Existing Conditions and Facility Evaluations - Berlin

POWDER MILL FISH HATCHERY FEASIBILITY STUDY

New Hampshire Fish and Game Department

May 25, 2023

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1 Introduction

Berlin State Fish Hatchery (Berlin) is in the Kilkenny Valley in the White Mountain National Forest in Coos County, New Hampshire. The facility was originally constructed in 1921 by the United States Fish and Wildlife Service (USFWS) and was used as an egg taking station for brook trout. The New Hampshire Fish and Game Department (NHFGD) took the facility over in 1982 and converted the facility to one of New Hampshire's largest intensive coldwater rearing stations, which and produces over 74,000 pounds annually with 3-3.5 lbs per fish weight. Berlin is situated on a 365-acre site of which approximately 36-acres have been developed. The facility consists of groundwater and surface water supply; forty-nine (49) outdoor concrete raceways; a hatchery building with twenty-four (24) concrete raceways and forty-eight (48) aluminum rearing troughs; numerous support buildings; and three (3) occupied residences.

Berlin at a Glance

- Constructed in 1921
- Source water includes surface water, well water, and spring water (domestic needs only)
- Fish rearing begins with incubation
- Produces 74,000 pounds of fish annually
- Stocks out between end of March to early July

The existing site plans are shown in Figure 1-1 to Figure 1-5 and illustrate the hatchery boundary, approximate topographical information and general hatchery infrastructure. The study drawings were developed using digitized (i.e., traced) Computer Aided Drafting (CAD) techniques and map overlay technology.

Water used for production at Belin is a mixture of groundwater from two production wells (Well #1 and Well #2), several low volume artesian unpumped wells, and surface water from Cold Brook, the West Branch of Upper Ammonoosuc River, Third Brook, and Diversion Pond (fed by #9 Brook). These water sources and the rearing units they supply are shown on the facilities process flow diagram in Figure 1-5.

Well #1 and #2 supply roughly 400-500 gpm, while Cold Brook supplies up to 1,400 gpm to the Hatchery Building, Young Raceways, and Foster's Raceways. Each well is housed in a structure and well flow rates are measured via a weir located at the headend of Young's Raceways. Well water is used Oct-May and to supplement low flows from Cold Brook in the summer (July-Sep) as needed.

The West Branch of the Upper Ammonoosuc River supplies up to 2,838 gpm and along with Third Brook (seasonally in use to provide more water) discharge into B canal. Diversion Pond supplies up to 2,063 gpm to the West Branch Raceways.

Berlin is authorized by its NPDES permit to discharge its hatchery effluent through Outfall Number 004, 005, 007, and 008 (shown in Figure 1-1) to Cold Brook, No. 9 Brook, West Branch of the Upper Ammonoosuc River, and York Pond, respectively. These are summarized in Table 1-1. Sampling and reporting requirements are different for each outfall. Currently, York Pond's water quality is a concern and regulators are interested in exploring the feasibility of relocating this outfall to the West Branch Upper Ammonoosuc River at Berlin. The effective NPDES permit was issued in 2013 (Permit No. NH0000621).

A condition assessment field visit was performed by HDR on May 3, 2022. The team of engineers included process, mechanical, structural, electrical, and architectural disciplines. The goal of the condition assessment was to understand the remaining useful life of the existing facilities, understand

deficiencies inherent in the existing design, and develop an understanding of whether existing facilities that are in poor condition can be rehabilitated or require complete replacement. The sections below review the conditions of the hatchery as witnessed on-site as well as through discussions with hatchery staff.

Table 1-1: Berlin Effluent Discharges Based on NPDES Permit

Receiving Water Body	Raceway's Served	Monitoring Required
Cold Brook	Hatchery Building, Young's Raceways, Display Pool, Foster's Raceway's, Flat Pond	Grab Sampling
York Pond	West Branch Raceways	Effluent Sampling and Metering
Diversion Pond	Canals	Not Applicable

