Gannett Fleming

Excellence Delivered ***As Promised***

Memorandum

To: Mr. Jason M. Smith (New Hampshire Fish and Game Department)

From: Ms. Carolina Cubides, P.E. (Gannett Fleming, Inc.)

Copy: Mr. Nicholaus J. Sahd (Gannett Fleming, Inc.)

Date: January 25, 2021

Subject: Conditions Assessment and Updated Opinion of Probable Construction Costs for Proposed Improvements to the Powder Mill State Fish Hatchery

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The New Hampshire Fish and Game Department's Powder Mill State Fish Hatchery is located at the headwaters of the Merrymeeting River at the Merrymeeting Lake Dam on Merrymeeting Road in New Durham, NH. The Hatchery produces eastern brook trout, rainbow trout, brown trout, and landlocked Atlantic salmon, for fisheries management of selected waterbodies located primarily in the central part of the state. The U.S. Environmental Protection Agency recently issued a final National Pollutant Discharge Elimination System (NPDES) Permit for the Hatchery effluent, or overflow water, to the Merrymeeting River. The final NPDES Permit includes stringent Total Phosphorus discharge limits as outlined below. The facility cannot currently meet these proposed limits and will require capital improvements for consistent compliance.

Parameter	Outfall 001 Limit	Outfall 002 Limit	Cumulative Outfalls 001 and 002
Effluent Total Phosphorus Concentration	12 µg/L	12 µg/L	N/A
Annual Total Phosphorus Load	N/A	N/A	227 lbs/year

FishPro (now a division of HDR) conducted an evaluation of potential effluent treatment alternatives for the Hatchery in 2002, along with an itemized construction cost estimate of the recommended improvements. The New Hampshire Department of Environmental Services (NHDES) retained Gannett Fleming to provide the updated budget-level cost estimate, to be budgeted in the 2022/2023 State Capital Plan. The updated budget-level cost estimate was completed in April 2020, based on general assumptions regarding the Draft NPDES permit discharge limits, updated unit prices and escalation rates. The updated budget-level cost estimate memorandum is included in *Attachment A*.

1. GF April 2020 Opinion of Probable Construction Cost and NPDES Permit

On April 2020, Gannett Fleming was requested to update the 2003 FishPro cost estimate to present value for budgetary purposes. The planning level opinion of probable construction cost was updated considering the Total Phosphorus discharge limits included in the Draft NPDES Permit and the following general assumptions on how those discharge limits would be met:

- The Draft NPDES Permit noted that a reduction of approximate 53% of the Total Phosphorus concentrations would be required to meet permit limits;
- The 2003 FishPro report noted that their recommendations on wastewater treatment would achieve 20-40% reduction of the Total Phosphorus concentrations;
- The 2003 FishPro report noted that a modified fish diet would contribute to a reduction of 10% of the Total Phosphorus concentrations; and
- The Drum Filter vendors noted their equipment could provide a 50-80% reduction of phosphorus in particulate form, as such, the updated opinion of probable construction cost considered the addition of ferric chloride.

The Final NPDES Permit requires the facility to employ an efficient feed management and feeding strategies, with, among others, the lowest possible phosphorus feed. It is expected that this requirement will be in-line with the above-mentioned assumption from the 2003 FishPro report.

The Total Phosphorus discharge limits vary from the Draft NPDES Permit to the Final NPDES Permit from a minimum of 14 µg/L and a seasonal variation, to 12 µg/L; and an annual Total Phosphorus Load, cumulative between the two existing outfalls, from 395 lbs/year to 227 lbs/year. As such, a feasibility study or preliminary engineering design would be required to verify that the proposed improvements are sufficient to meet the new nutrient restrictions.

2. October 2020 Site Visit

Gannett Fleming conducted a site visit on October 15, 2020. The site visit served to document the facility's existing conditions, and to obtain an understanding of the operations and needs. An account of the site visit observations and the facility's flow schematics are included in *Attachment B*. The following challenges were noted during the October 2020 site visit:

- The upstream concrete raceway, Raceway A, presents significant concrete damages such as spallings, surface delamination and cracks. As such, only three of the ten available banks are currently in use.
- The granite canal is an open channel that transfers flow from the show ponds to the wood ponds and does not serve for rearing purposes or for showing purposes. It requires intensive labor to clean out the leaves from the surrounding trees that clog the channel; during the fall season, cleaning is required multiple times a day.

- The facility currently owns and operates two portable vacuuming systems that are used to collect solids from the raceways and from the circular tanks. The show ponds, wood ponds and bass ponds are very difficult to vacuum. Vacuumed solids are then transferred to the solids treatment tanks, wood chip bags, and subsequently transported offsite.

- Operations staff noted the need to repair Raceway A and the preference of circular fiberglass units instead of rectangular concrete units; and are agreeable to a new design that will allow them to limit the unclogging efforts on the granite canal, such as installing a catch basin to capture flow prior to piping. In order to meet the final NPDES Permit effluent requirements, operations staff are open to operational changes, such as converting all bass ponds into clarifiers or installing a pumping system that enables recirculation and reuse of the effluent water.

3. GF January 2021 Opinion of Probable Construction Cost

In conjunction with the October 2020 conditions assessment site visit, the April 2020 revised opinion of probable construction cost was updated to account for the following items:

- The April 2020 revised opinion of probable construction cost considered Raceway improvements consisting of the addition of baffles/guides, with no structural repairs included. At a minimum, structural repairs to Raceway A are required to render it operational.

- A portable vacuuming system consisting of two portable vacuum cleaning pumps was included. This item is considered redundant, as the facility currently owns and operates two portable vacuum systems.

