repairs	D1	$129,273
C	Provide Fish Transport Vehicle Wash/Disinfect Station	E7	$71,500
A	Oxygen Injection System	E9	$29,115
	PRIORITY 3		**$193,086**
C	Utilize Groundwater from Production Well	A3	$23,452
C	High Vol. Forced Air Stripping Column and Headtank (Alt. to A5)	A4	$85,800
A	Replace or Expand Resident Garage	C4	$12,334
C	Visitor I & E Building with Observation Platform	G1	$71,500
	Items Not Recommended for Prioritization at This Time		
A	Extend Length of Spring Pool Dam (In Progress)	A1	$0
C	Flat-Plate Heat Exchanger (Alt. to A4)	A5	$169,455
A	Install Flow Baffles within Raceways (Completed)	B1	$0
A	Replace or Repair Existing Raceway Standpipes (In Progress)	B2	$0
A	Extend Raceway Quiescent Zones (Completed)	B4	$0
A	Install New Effluent Flow Measurement Device and Sampler (Completed)	E5	$0
C	Install Sludge Storage System (In Progress)	E6	$0

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

C = Improvement Recommended to be Completed by Contracted Construction
A = Improvement Recommended to be Completed by PFBC Construction Crews
CB = Capital Budget Items

Fairview FCS Summary of Opinions of Probable Cost

	Summary - Opinions of Probable Cost		
	ITEM	**DRAWING I.D. #**	**TOTAL COST ****
	PRIORITY 1		**$1,104,686**
C	Install Hor. Well/Collection Gallery or New Pumped Vert. Well for N & S Raine	A2	$286,000
C	Install Sump and New Pumps for Recirculation System	A6	$131,852
A	Install Flow Baffles within Raceways	B2	$53,768
C	Pole Building Expansion	C1	$79,695
A	Chemical Storage Expansion	C2	$6,831
C	New Pump House for Recirculation	C5	$12,650
C	Install Sludge Storage System	E1	$228,800
C	Install High Flow Capacity Disc Filter (1,000 gpm)	E3	$154,941
A	Aeration System For Polishing Pond	E4	$35,750
C	Improve Electrical Service to Raceways	F2	$28,600
C	Air Conditioning for Residence	F4	$7,150
C	Heating Replacement in Hatchery Building	F5	$78,650
	PRIORITY 2		**$911,002**
C	Disinfection Bldg. with In-Line Screening/Filtering and UV Disinf. Equip.	A3	$455,172
A	Hatchery Building Roof Replacement (Sloped Portions Only)	C3	$12,966
A	Residence Renovation	C4	$41,745
C	Improve Security and Facility Lighting	D1	$35,750
C	Bituminous Road Surface (Re-Seal Only)	D2	$65,069
C	Upgrade Alarm and Control Systems	F1	$143,000
C	Electrical and Emerg. Service to all Water/Wastewater Improvements	F3	$135,850
C	Install VFD Controllers for the Pumps within New Pump Bldg.	F6	$21,450
	PRIORITY 3		**$1,171,638**
A	Construct a Shelter Over North Raine	A1	$51,480
C	Install Chillers for North Raine Water (Summer Months Only)	A5	$536,250
C	Construct New Fish Rearing Units at Mission Site	B1	$508,200
A	Construct Containment Dike for Sludge Disposal Area	E2	$7,150
A	Upgrade Visitors Displays and Construct Walkway to Facility	G1	$15,373
A	Media for Educational Videos and Training	G2	$3,575
A	PENN DOT Signage	G3	$3,575
A	ADA Compliant Restrooms, Parking, and Walkways	G4	$41,745
A	Picnic Tables near Parking Lot	G5	$4,290
	Items Not Recommended for Prioritization at This Time		
C	Bulk Liquid Oxygen System (Completed)	A4	$0

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

C = Improvement Recommended to be Completed by Contracted Construction
A = Improvement Recommended to be Completed by PFBC Construction Crews