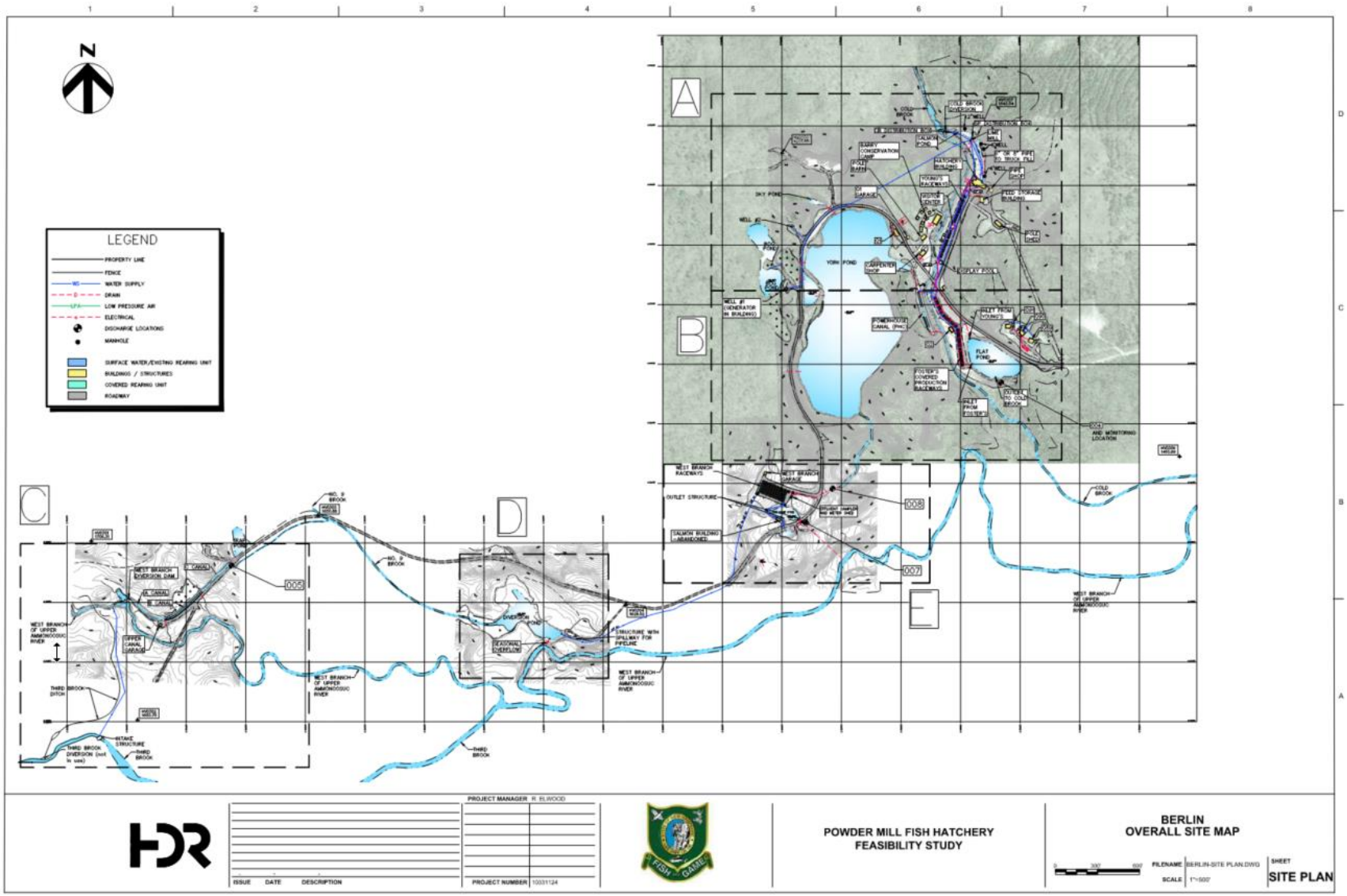

Figure 1-1: Existing Berlin Site Plan

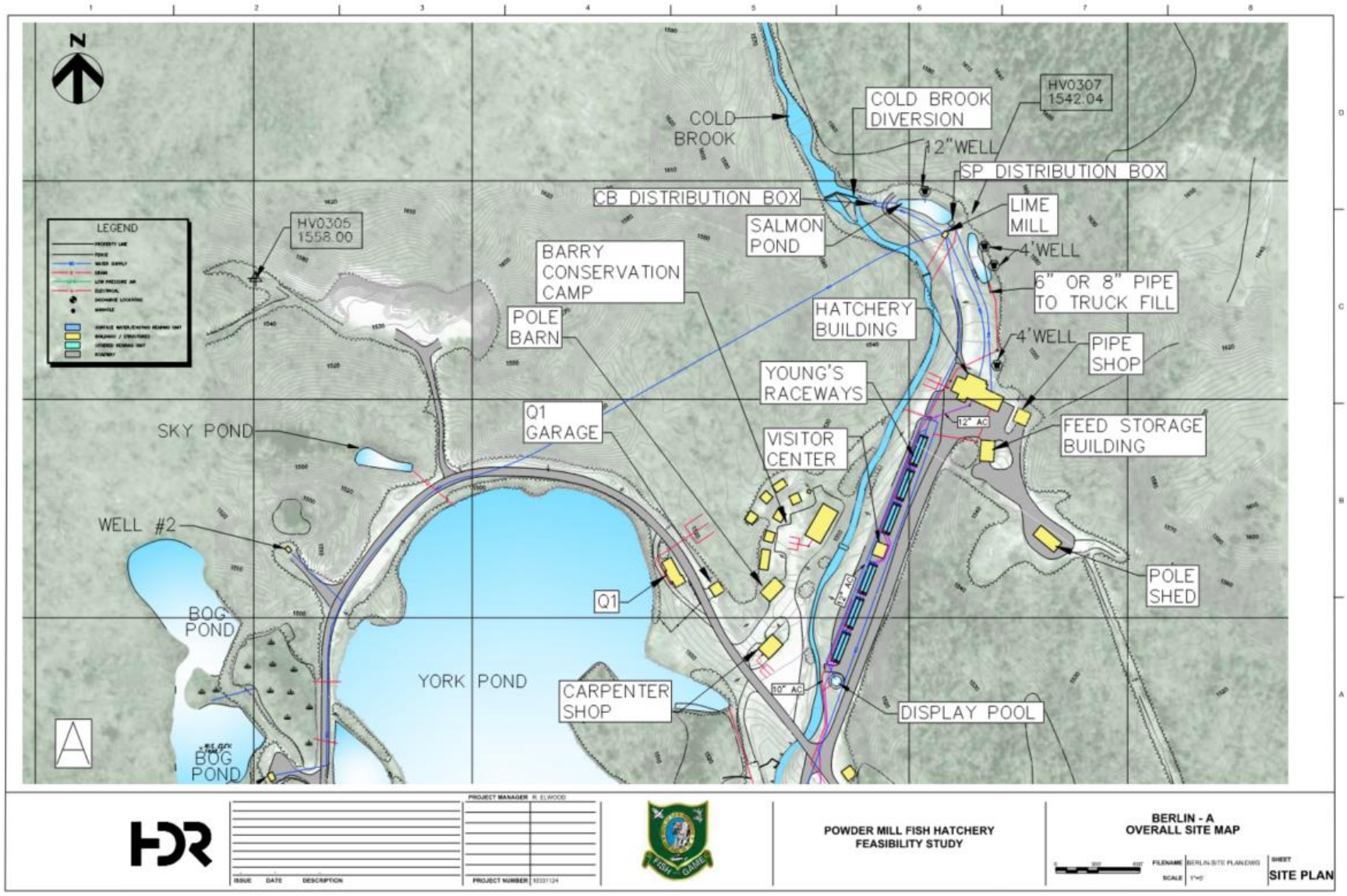

Figure 1-2: Zoomed Berlin Site Plan A

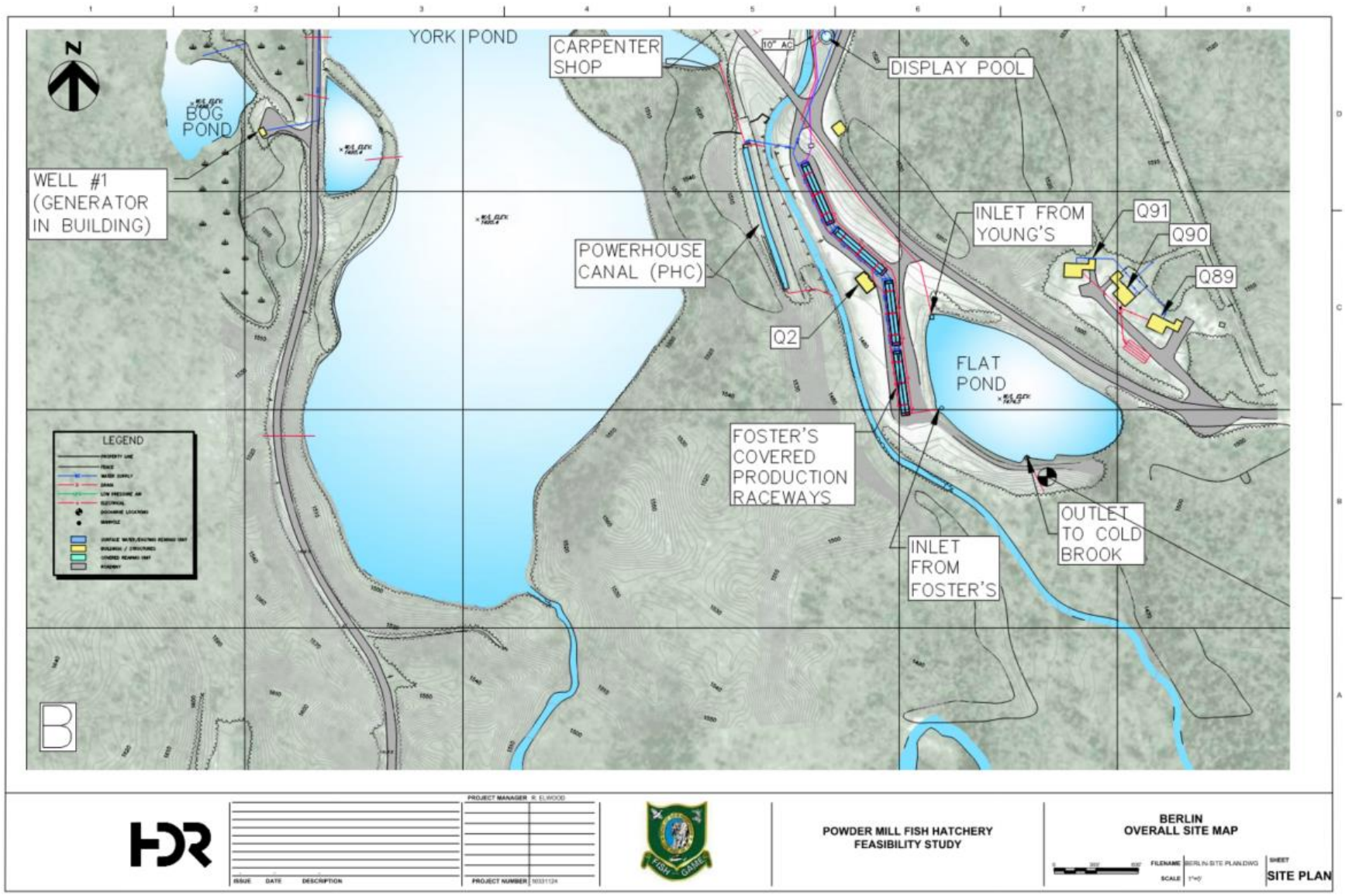

Figure 1-3: Zoomed Berlin Site Plan B

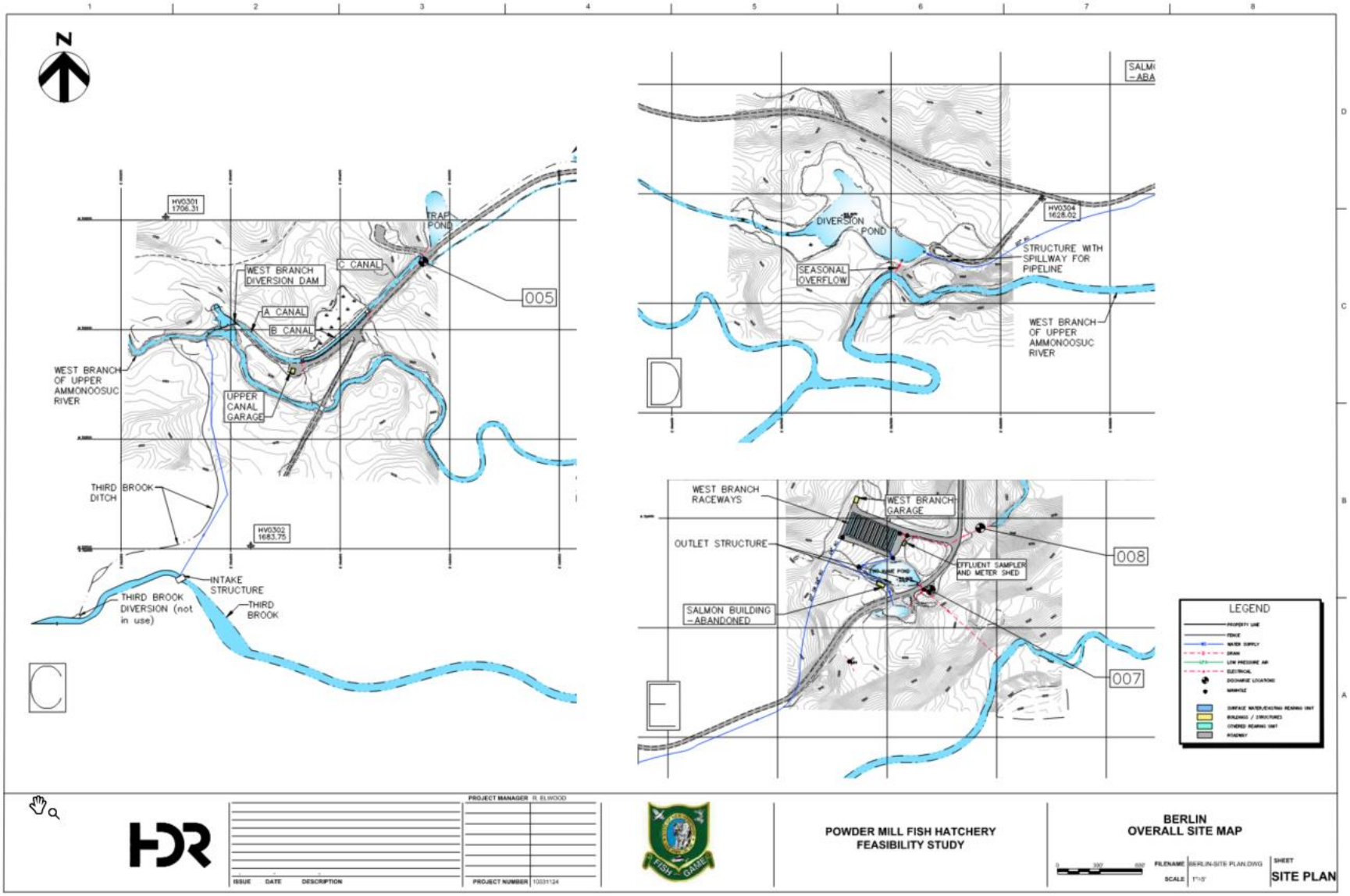

Figure 1-4: Zoomed Berlin Site Plan C-D-E

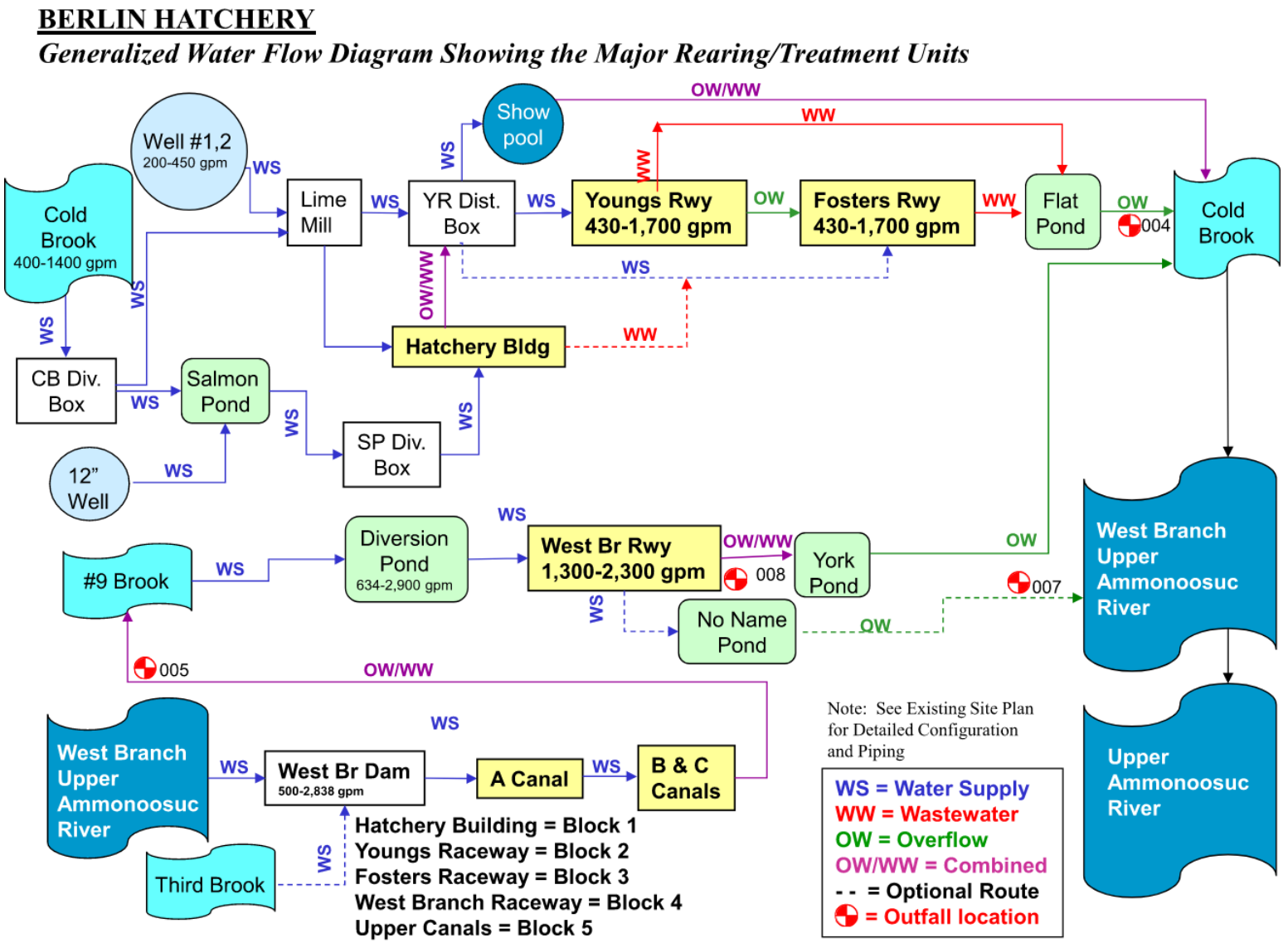

Figure 1-5: Berlin Process Flow Diagram

2 Best Management Practices

There is a quiescent zone at the end of each raceway in all of the rearing areas at Berlin Fish Hatchery. There is also additional settling at the West Branch rearing area, where the final four raceways have been converted to “non-rearing” settling areas. These are cleaned differently than the other series at the facility. These settling areas can be discharged into large settling ponds during brush cleaning and also vacuumed at various times of the year depending on settlement load. The remaining series on station are brushed weekly. Quiescent zones at the West Branch and Upper Canal series are vacuumed clean, when necessary, depending on the amount of settlement, by a portable vacuum similar to that used by Powder Mill. This procedure was implemented approximately ten years ago to reduce the amount of particulate phosphorous in the hatchery effluent. The contents of the portable tank containing the vacuumed solids is directly land applied at the hatchery site.