- Finally, the April 2020 revised opinion of probable construction cost did not include a pumping system to allow for recirculation of the flow.

The January 2021 planning level opinion of probable construction cost has an updated total of $5,100,000 and is included in *Attachment C*. The same methodology for unit pricing, markups, and contingencies that were described for the previous update were applied.

4. Further Planning Considerations

Gannett Fleming recognizes that the Powder Mill State Fish Hatchery cannot meet the effluent phosphorus limits with the current operations. The updated planning level opinion of probable construction cost is based on the recommendations contained in the FishPro 2003 cost estimate and general assumptions to meet the Final NPDES Permit requirements.

A subsequent engineering phase, such as a feasibility study or a conceptual engineering design, are required to provide preliminary sizing of improvements needed to meet the Final NPDES Permit effluent requirements.

Attachment A
GF Memorandum, April 2020

Gannett Fleming

Excellence Delivered ***As Promised***

Memorandum

To: Mr. Jason M. Smith (New Hampshire Fish and Game Department)

From: Ms. Carolina Cubides, P.E. (Gannett Fleming, Inc.)

Copy: Mr. Nicholaus J. Sahd (Gannett Fleming, Inc.)

Date: April 30, 2020

Subject: Updated Opinion of Probable Construction Costs for Proposed Improvements to the Powder Mill State Fish Hatchery

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The New Hampshire Fish and Game Department's Powder Mill State Fish Hatchery is located at the headwaters of the Merrymeeting River at the Merrymeeting Lake Dam on Merrymeeting Road in New Durham, NH. The Hatchery produces Eastern brook trout, rainbow trout, brown trout, and landlocked Atlantic salmon, for fisheries management of selected water bodies located primarily in the central part of the state. The U.S. Environmental Protection Agency recently issued a draft National Pollutant Discharge Elimination System (NPDES) Permit for the Hatchery effluent, or overflow water, to the Merrymeeting River. The draft NPDES Permit includes stringent summer-time and winter-time seasonal Total Phosphorus discharge limits as outlined below. The facility cannot currently meet these proposed limits and will require capital improvements for consistent compliance.

Parameter	Outfall 001 Limit	Outfall 002 Limit	Cumulative Outfalls 001 and 002
Effluent Total Phosphorus (October – May)	25 µg/L	25 µg/L	N/A
Effluent Total Phosphorus (June – September)	14 µg/L	14 µg/L	N/A
Annual Total Phosphorus Load	N/A	N/A	395 lbs/year
Seasonal Total Phosphorus Load (June – September)	N/A	N/A	87 lbs/year

FishPro (now a division of HDR) conducted an evaluation of potential effluent treatment alternatives for the Hatchery in 2002, along with an itemized construction cost estimate of the recommended improvements. Now that the Hatchery is faced with stringent TP limits, the capital improvements to the facility will need to be budgeted in next year's State Capital Plan. Therefore, the New Hampshire Fish and Game Department is in need of an updated budget-level cost estimate for the necessary improvements.

The New Hampshire Department of Environmental Services (NHDES) retained Gannett Fleming to provide the updated budget-level cost estimate.

1. 2002-2003 FishPro Evaluation and Construction Cost Estimate

NHDES conducted an overall system evaluation of the New Hampshire Hatcheries with FishPro in 2002. FishPro prepared a report titled "New Hampshire Hatchery System Evaluation" detailing the hatchery production analysis, wastewater analysis and treatment, and recommended improvements for each of the facilities. FishPro described the Powder Mill State Hatchery configuration and outlined recommendations for improvements.

The Powder Mill State Fish Hatchery receives its influent from Merrymeeting Lake. The influent flows by gravity to a distribution box which directs flow to either the hatchery building and raceways located at the northern portion of the site or the bass ponds and circular rearing units located at the southern portion of the site. At the time of preparation of the 2002 Report, the hatchery building contained ten (10) circular rearing units, each consisting of a galvanized tank with a diameter of 5 feet and an operating depth of 1.58 feet. Each tank has an approximate flow of 10 gallons per minute (gpm). The facility contained raceways composed of 101 concrete and earthen rearing units, distributed within nine (9) Banks (Banks A through G). Each bank accepted a flow of approximately 328 or 1,000 gpm, depending on size. Bass ponds consisted of four (4) clay-lined ponds, with dimensions of 60 feet by 80 feet and a 4-foot depth. A total of 27 circular rearing units were present at the southernmost of the facility, with a diameter of 25 feet and a depth of 1.5 feet. The flow into each circular rearing unit was approximately 18 gpm.

Discharge from Banks A through D served as the supply to three (3) earthen ponds (show ponds), and four (4) earthen ponds (wood ponds). It is noted that the effluent from the wood ponds could be directed into the bass ponds as well.

At the time of the preparation of the 2002 Report, the hatchery effluent did not receive any treatment prior to discharge via multiple outfalls into the Merrymeeting River. The report recommended three (3) main areas of improvements: A Raceway Vacuum System was identified as a minimum improvement or as an interim solution while the other improvements were implemented; a Tier 1 Wastewater Treatment System; and a Tier 2 Wastewater Treatment System.

a. Raceway Vacuum System: A new trailer mounted vacuuming system was recommended that can collect and store solids and included a spray applicator for land application. The cost for the trailer mounted system and cleaning wand was included in the Tier 1 cost.

b. Tier 1 Wastewater Treatment System: The recommended Tier 1 System included the collection of cleaning and draining wastewater from raceways, and its transmission to a wastewater lift station to pump wastewater to a new clarifier and sludge storage tank; subsequent flow measurement, monitoring via automatic composite sampling, and discharge via outfall.

c. Tier 2 Wastewater Treatment System: The recommended Tier 2 System improvements were intended to provide treatment of overflow water, including new micro-screens for the overflow from Raceways E through G and the circular rearing units. Overflow from

Raceways A through D would be treated through a settling pond, created by converting the four (4) existing wood ponds. Backwash water from the micro-screens would be sent to the new clarifier constructed as part of the Tier 1 improvements. Overflow from the micro-screens would be sent with the overflow from the clarifier in Tier 1 for flow measurement, monitoring, and discharge via outfall.