Linesville FCS Summary of Opinions of Probable Cost

	Summary - Opinions of Probable Cost		
	ITEM	**DRAWING I.D. #**	**TOTAL COST ****
	PRIORITY 1		**$3,393,998**
C	Reservoir WS Treatment (T-Screen, Pressure Strainer & UV)	A8	$676,363
C	Install Sand Filter & UV Systems for Hatchery Building	A9	$379,291
C	Iron Filtration System for Production Well Water	A11	$250,250
C	Concrete Harvest Structure for Big Ponds	B2	$67,515
C	Install Liners within North and South Ponds	B7	$505,794
A	Replacement of Valves at Silos	B10	$28,518
C	New Outlet Structures for South and Pumphouse Ponds	B11	$438,846
A	Roof Replacement (Multi-Purpose and Well Houses)	C2	$40,864
A	Replace Windows and Paint Visitor Center	C4	$43,472
C	Settling Pond Improvements (Big & South Ponds)	E1	$111,254
C	Convert Pond #12 to Settling Pond (Pumphouse Ponds)	E2	$174,876
C	Construct Additional and/or Improve Settling Ponds (North)	E3	$212,757
C	Replace WW Transfer Pumps for Multi-Purpose Bldg.	E4	$85,800
C	Upgrade Alarm Systems	F1	$135,300
C	Electrical and Emerg. Service to all Water/Wastewater Improvements	F3	$243,100
	PRIORITY 2		**$4,686,289**
A	Install Well Metering System	A1	$25,025
C	Replace Pumps for South Ponds	A2	$138,875
C	Improve Yield or Replace Production Well #5	A3	$63,250
C	Increase Main Pump House Capacity	A4	$84,546
C	Install Additional Production Wells	A5	$126,500
A	Aeration for Production Ponds (Add to Item F2)	A6	$201,300
C	Install Water Heating System for Hatchery Building	A12	$128,700
C	Temperature Management Capability for N & S Ponds	A13	$120,175
A	Replacement of Egg Incubation Units	B1	$145,860
C	Remove and Reconstruct Concrete Raceways (Daphnia)	B3	$328,900
C	Remove Double Ditch Ponds and Construct New Ponds	B5	$2,277,329
C	Predation Protection over New Daphnia Raceways	B8	$224,224
A	Repair and Resurface the Concrete Raceways	B9	$12,177
C	Construct New Pre-Engineered Storage Building	C1	$233,475
C	Bituminous Road Surface	D3	$232,870
A	Install Boat Ramp	D4	$71,500
C	Provide Electric Service to All Ponds	F2	$178,750
C	Replace HVAC Systems within the Multi-Purpose Bldg.	F5	$57,083
C	Electrical and Lighting Repairs in Multi-Purpose Boiler Room	F6	$35,750
	PRIORITY 3		**$1,857,863**
C	Monitoring for pH and DO for N & S Ponds	A14	$135,850
C	Construction of New Cool/Warmwater Production Ponds	B4	$1,606,551
A	Install Window in Bathroom at Residence	C3	$677
A	Walking Trail, Site Observation Tower and Picnic Pavilion	D1	$25,025
C	ADA Compliant Restrooms, Parking and Walkways	D2	$43,285
A	Visitor Observation Platform & Picnic Shelter	G1	$42,900
A	PENN DOT Signage	G2	$3,575
	Items Not Recommended for Prioritization at This Time		
C	Bulk Liquid Oxygen System (Completed)	A7	$0
C	Reservoir Trtmnt (T-Screen, Microscreen & UV) (Alt. to A8)	A10	$633,677
C	Regrade and Reslope the North Ponds (Alt. to B5)	B6	$22,341
A	Additional Telephone Line in Maintenance Building (Completed)	F4	$0

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

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= Improvement Recommended to be Completed by PFBC Construction Crews