The process of manual vacuuming is very labor intensive and physically demanding on hatchery staff. Given that effluent total phosphorus (TP) limits are anticipated to be in the facility’s next NPDES permit, solids should ideally be collected and extracted from the tank as quickly as possible using an automated process. Quick removal of the solids should help reduce the possibility of phosphorus in solid form from becoming soluble, and therefore harder to remove from the effluent.

3 General Site Conditions

The site is divided into four sections and generally drains east-northeast. The West Branch Diversion Dam and A, B, and C Canals are at the most upstream end of the site to the west. The next downstream section contains a diversion pond fed by No. 9 Brook and a water supply intake. The third section contains the West Branch Raceways, a garage and two outfalls. All other facilities are in the vicinity of York Pond at the northeast end of the site. The site is serviced by York Pond Road from the east. This road continues west though the site and services all areas of the site.

3.1 Predator Control Systems

Fish predators include herons, osprey, eagles, king fishers and mink. Young's Raceways and eight pairs of West Branch Raceways have bird netting over metal framing (hoop-like galvanized steel tubing). Foster's raceways have fabric covers over similar metal framing. The Display Pool has a 42-inch-high chain-link fence. B Canal has a 7-foot-high chain-link fence with wires across the top.

Hatchery staff estimate roughly a 12% loss of fish through predation. This equates to roughly 34,000 fish. Higher levels of predator control systems, such as metal buildings, should be considered as part of any future improvements to drive down losses by predators, particularly if the facility is required to upgrade to a more modernized facility with high levels of solids and effluent treatment. The condition of predator control systems is discussed in the sections that follow for each individual rearing train.

3.2 Holding Ponds for Disease Treatment

Water flowing serially over weir boards and out of Young's Raceways and separately and similarly out of Foster's Raceways goes to Flat Pond, as do individual drains from those raceways, which affords some detention time if any disinfectants or therapeutants are used in the raceways. Settling of waste also occurs in Flat Pond. Although most West Branch Raceways' flow goes to York Pond, drains and a small amount of overflow is piped to two unnamed ponds that afford detention time and promote settling of waste.

3.3 Roads and Parking

The roadways and parking areas at Berlin are asphalt and gravel and are in fair condition. There is no paving around the Foster's raceways, which makes loading and unloading more difficult during poor weather conditions. Pavement around West Branch Raceways is also in fair condition. The US Forest Service maintains the entrance road from the Forest Service boundary near the Guard Shack to the hatchery. Berlin plows the entrance road to the facility. Overall snow removal is difficult around the raceways.

3.4 Fencing and Security

Fencing extends around B Canal only. The extent of fencing at Berlin is shown on Figure 1-1. Hatchery owned lighting is used to illuminate the facility during non-working hours. Due to the remote location of the facility, vandalism has not been encountered previously and is not currently a concern.

3.5 Site Drainage and Flooding

According to the Flood Insurance Rate Map (FIRM) from the National Flood Insurance Program (Community Panel Number 33007C0790D, effective February 20, 2013) Berlin does not lie within the 100-year floodplain. The Panel was not printed since the area has no special flood hazard areas. According to Berlin personnel, flooding is generally not a problem.

3.6 Domestic Water/Wastewater Systems

The domestic water supply source is a small free flowing spring, located on a ridge above the facility. The spring water is collected and piped to a 10,000 gallon enclosed tank that gravity feeds the residences, hatchery building, feed room, shop and Barry Conservation Camp. The 4” asbestos cement (AC) pipe from the spring also recently ruptured several times. Due to age and continued failure, this line will be replaced by three wells to be dug this fall/winter. Domestic wastewater is treated on-site via a conventional gravity septic system and leaching field. There are two septic systems near the hatch house, one for the hatch house and one for the feed room across the way. There is one near the residences, one at the white house (seasonal use) and another at Barry Camp.

3.7 Electrical

Electricity is provided to Berlin by the utility Eversource via an overhead 3-phase distribution line. Electricity supply is not reliable due to the single feeder supply line to a remote, heavily forested region subject to frequent adverse weather. Berlin personnel report that power outages occur approximately 3 to 5 times per year and last an average of about 3 hours. The longest reported power outage was four days.