A separate construction cost estimate, dated November 2003, was provided for the recommended improvements at the Powder Mill State Fish Hatchery. The cost estimate was subdivided into 13 separate components, including general site, monitoring system, raceway improvements, portable vacuuming system, central vacuuming system, sludge storage lagoon, site piping modifications, clarifier, sludge storage tank, settling pond, trailer mounted sludge tank, and micro-screen system. Each unit price within the cost estimate included 20% of overhead and profit and a series of contingencies, including estimating contingency, state construction contingency, planning and design engineering contingency and construction engineering contingency. The total amount was of $1,246,011. The 2003 FishPro construction cost estimate is included in Attachment A.

2. GF 2020 Updated Opinion of Probable Construction Costs

Gannett Fleming was requested to update the 2003 FishPro cost estimate to present value for budgetary purposes. The planning level opinion of probable construction cost has an updated total of $4,300,000, and is included in Attachment B.

Gannett Fleming updated the planning level opinion of probable construction cost based on the following methodology:

- Updated unit costs: Where feasible, updated unit costs were obtained from the 2020 RSMeans Facilities Construction Costs Book.

- Budgetary quotes from vendors: Budgetary quotes were received for the Drum Filter, vacuum cleaning pumps, and composite samplers.

- Escalation rate: Escalation rates were applied to items within the original cost estimate that were not sufficiently described to allow for updated unitary costs. An escalation rate of 174% between November 2003 and March 2020 was identified by considering the Engineering News Record (ENR) Building Cost Index (BCI) and Construction Cost Index (CCI), and the Turner Index. The Turner Index reflects the competitiveness in the marketplace.

- Markups and Contingencies: The planning level opinion of probable construction cost has a series of markups and contingencies.

    - Markups: To establish a comparable scenario with the 2003 FishPro cost estimate, all unit prices include a 20% overhead and profit markup.

- Contingencies:

  - Estimate Contingency: In accordance with industry standards, a 30% estimate contingency was added to the overall cost estimate based on the limited information available. When a project is less than 5% defined, the estimate contingency ranges between 15% and 40%.

  - Planning, Design, and Construction Engineering Contingency: A contingency of 15% was included for planning, design, and construction engineering efforts. This contingency includes the further definition of the project and detailed design, as well as construction observations, and coordination with the Contractor.

  - Construction Contingency: for budgetary purposes, a 10% contingency account is included for NHDES to administer during the construction of the improvements.

3. Further Planning Considerations

The Draft NPDES Permit for the Powder Mill State Fish Hatchery describes modifications to the facility that were completed after the 2002 FishPro Report and before the preparation of the Draft Permit in 2019. It should be noted that these modifications are, therefore, not reflected in the 2003 FishPro construction cost estimate or the 2020 GF project cost estimate. These modifications are described below.

a. The existing discharges within the facility were consolidated to two (2) outfalls; Outfall 001 and Outfall 002. Outfall 001 includes flow from Raceways E through F. The permitted average monthly discharge from this outfall is 2 mgd. Outfall 002 includes flow from the hatchery house, Raceways A through D, wood ponds, and circular rearing tanks. The permitted average monthly discharge from this outfall is 4.2 mgd.

b. Two (2) of the existing 4 bass ponds were drained, and the dredged solids were transported offsite.

c. Three (3) of the existing 27 circular rearing units located at the southernmost portion of the facility were converted into settling tanks, each with a volume of approximately 800 cubic feet (6,000 gallons). Two of the settling tanks (Tank 1 and Tank 3) are currently used as primary clarifiers providing preliminary nutrient treatment. The overflow from these tanks flows through a 3-inch pipe into the third tank (Tank 2), that is currently used as a secondary nutrient treatment and clarifier. The rearing units and quiescent zones are now vacuumed with a vacuum truck, and solids are discharged into Tank 1 or Tank 3.

   The secondary nutrient treatment and solids removal provided at Tank 2 consists of a microalgal culture suspended by a silt screen in the upper 8 inches of the tank. The tank

has a sand filter at its center, for the overflow. The overflow is then discharged through a 3-inch line to bag filters over 8-10 inches of wood chips that provide additional nitrogen removal. The discharge flows into the ground. The solids are disposed of at a sand pit owned by the Town of New Durham.

The updated planning level opinion of probable construction cost is based on the recommendations contained in the FishPro 2003 cost estimate, with the exception of the ferric chloride feed system. Gannett Fleming recognizes that since the preparation of the 2003 cost estimate, however, the facility has modified its operating conditions. Nonetheless, it is understood that the Powder Mill State Fish Hatchery cannot meet the effluent phosphorus limits with the current operations. To provide a more detailed opinion of probable construction cost, the following items originally contained in the FishPro 2003 cost estimate in Appendix A should be further evaluated:

- Items 4 and 5 – Vacuuming System: The facility currently operates a vacuum truck that is used for cleaning and disposing of solids from the rearing units and quiescent zones into the clarifiers. This may eliminate the need for a portable or central vacuuming system (Items 4 and 5 of the OPCC). To eliminate or modify these items of the OPCC, it is necessary to understand the operation requirements and solids production of the facility and the condition of the existing vacuum truck.