A

Pleasant Mount FCS Summary of Opinions of Probable Cost

	Summary - Opinions of Probable Cost		
	ITEM	**DRAWING I.D. #**	**TOTAL COST ****
	PRIORITY 1		**$3,224,740**
C	Replace Creek Intake Water Supply Piping	A1	$121,550
A	Bulk Liquid Oxygen System	A2	$100,100
A	LHO Contacting Chambers, Distribution Piping, and Metering	A3	$128,700
C	Rehabilitate Existing Production Wells	A4	$50,738
C	Hatchery Building Recirculation Systems	A7	$515,814
C	Construct New Rearing Ponds at Hankins Site	B1	$368,636
C	Construct Larger Catch Basin in Pond #12	B3	$48,979
C	Production Pond Consolidation and Renovation (Alt. to Item B2)	B5	$1,240,085
A	Remove and Replace Early Rearing Units	B6	$106,887
C	Concrete Raceways Serial Drainage Modifications	B7	$101,475
A	Hankins Pond Drainage Improvements	B8	$4,059
C	Demolish Large Barn	C1	$10,148
A	New Effluent Flow Measurement Device	E1	$35,750
C	Repair or Replace Wastewater Line to Clarifier	E2	$27,170
C	Electrical and Emerg. Service to all Water/Wastewater Improvements	F1	$221,650
C	Install a New Emergency Generator and Transfer Switch (See F1)	F2	$0
C	Upgrade Elec. Service and Rewire HBs, Res. & Rearing Units	F3	$143,000
C	Conduct Electrical Study (Under Separate Contract)	F5	$0
	PRIORITY 2		**$828,832**
C	Construct New Pre-Engineered Vehicle and Feed Storage Bldg	C2	$235,422
A	Renovations to Coldwater Production Hatchery Building #1	C3	$22,140
C	Renovations to Both Residences (3,500 SF Combined)	C4	$143,756
C	Resurface Roadways and Parking Areas as Reqd.	D1	$284,513
C	Reserved	D2	$0
C	Upgrade Alarm Systems	F4	$143,000
	PRIORITY 3		**$526,378**
C	Water Treatment Syst. For Pumped Recirc. & Creek Water	A8	$462,798
A	Trailer Mounted Pump and Aluminum Irrigation Piping	A9	$21,450
A	Construct Additional Footbridge	D3	$6,765
A	Crosswalk Warning Signs Across Route 371	D4	$6,765
A	Upgrade Visitor Displays	G1	$14,300
A	Install Wayside Visitor Kiosk & Visitor's Facilities	G2	$14,300
	Items Not Recommended for Prioritization at This Time		
A	Increase Buffering Capacity in Cool/Warmwater Ponds (by PFBC)	A5	$0
C	Improve Aeration to Cool/Warmwater Production Ponds	A6	$81,191
C	Production Pond Repairs (Alt. to Item B5)	B2	$588,552
C	Repair or Replace all Bulkheads (Inlet Structures) within Ponds	B4	$44,649

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

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Tionesta FCS Summary of Opinions of Probable Cost

	Summary - Opinions of Probable Cost		
	ITEM	**DRAWING I.D. #**	**TOTAL COST ****
	PRIORITY 1		**$2,184,540**
A	Install Bulk Liquid Oxygen System	A2	$100,100
C	Modify Existing Aeration Towers	A3	$64,350
A	Install Control Valves at Head Ends of Upper & Lower Raceways	A7	$91,520
C	Replacement of Production Well #2	A8	$35,750
C	Repair Head and Midpoint Aerators	A9	$21,450
C	Install Chillers to Well Water	A10	$286,000
C	Install Flow Meters, Meter Pit & Related Instrumentation to Wells	A11	$50,050
C	Replace Production Well Pumps	A12	$50,050
C	Cool/Warmwater Production Pond Renovations	B1	$264,622
A	Renovate Circular Tanks within Hatchery Building	B3	$62,205
A	Replace Existing Standpipes within Hatchery Bldg. & Curvilinear Rwys	B7	$27,885
A	Replace Egg Incubation Units within Hatchery Bldg.	B8	$60,060
A	Install Flow Baffles within Curvilinear Raceways	B9	$171,600
C	Additional Domestic Water Well	D1	$7,150
A	Install New Effluent Flow Measurement Devices & Composite Samplers	E1	$58,630
C	Install a High Flow Capacity Disc Microscreen	E3	$167,811
C	Traveling Bridge Sand Media Filter	E4	$405,900
A	Aeration System For Polishing Pond	E5	$33,825
C	Electrical and Emerg. Service to all Water/Wastewater Improvements	F1	$135,850
C	Electrical Service to Curvilinear Raceways	F2	$28,600
C	Replace Electrical Wiring Between Production Well #2 and #3	F3	$5,720
C	Rewire Existing Production Well Bldgs.	F6	$21,450
C	Install Control Systems for the Production Well Pumps	F7	$32,175
A	Air Conditioning for Conference Room	F8	$1,788
	PRIORITY 2		**$486,674**
C	Remove and Replace Tubbs Run Units (Alt. to B6)	B2	$300,114
A	Replace Fiberglass on Existing Drying Bed Enclosure	C2	$38,610
C	Upgrade Alarm Systems	F4	$126,500
C	Rewire Hatchery Bldg.	F5	$21,450
	PRIORITY 3		**$74,058**
C	Install Permanent Birds Predation for Tubbs Run Units	B5	$21,450
A	Crosswalk Across Route 62	D2	$30,443
A	Picnic Tables at PFBC Access Area	D3	$4,290
A	Upgrade Visitor Displays & Exhibits	G1	$14,300
A	PENN DOT Signage	G2	$3,575
	Items Not Recommended for Prioritization at This Time		
C	Treated Water from Tubbs Run (Completed)	A1	$0
C	Sand Filter & UV Disinfection of Tubbs Run Water (See A1)	A4	$0
C	Pump Replacement for Production Well #1 (Completed)	A5	$0
A	Increase Buffering Capacity in Cool/Warmwater Prod. Ponds (by PFBC)	A6	$0
C	Additional Production Ponds	B4	$1,248,176
C	Repair Existing Concrete Tubbs Run Raceways (Alt. to B2)	B6	$240,240
A	Construct Bldg. to House Sand Filters and UV (Completed)	C1	$0
A	Combine Effluent Outfalls (Completed)	E2	$0