The utility distribution line provides power to hatchery facilities from several service points. A 240V 3-phase (high-leg) service at the main hatchery area serves the headquarters, garage, and storage building. A single-phase 240/120V service near Young’s raceways powers the Carpenter’s Shop, the raceway receptacles (aerators), and the Conservation Camp facilities. A single-phase 240/120V service powers the Q2 building (old residence) along with receptacles for aeration at Foster’s raceways. A single-phase 240/120V service provides power to the West Branch raceways and supporting facilities. A single 240V 3-phase (high-leg) service provides power to Well #1 and Well #2.

Berlin has two (2) propane powered emergency generators (100 kW and 45 kW, voltage 120/240, three-phase) with auto start and auto transfer switch capabilities. The 100 kW generator was installed in 2002 and provides backup power to Well #1 and Well #2. The 45 kW generator was installed in 1986 and provides backup power to the hatchery building. The condition of each backup power system is discussed in the sections that follow based on the systems they serve.

3.8 Other Utilities

Berlin has telephone service, but staff has indicated that it is in poor condition. The site has cellular internet service provided by U.S. Cellular. Hatchery staff has indicated that the reception and bandwidth is not sufficient for operations. Satellite service is not an option due to extensive costs and even poorer reception.

Heating oil is stored in a 5,000 gallon underground tank. Hatchery staff have indicated they would prefer the tank to be above ground and that it could be reduced in capacity.

3.9 Public Visitation Information & Education Services

The Berlin Hatchery is open to the public year-round, and visitor parking is located along the Young's Raceways between the main access road and the Headquarters and Hatchery Building. There is a visitors' center located between the two sets of Young's Raceways and a display pool located at the end of the Young's Raceways. There are no public restrooms located at the Berlin Hatchery. The condition of the existing visitors' center is discussed in the sections that follow.

4 Water Supply and Control Structures

Water used for production at Berlin is mostly a mixture of groundwater from two (2) pumped production wells and surface water from Cold Brook, the West Branch of Upper Ammonoosuc River, Third Brook, and Diversion Pond (fed by #9 Brook). One other small contributing water source includes a small gravity fed well complex in the vicinity of Salmon Pond. Available flow of water supply is summarized in Table 4-1.

Table 4-1: Available Flow from Water Supply

Water Supply	Min Flow	Max Flow	Rearing Area Served	
	gpm	gpm	First Use	Serial Reuse
Cold Branch Diversion	400	1400	Hatchery, Youngs Raceway, Show Pool	Foster's Raceway
Well #1 and #2	200	450	Hatchery, Youngs Raceway, Show Pool	Foster's Raceway
West Branch Diversion Dam	500	2,838	Upper Canals	
Diversion Pond	634	2,063	West Branch Raceways	

This well complex includes one small pipe-cased well with a low volume artesian flow which discharges into Salmon Pond, and a few wide, shallow, unpumped wells directly to the east which discharge into an Unnamed Pond which then flows via 6 or 8" piping to the hatchery building where it is used for truck filling. Another wide, shallow well in the general vicinity was previously capped due to the presence of copper, which is detrimental to the health of the fish.

Surface waters are used in the summer and winter. Well water is used in the winter and to supplement low surface water flows in the summer.

4.1 Cold Brook Diversion Dam, Distribution Boxes, and Well Complex

The Cold Brook Diversion Dam was constructed in 1933 (Figure 4-1). Cold Brook intake has an aluminum self-cleaning screen (95' x 17' x 5') with 1/8" on center holes. The screen works well during high flows, but fallen leaves clog the screen at times causing silt build up which requires daily leaf removal by staff. The screen has no alarm or flowmeter.

During high storm events, silt can be washed into the raceways as there is no means for sediment removal withing the Cold Brook (CB) Diversion Structure or CB Distribution Box. Water flows through the Cold Brook Diversion Box, which does not have modern features for sediment removal. Average surface water flow from 2001 from the Cold Brook Dam was measured as 1,100 gpm with a maximum flow rate of 1,400 gpm and a minimum flow rate of 400 gpm.

The Cold Brook Diversion Dam is comprised of a concrete wall across the natural channel with timber planking on top for added height. It diverts the flow of Cold Brook through the intake screen

and into a concrete collection box, which collects flow and allows overflow to return to the stream through a spillway. At the time of inspection, flow in the brook was sufficient that there was additional overflow going over the timber planks on the diversion dam. The condition of the concrete of the diversion dam, collection box and spillway was fair to good, with surface cracking and minor surface spalls at the top of the walls that are exposed to vegetation growth and weathering.

There is a low stone retaining wall along the right side of the collection box inlet that has formed a level area of ground from which hatchery personnel access the impoundment area to remove sediment and debris. Hatchery personnel indicated that they would prefer that area to the right of the inlet box be modified to be a ramp down to the impoundment area to assist in debris removal equipment access.