- Item 10 of – Settling Pond: Two of the existing four Bass Ponds were dredged and are no longer in use. A feasibility study would identify if these ponds could be used as the proposed settling ponds.

- Item 14 – Ferric Chloride Feed System: A planning level ferric chloride feed system was added to the OPCC to enhance the Total Phosphorus removal through the drum filters. It is noted that a comprehensive evaluation is necessary to assess the system's effectiveness and to establish a location.

- Operations and Maintenance (O&M) Costs: O&M costs will be assessed upon further definition of required improvements and upon meeting with the facility operators to discuss operational practices.

These items will be further investigated as part of Gannett Fleming's site visit to the Powder Mill State Fish Hatchery and subsequent existing conditions assessment and second opinion review of the 2002 FishPro Evaluation.

Attachment A

FISHPRO
Engineers and Environmental Consultants
5201 S. Sixth St. Rd., Springfield, IL. 62703-5143
Phone: (217) 585-8300 Fax: (217) 585-1890

Project: Powder Mill SFH
Phase: Wastewater Study - **Template**
By: Team **Date:** 11/17/2003

Casco Detailed Cost Estimate

I.D.#	ITEM	NO. UNITS	UNIT MEAS.	COST PER UNIT	SUBTOTAL COST	TOTAL COST + 35% CONT.
1	**General Site**	**Cont.**	**35%**		**$15,000**	**$20,625**
	Earthwork	1	LS	$5,000.00	$5,000	$6,875
	Finish Grading, Seeding and Erosion Control	1	LS	$5,000.00	$5,000	$6,875
	Mobilization/Demobilization	1	LS	$5,000.00	$5,000	$6,875
2	**Monitoring System**	**Cont.**	**10%**		**$7,500**	**$8,250**
	Fabricated Flow Measurement V-Notch Weir	3	EA	$500.00	$1,500	$1,650
	Composite Sampler	2	EA	$3,000.00	$6,000	$6,600
3	**Raceway Improvements**	**Cont.**	**10%**		**$143,300**	**$157,630**
	Quiescent Zone Baffle/Guides	88	EA	$400.00	$35,200	$38,720
	5' Raceway Baffles	70	EA	$150.00	$10,500	$11,550
	8' Raceway Baffles	488	EA	$200.00	$97,600	$107,360
4	**Portable Vacuuming System**	**Cont.**	**10%**		**$18,000**	**$19,800**
	Portable Vacuum Cleaning Pump	2	EA	$4,000.00	$8,000	$8,800
	Piping, Hoses and Accessories	1	LS	$10,000.00	$10,000	$11,000
5	**Central Vacuuming System**	**Cont.**	**10%**		**$48,000**	**$52,800**
	Vacuum Cleaning Pump	2	EA	$4,000.00	$8,000	$8,800
	Pump Station, Enclosure, Controls	1	LS	$25,000.00	$25,000	$27,500
	Vacuuming Accessories	1	LS	$5,000.00	$5,000	$5,500
	Piping, PE, Buried	1,000	LF	$10.00	$10,000	$11,000
6	**Sludge Storage Lagoon**	**Cont.**	**35%**		**$13,750**	**$18,906**
	Water Control Structure and Piping	1	LS	$7,500.00	$7,500	$10,313
	Earthwork	1	LS	$5,000.00	$5,000	$6,875
	Liner	1,000	SF	$1.25	$1,250	$1,719
7	**Site Piping Modifications**	**Cont.**	**35%**		**$103,500**	**$142,313**
	Piping and Fittings	1,000	LF	$75.00	$75,000	$103,125
	Manholes	8	EA	$2,000.00	$16,000	$22,000
	Water Control Structures	2	EA	$5,000.00	$10,000	$13,750
	Excavating, Grouting and Abandonment of Existing Drains	1	LS	$2,500.00	$2,500	$3,438
8	**Clarifier**	**Cont.**	**35%**		**$227,500**	**$312,813**
	Excavation	1	LS	$22,500.00	$22,500	$30,938
	Structure (Including Floor, Walls) (25' Diameter)	1	LS	$75,000.00	$75,000	$103,125
	Wastewater Equipment	1	LS	$50,000.00	$50,000	$68,750
	Metals (Including Walkway, Coating)	1	LS	$10,000.00	$10,000	$13,750
	Sludge Pump	1	LS	$25,000.00	$25,000	$34,375
	Plumbing	1	LS	$20,000.00	$20,000	$27,500
	Electrical	1	LS	$25,000.00	$25,000	$34,375

PM

NH Effluent Treatment Costs Only

Casco Detailed Cost Estimate						
I.D.#	ITEM	NO. UNITS	UNIT MEAS.	COST PER UNIT	SUBTOTAL COST	TOTAL COST + 35% CONT.
9	**Sludge Storage Tank**	**Cont.**	**35%**		$97,500	**$134,063**
	Excavation	1	LS	$7,500.00	$7,500	$10,313
	Concrete	1	LS	$30,000.00	$25,000	$34,375
	Metal Tank (Including Walkway, Coating) (25' Diameter)	1	LS	$50,000.00	$40,000	$55,000
	Plumbing (including Aeration)	1	LS	$25,000.00	$15,000	$20,625
	Electrical	1	LS	$10,000.00	$10,000	$13,750
10	**Settling Pond**	**Cont.**	**35%**		$76,500	**$105,188**
	Water Control Structure and Piping	1	LS	$10,000.00	$10,000	$13,750
	Earthwork	1	AC	$29,000.00	$29,000	$39,875
	Liner (0.75/SF, 50,000 SF/AC)	1	AC	$37,500.00	$37,500	$51,563
11	**Trailer Mounted Sludge Tank**	**Cont.**	**10%**		$25,000	**$27,500**
	Trailer Mounted Sludge Tank	1	LS	$25,000.00	$25,000	$27,500
	vs.					
	Sludge Hauling Trucks	1	LS	$100,000.00	$100,000	$110,000
	vs.					
	Trailer Mounted Vacuum Induced Sludge Tank	1	LS	$50,000.00	$50,000	$55,000
12	**New Rearing Units**	**Cont.**	**35%**		$0	**$0**
	Not Applicable					
13	**Microscreen System (2000 gpm)**	**Cont.**	**35%**		$179,000	**$246,125**
	Building	1	LS	$56,000.00	$56,000	$77,000
	Drum Microscreen	1	LS	$65,000.00	$65,000	$89,375
	Plumbing	1	LS	$38,000.00	$38,000	$52,250
	Electrical	1	LS	$20,000.00	$20,000	$27,500
					Subtotal	$1,246,011