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

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Union City FCS Summary of Opinions of Probable Cost

	Summary - Opinions of Probable Cost		
	ITEM	**DRAWING I.D. #**	**TOTAL COST ****
	PRIORITY 1		**$2,893,072**
C	Improve Sand Filtration System	A1	$486,200
C	Install Chillers in Hatchery Building for Reservoir Water	A2	$185,900
C	Install Additional Wells	A3	$126,500
A	Install Control Valves on Lower Supply Dam Pipeline	A6	$44,275
A	Replace Valves in Hatchery Building and Garage	A7	$12,650
A	Connect Upper Supply Dam to Sand Filtration System	A8	$79,063
C	Replace Boiler or Install Heat Exchangers in HB	A9	$86,930
C	Install Recirculation Water Pump Station, Filtration and UV System	A10	$454,548
A	Replacement of Egg Incubation Units and Piping	B1	$19,811
C	Repair Leaks within Ponds #2 and #7	B5	$14,300
A	Replace Slide Gates with Control Valves	B6	$8,580
C	Pond Consolidation and Replacement	B7	$661,554
A	Demolish Old Concrete Raceways	B8	$7,150
A	Additional Chemical Storage	C3	$68,145
C	Bituminous Paving and Road Repairs	D1	$71,709
C	Connect Facility DWW to Municipal Domestic Wastewater	E1	$20,625
C	Expand Settling Pond #10	E2	$26,813
A	Install Control Valves to Stop Flow from HB to Pond #12	E3	$13,750
C	Install Modern Effluent Treatment System for HB Effluent	E4	$305,470
C	Electrical and Emerg. Service to all Water/Wastewater Improvements	F3	$135,850
C	Upgrade and Replace Electrical Wiring Systems	F4	$63,250
	PRIORITY 2		**$374,897**
A	Replace or Expand the Garage	C1	$93,390
A	Replace Windows and Siding for Hatchery Building	C2	$75,075
A	Additional Office Space	C4	$16,445
C	Upgrade Alarm Systems	F1	$126,500
C	Install New Lighting in Pole Barn, Hatchery Building and Garage	F5	$27,737
C	Security Lighting	F6	$35,750
	PRIORITY 3		**$75,675**
A	Residence Renovation	C7	$18,975
A	Installation of Security Fencing	D2	$12,177
A	Upgrade Visitor Displays and Wayside Exhibits	G1	$14,300
A	Pennsylvania DOT Signage	G2	$3,575
A	ADA Restrooms and Parking	G3	$26,648
	Items Not Recommended for Prioritization at This Time		
A	Construct Larger Supply Dam	A4	$63,250
C	Freeze Protect Pipes	A5	$37,950
C	Dredge and Reslope Production Ponds (Alt. to Item B7)	B2	$54,120
C	Construct Concrete Harvest Structures (Alt. to Item B7)	B3	$275,606
A	Eliminate Production Pond #6 (Alt. to Item B7)	B4	$26,384
A	Siding for Garage	C5	$9,662
A	Replace Barn Door (In Progress)	C6	$0
A	Replace Telephone Systems (Completed)	F2	$0

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

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Upper Spring Creek FCS Summary of Opinions of Probable Cost