Attachment B

Updated Opinion of Probable Construction Cost **Prepared by Gannett Fleming**
Powder Mill State Hatchery **April 23, 2020**

ID	Item	No. Units	Unit of Measure	Cost per Unit	Subtotal Cost
1	**General Site**				
	Earthwork	1	LS	$ 15,000	$ 15,000
	Finish Grading, Seeding and Erosion Control	1	LS	$ 15,000	$ 15,000
	Mobilization / Demobilization	1	LS	$ 50,000	$ 50,000
	Subtotal				**$ 80,000**
2	**Monitoring System**				
	Fabricated Flow Measurement V-Notch Weir	3	EA	$ 1,644.0	$ 4,930
	Composite Sampler	2	EA	$ 8,475.48	$ 16,950
	Subtotal				**$ 21,880**
3	**Raceway Improvements**				
	Quiescent Zone Baffle/Guides	88	EA	$ 1,315.2	$ 115,740
	5' Raceway Baffles	70	EA	$ 493.2	$ 34,520
	8' Raceway Baffles	488	EA	$ 660	$ 322,080
	Subtotal				**$ 472,340**
4	**Portable Vacuuming System**				
	Portable Vacuum Cleaning Pump	2	EA	$ 5,340	$ 10,680
	Piping, Hoses and Accessories	1	LS	$ 32,880	$ 32,880
	Subtotal				**$ 43,560**
5	**Central Vauuming System**				
	Vacuum Cleaning Pump	2	EA	$ 5,340	$ 10,680
	Pump Station, Enclosure, Controls	1	LS	$ 82,200	$ 82,200
	Vacuuming Accessories	1	LS	$ 16,440	$ 16,440
	Piping, PE, Buried	1000	LF	$ 24.6	$ 24,600
	Subtotal				**$ 133,920**
6	**Sludge Storage Lagoon**				
	Water Control Structure and Piping	1	LS	$ 24,660	$ 24,660
	Earthwork	1	LS	$ 16,440	$ 16,440
	Liner	1000	SF	$ 3.89	$ 3,890
	Subtotal				**$ 44,990**
7	**Site Piping Modifications**				
	Piping and Fittings	1000	LF	$ 121.56	$ 121,560
	Manholes	8	EA	$ 4,176	$ 33,410
	Water Control Structures	2	EA	$ 12,252	$ 24,500
	Excavating, Grouting and Abandonment of Existing Drains	1	LS	$ 8,220	$ 8,220
	Subtotal				**$ 187,690**
8	**Clarifier**				
	Excavation	1	LS	$ 17,280	$ 17,280
	Structure (including Floor, Walls) (25' Diameter)	1	LS	$ 59,400	$ 59,400
	Wastewater Equipment	1	LS	$ 160,200	$ 160,200
	Metals (including Walkway, Coating)	1	LS	$ 32,880	$ 32,880
	Sludge Pump	1	LS	$ 82,200	$ 82,200
	Plumbing	1	LS	$ 65,760	$ 65,760
	Electrical	1	LS	$ 82,200	$ 82,200
	Subtotal				**$ 499,920**

Updated Opinion of Probable Construction Cost **Prepared by Gannett Fleming**
Powder Mill State Hatchery **April 23, 2020**

ID	Item	No. Units	Unit of Measure	Cost per Unit	Subtotal Cost
9	**Sludge Storage Tank**				
	Excavation	1	LS	$ 24,660	$ 24,660
	Concrete	1	LS	$ 82,200	$ 82,200
	Metal Tank (including Walkway, Coating) (25' Diameter)	1	LS	$ 131,520	$ 131,520
	Plumbing (ncludign aeration)	1	LS	$ 49,320	$ 49,320
	Electrical	1	LS	$ 32,880	$ 32,880
	Subtotal				**$ 320,580**
10	**Settling Pond**				
	Water Control Structure and Piping	1	LS	$ 25,296	$ 25,300
	Earthwork	1	AC	$ 91,080	$ 91,080
	Liner ($0.75/SF, 50,000 SF/AC)	1	AC	$ 127,800	$ 127,800
	Subtotal				**$ 244,180**
11	**Trailer Mounted Sludge Tank** [a]				
	Trailer Mounted Sludge Tank	1	LS	$ 72,000	$ 72,000
	vs				
	Sludge Hauling Truck	1	LS	$ 252,000	$ 252,000
	vs				
	Trailer Mounted Vacuum Induced Sludge Tank	1	LS	$ 164,400	$ 164,400
	Subtotal				**$ 72,000**
12	**New Rearing Units (N/A)**				
13	**Microscreen System (2000 gpm)**				
	Building	1	LS	$ 184,128	$ 184,130
	Drum Microscreen	1	LS	$ 137,346	$ 137,350
	Plumbing	1	LS	$ 124,944	$ 124,940
	Electrical	1	LS	$ 65,760	$ 65,760
	Subtotal				**$ 512,180**
14	**Ferric Chloride Feed System**				
	Liquid Ferric Chloride Storage Tank (500 Gallons)	1	EA	$ 1,716	$ 1,720
	Peristaltic Metering Pumps (0.1 - 0.3 gph)	2	EA	$ 1,584	$ 3,170
	In-line Static Induction Mixer	1	LS	$ 660	$ 660
	Instrumentation and Controls	1	LS	$ 1,980	$ 1,980
	Ferric Chloride	500	GAL	$ 1.8	$ 900
	Subtotal				**$ 8,430**
				SUBTOTAL	**$ 2,641,670**
				Estimate Contingency (30%)	$ 792,501
				SUBTOTAL INLCUDING ESTIMATE CONTINGENCY	**$ 3,434,171**
				Planning, Design and Construction Engineering (15%):	$ 515,126
				Construction Contingency Account (10%):	$ 343,417
				TOTAL	**$ 4,300,000**

Notes:

[a] Selected Trailer Mounted Sludge Tank, consistent with 2003 FishPro OPCC

[b] Unit prices are assumed to be inclussive of QC and testing

Attachment B

Site Visit Observations
Facility's Flow Schematics

Powder Mill State Fish Hatchery
Observations During Site Visit

The following operational observations of the Powder Mill State Fish Hatchery were noted during the site visit held on October 15, 2020:

Hatch House

1. Ten (10) circular rearing units are in operation, with a varying flow between 3 gpm and 12 gpm each.
2. The circular rearing units appear to be in good condition.
3. There is no process mechanical equipment, inflow flows by gravity.

Raceways

1. There are seven (7) concrete raceways; four (4) located on the Eastern side and 3 located on the Western side.
2. The first raceway from the Eastern side, Raceway A, contains ten (10) banks; however, only three or four are currently in use. The concrete contains damages, including significant spallings, surface delamination, and cracks. The extent of damage, in some cases, exceeds a few feet in length a few inches in depth.
3. The three remaining raceways on the Eastern side, Raceways B through D, are in satisfactory condition.
4. Raceways B and C contain 6 banks each, and have a capacity of approximately 1,900 CF (14,200 gallons) each; Raceway D contains 8 banks and has a capacity of approximately 800 CF (6,000 gallons).
5. There is a flow control valve between Raceway C and Raceway D.
6. Flow from Raceways A through D gravity flow into the downstream production and show ponds.
7. Raceways E through G are located on the Western side. Each has a flow of approximately 400 gpm. Each Raceway has 10 banks.
8. Raceways E through G appear to be in good condition are fenced.

Outfall 001

1. Flow from Raceways E through G is discharged into the Merrymeeting River through Outfall 001.
2. There is a shed for testing with access to the outfall pipe, and has space for additional storage.
3. Outfall 001 is an 18” diameter pipe.

Show Ponds and Granite Canal

1. Two of the three show ponds are currently being used for production, and only one is currently being used as a show pond.
2. The flow on the show ponds is of approximately 3,800 gpm.
3. Flow from the show ponds flows through the granite canal to the wood ponds.
4. The granite canal is an open channel that requires intensive labor to clean out the leaves from the surrounding trees that clog the channel; during the fall cleaning is required multiple times a day.
5. Operations staff noted they were open to the alternative of piping the flow to avoid the ongoing clogging by leaves and water loss due to seepage.

Wood Ponds

1. The four (4) wood ponds accumulate waste and are difficult to vacuum.
2. There is an access road between the first and second wood ponds.
3. Flow from the wood ponds is diverted to Outfall 002 or formerly diverted to bass ponds, or a combination thereof.

Bass Ponds

1. Flow to the bass ponds is gravity fed through an underground pipe directly from the main flow distribution box, located upstream of the facility or woods pond overflow.
2. Two (2) of the four (4) bass ponds are currently not in use.
3. Operations staff noted they were open to using all four (4) bass ponds as clarifiers for effluent treatment.

Circular Tanks and Solids Treatment

1. Out of the twenty-seven (27) circular tanks, twenty-four (24) are currently used for production, and three (3) are currently used for the treatment of solids.
2. Waste is accumulated at the end of each circular tank. These ends are vacuumed.
3. The three (3) circular tanks used for the treatment of solids are arranged in a configuration in which the two outer tanks serve as primary clarifiers and the middle tank serves as a secondary clarifier. Flow from the primary clarifiers flows into the secondary clarifier, which ultimately has an effluent that is sprayed into the wood chips area.

Outfall 002

1. All production units and show ponds located on the Eastern side of the Merrymeeting River discharge through Outfall 002.
2. There is a shed for testing with access to the outfall pipe, and has spacing for additional storage.
3. Outfall 001 is an 18” diameter pipe.

Vacuum Tanks

1. The facility currently has two vacuum tanks, each with a capacity of 600 gallons (approximately 80 CF).
2. Operations staff noted it is not practical to vacuum each production unit and continuously dispose of solids.
3. Operations staff expressed potential need to install a recirculating pump that will allow to continuously reuse flow throughout the facility.