	Summary - Opinions of Probable Cost		
	ITEM	**DRAWING I.D. #**	**TOTAL COST ****
	PRIORITY 1		**$1,033,504**
C	Install Recirculation Water Pump Station, Filtration and UV System	A3	$454,548
A	Chemical and Bagged Feed Storage	C2	$7,590
C	Repair and Enhance Settling Pond	E1	$87,641
C	Update Electrical Service and System	F1	$221,375
C	Electrical and Emerg. Service to all Water/Wastewater Improvements	F2	$135,850
C	Install Monitoring, Alarm, and Notification Systems	F4	$126,500
	PRIORITY 2		**$1,476,210**
C	Service and/or Replace Production Wells and Pumps	A1	$126,500
A	Install Bulk LOX System, LHO Contacting Chambers & Sealed Columns	A2	$192,610
C	Aeration for Production Ponds	A4	$86,559
C	Installation of Additional Water Supply Piping for Ponds	A5	$172,964
C	Demolition of Concrete Raceways	B1	$7,150
C	Installation of Circular Tanks for Broodstock Holding	B2	$292,964
C	Subdivision of Existing Warming Pond	B3	$29,990
A	Replace Existing Pond Harvest Structures	B4	$175,031
A	Install Egg Incubators	B5	$47,740
A	Install Early Rearing Units	B6	$70,400
A	Renovation of Existing Hatchery Building	C1	$97,416
A	Security Fencing Around Spring Crk Intake, HB and Improvements	D1	$14,207
C	Bituminous Road Surface	D2	$31,119
C	Security Lighting	D3	$35,750
C	Provide Electrical Service to Cool/Warmwater Production Ponds	F3	$25,025
C	Install VFD Controllers for Production Well Pumps	F5	$32,175
C	Bury Electrical Lines to Upper Spring Creek	F6	$38,610
	PRIORITY 3		**$0**
	None		
	Items Not Recommended for Prioritization at This Time		
	None		

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

C = Improvement Recommended to be Completed by Contracted Construction
A = Improvement Recommended to be Completed by PFBC Construction Crews

New Coldwater FCS Summary of Opinions of Probable Cost

Summary - Opinions of Probable Cost		
ITEM	**DRAWING I.D. #**	**TOTAL COST ****
PRIORITY 1		
Water Groundwater Supply	A1	$1,716,000
Dissolved Oxygen Management System	A2	$347,061
New Raceways (Option)	B1	$3,432,000
Circular Tank Rearing (Option)	B1A	$7,662,398
Hatchery Building--Production Area	C1	$1,587,300
Broodstock Bldg.	C2	$1,447,875
Vehicle/Equipment Storage Building	C3	$446,160
Residences	C4	$643,500
Land Acquisition & Sitework	D1	$2,395,250
Site Paving and Access to State or Local Highway	D2	$194,480
Security Fence	D3	$8,580
Domestic Well & Water System	D4	$28,600
Domestic Wastewater System	D5	$35,750
Wastewater Piping	E1	$170,170
Microscreen	E2	$249,026
Clarifier	E3	$185,900
Sludge Storage	E4	$165,437
Wastewater Related Site Work	E5	$87,087
Effluent Measurement	E6	$35,750
Electrical Service	F1	$286,000
Emergency Power	F2	$150,150
Instrumentation and Alarm System	F3	$214,500
Hatchery Building--Visitor Interpretation	G1	$35,750
New Raceways (Option)	**PRIORITY 1**	**$13,862,326**
Circular Tank Rearing (Option)	**PRIORITY 1**	**$18,092,724**

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)

New Cool/Warmwater FCS Summary of Opinions of Probable Cost

New Hatchery Summary - Opinions of Probable Cost		
ITEM	**Summary I.D.#**	**TOTAL COST**
PRIORITY 1		
Water Groundwater Supply	A1	$250,250
Elevated Water Supply Reservoir	A2	$1,401,400
Building Water Supply Well	A3	$71,500
One-Acre Production Ponds	B1	$6,864,000
Indoor Fish Holding Tanks (Included in C1)	B2	$0
Adult Spawning, Jar Incubation & Early Rearing Tanks (Inc. in C1)	B3	$0
Future Pond Expansion Area	B4	$3,432,000
Hatchery Building--Production	C1	$1,430,000
Hatchery Building--Office/Laboratory	C2	$514,800
Vehicle/Equipment Storage Building	C3	$371,800
Residences	C4	$429,000
Land Acquisition & Sitework (Assume PFBC Property, NO PROJECT COST)	D1	$286,000
Paved Access to Commonwealth Highway	D2	$35,750
Security Fence	D3	$182,342
Effluent Settling Ponds	E1	$143,000
Effluent Monitoring	E2	$35,750
Electrical Service	F1	$286,000
Emergency Power	F2	$112,613
Instrumentation and Alarm System	F3	$214,500
Hatchery Building--Visitor Interpretation	G1	$71,500
(Note: Future Expansion Ponds, Item B4, was not included in this Total)		
PRIORITY 1		**$16,132,205**

** Costs include Estimating (10%), State Construction (15%), Design Phase (8%), and Construction Phase (7%) Contingencies. (See Section XX for Contingencies Discussion)