Photo Documentation

Figure 1 - Hatchery House

Figure 2 - Raceway A Concrete Damages

Figure 3 - Raceway C

Figure 4 - Raceway E

Figure 5 - Outfall 001 Testing Location

Figure 6 - Outfall 001

Figure 7 - Show Ponds

Figure 8 - Granite Canal

Figure 9 - Wood Ponds

Figure 10 - Bass Pond

Figure 11 - Bass Pond Out of Service

Figure 12 - Circular Tanks

Figure 13 - Waste Collection for Circular Tanks

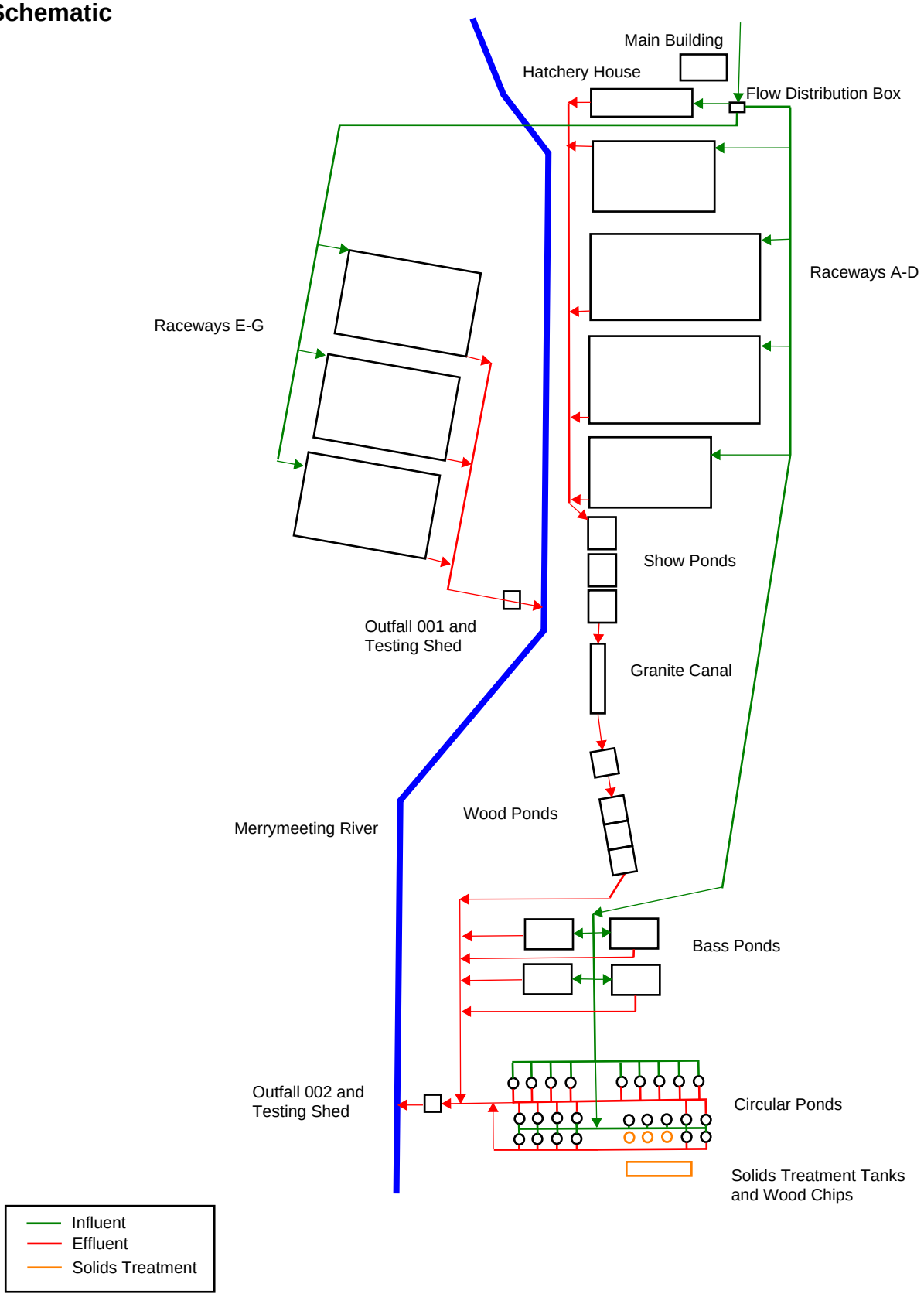
Figure 14 - Solids Treatment Tanks

Figure 15 - Solids Treatment Wood Chips

Figure 16 - Outfall 002 Testing Location

Figure 17 - Outfall 002

Powder Mill State Fish Hatchery
Flow Schematic



Attachment C

Updated Opinion of Probable Construction Cost

Updated Opinion of Probable Construction Cost **Prepared by Gannett Fleming**
Powder Mill State Hatchery **January 25, 2021**

ID	Item	No. Units	Unit of Measure	Cost per Unit	Subtotal Cost
1	**General Site**				
	Earthwork	1	LS	$ 15,000	$ 15,000
	Finish Grading, Seeding and Erosion Control	1	LS	$ 15,000	$ 15,000
	Mobilization / Demobilization	1	LS	$ 50,000	$ 50,000
	Subtotal				**$ 80,000**
2	**Monitoring System**				
	Flow Meter with Totalizer	2	EA	$ 5,000.0	$ 10,000
	Composite Sampler	2	EA	$ 8,475.48	$ 16,950
	Subtotal				**$ 26,950**
3	**Raceway Improvements**				
	Quiescent Zone Baffle/Guides	88	EA	$ 1,315.2	$ 115,740
	5' Raceway Baffles	70	EA	$ 493.2	$ 34,520
	8' Raceway Baffles	488	EA	$ 660	$ 322,080
	Subtotal				**$ 472,340**
4	**Portable Vacuuming System (N/A)**				
5	**Central Vauuming System**				
	Vacuum Cleaning Pump	2	EA	$ 5,340	$ 10,680
	Pump Station, Enclosure, Controls	1	LS	$ 82,200	$ 82,200
	Vacuuming Accessories	1	LS	$ 16,440	$ 16,440
	Piping, PE, Buried	1000	LF	$ 24.6	$ 24,600
	Subtotal				**$ 133,920**
6	**Sludge Storage Lagoon**				
	Water Control Structure and Piping	1	LS	$ 24,660	$ 24,660
	Earthwork	1	LS	$ 16,440	$ 16,440
	Liner	1000	SF	$ 3.89	$ 3,890
	Subtotal				**$ 44,990**
7	**Site Piping Modifications**				
	Piping and Fittings	1000	LF	$ 121.56	$ 121,560
	Manholes	8	EA	$ 4,176	$ 33,410
	Water Control Structures	2	EA	$ 12,252	$ 24,500
	Excavating, Grouting and Abandonment of Existing Drains	1	LS	$ 8,220	$ 8,220
	Subtotal				**$ 187,690**
8	**Clarifier**				
	Excavation	1	LS	$ 17,280	$ 17,280
	Structure (including Floor, Walls) (25' Diameter)	1	LS	$ 59,400	$ 59,400
	Wastewater Equipment	1	LS	$ 160,200	$ 160,200
	Metals (including Walkway, Coating)	1	LS	$ 32,880	$ 32,880
	Sludge Pump	1	LS	$ 82,200	$ 82,200
	Plumbing	1	LS	$ 65,760	$ 65,760
	Electrical	1	LS	$ 82,200	$ 82,200
	Subtotal				**$ 499,920**
9	**Sludge Storage Tank**				
	Excavation	1	LS	$ 24,660	$ 24,660
	Concrete	1	LS	$ 82,200	$ 82,200
	Metal Tank (including Walkway, Coating) (25' Diameter)	1	LS	$ 131,520	$ 131,520
	Plumbing (ncludign aeration)	1	LS	$ 49,320	$ 49,320
	Electrical	1	LS	$ 32,880	$ 32,880
	Subtotal				**$ 320,580**

Updated Opinion of Probable Construction Cost **Prepared by Gannett Fleming**
Powder Mill State Hatchery **January 25, 2021**

ID	Item	No. Units	Unit of Measure	Cost per Unit	Subtotal Cost
10	**Settling Pond**				
	Water Control Structure and Piping	1	LS	$ 25,296	$ 25,300
	Earthwork	1	AC	$ 91,080	$ 91,080
	Liner ($0.75/SF, 50,000 SF/AC)	1	AC	$ 127,800	$ 127,800
	Subtotal				**$ 244,180**
11	**Trailer Mounted Sludge Tank [a]**				
	Trailer Mounted Sludge Tank	1	LS	$ 72,000	$ 72,000
	vs				
	Sludge Hauling Truck	1	LS	$ 252,000	$ 252,000
	vs				
	Trailer Mounted Vacuum Induced Sludge Tank	1	LS	$ 164,400	$ 164,400
	Subtotal				**$ 72,000**
12	**New Rearing Units (N/A)**				
13	**Microscreen System (2000 gpm)**				
	Building	1	LS	$ 184,128	$ 184,130
	Drum Microscreen	1	LS	$ 137,346.00	$ 137,350
	Plumbing	1	LS	$ 124,944	$ 124,940
	Electrical	1	LS	$ 65,760	$ 65,760
	Subtotal				**$ 512,180**
14	**Ferric Chloride Feed System**				
	Liquid Ferric Chloride Storage Tank (500 Gallons)	1	EA	$ 1,716	$ 1,720
	Peristaltic Metering Pumps (0.1 - 0.3 gph)	2	EA	$ 1,584.00	$ 3,170
	In-line Static Induction Mixer	1	LS	$ 660	$ 660
	Instrumentation and Controls	1	LS	$ 1,980	$ 1,980
	Ferric Chloride	500	GAL	$ 1.8	$ 900
	Subtotal				**$ 8,430**
14	**Structural Repairs**				
	Medium spalling repairs	300	SF	$ 140.0	$ 42,000
	Subtotal				**$ 42,000**
14	**Recirculating Pumping System**				
	Pipe, 18" PVC, including fittings	3000	LF	$ 60.60	$ 181,800
	Pumps, 200 hp, 4,200 gpm	2	EA	$ 48,000.00	$ 96,000
	Foundations	4	CY	$ 720.00	$ 2,880
	Electrical supply, panel and feeders	1	LS	$ 22,200.00	$ 22,200
	Wet well, 10' x 12' x 24'	49	CY	$ 1,080	$ 52,920
	Support of excavation	2184	SF	$ 36.00	$ 78,620
	Excavation	424	CY	$ 18.00	$ 7,630
	Backfill and Compaction	317	CY	$ 30.00	$ 9,510
	Coating	1176	SF	$ 9.00	$ 10,580
	Pump shed, metal building	300	SF	$ 108.00	$ 32,400
	Lighting	3	EA	$ 900	$ 2,700
	Subtotal				**$ 497,240**
				SUBTOTAL	**$ 3,142,420**
				Estimate Contingency (30%)	$ 942,726
				SUBTOTAL INLCUDING ESTIMATE CONTINGENCY	**$ 4,085,146**
				Planning, Design and Construction Engineering (15%):	$ 612,772
				Construction Contingency Account (10%):	$ 408,515
				TOTAL	**$ 5,100,000**

Notes:

[a] Selected Trailer Mounted Sludge Tank, consistent with 2003 FishPro OPCC

[b] Unit prices are assumed to be inclussive of QC and testing