Figure 4-1: Cold Brook Diversion Dam

Cold Brook Diversion Dam has two cast iron slide gates. One controls flow into a 12” diameter AC pipe that discharges to the CB Distribution Box. The second is considered obsolete, as 1978 drawings indicate no piping is served by the second gate. Cold Brook Water is not used in winter since it is too cold. No freezing problems have occurred when not in use.

The CB Distribution Box needs rehabilitation. The walls of the concrete box extend above the surrounding grade by about a foot, with a two-piece wooden cover on top of the walls. The walls are heavily spalled, cracked and deteriorated above the level of the surrounding grade (Figure 4-2).

Additionally, given this site is open to the public, increased safety measures such as grating, or a solid aluminum hatch should be installed. The Distribution Box has two outflow pipes; one goes to a Blending Tank with Lime Mill and the other to Salmon Pond. A 2” high slot under stop logs feeds the pipe to Salmon Pond.

Figure 4-2: CB Distribution Box

Salmon Pond (Figure 4-3) is formed by a concrete impoundment wall with stone walls extending on either side of it. A concrete outlet box with a metal trash rack on its inlet is present near the center of the concrete impoundment. The concrete of the impoundment wall is in fair condition. The concrete of the outlet box is very deteriorated and spalled and needs to be rehabilitated. Timber boards have been used to replace missing metal gratings. For safety purposes for both staff and the public, these should be replaced with gratings. The screened outlet structure contains one discharge pipe arriving at a slide gate in the Blending Tank at Lime Mill. The distribution box houses a slide gate controlling flow to a discharge pipe to the lower part of Cold Brook as well as a second pipe feeding the Hatchery Building. Salmon Pond is allowed to spill into an un-named, un-numbered pond directly adjacent.

Figure 4-3: Salmon Pond Outlet and Distribution Box

The Blend Tank at Lime Mill is a concrete distribution box in front of Lime Mill that has a two-piece plywood/lumber cover, see Figure 4-4. The concrete of the Blend Tank is in good condition. Lime Mill itself is a concrete valve enclosure topped by a timber/lumber shed-type structure. The concrete of Lime Mill is in fair condition.

The Blending Tank at Lime Mill can receive water from Salmon Pond, a pipeline from the two pumped production wells, and a pipeline from Cold Brook. Leaving the Blending Tank is a valved 6” pipe to the Hatchery and 12” pipe to Young’s Raceways. The valve on the 6’ pipe is seized open and needs to be replaced.

Cold Brook water has low pH 6.0 to 6.3. Inside and atop the Blending Tank is a limestone mill that was historically used to raise pH; but the mill has deteriorated and is no longer in use. The timber of the Lime Mill structure is weathered and in need of maintenance or demolition, see Figure 4-5.

Figure 4-4: Blending Tank at Lime Mill

Figure 4-5: Lime Mill Structure

4.2 Well #1

Well water is used in the winter and to supplement low flows in the summer. Well #1 was installed in 1965 with a depth of 72 feet. It contains a 20-HP line-shaft turbine pump with an 8” discharge to an 1800 rpm, 3-phase motor. Originally providing an output of up to 500 gpm, is now reduced to around 300 gpm. Flow rates were measured via flow meters located directly upstream of Young’s Raceways in the past, but the meters have been dysfunctional for years. Now flow rates are calculated via a weir located at the headend of Young’s. This well was last cleaned in 2009 by Layne Christensen Company and is slated for cleaning in 2023.

Buried discharge piping is joined by the discharge of Well # 2 before continuing to the Blending Tank at Lime Mill. The discharge piping is equipped a low-pressure cutoff switch.

The well pump, generator, and controls for both wells are housed within Well House #1. This structure consists of a concrete foundation slab and metal panel walls and roof (Figure 4-6). The walls are comprised of a combination of structural metal panels and a section of metal stud framing where the structure was expanded. The roof is a standing seam metal roof with a very low slope. The walls and roof appear to be in fair condition other than a damaged section of the metal wall panel at the entrance door. Well House #1 is not insulated, barring a few pieces of rigid insulation around the generator exhaust louver, and has no windows.

Electricity is provided to Well House #1 from the utility distribution line that runs along the road. 240V 3-phase is routed underground from a 3-phase pole-top transformer and terminated at the utility meter on the building exterior. The main panel “A-1” is rated 200A and provides power to both Well House #1 and Well House #2 up the road.

Well #1 has an on/off combination starter with pump fail alarm. The alarm notifies the dialer at the Hatchery Building. The main panel is in good condition. The sub-panel “P2” and auxiliary power transformer are in poor condition due to age.

A 100kW backup generator is located in the well house. The generator is connected to an automatic transfer switch that provides emergency power to both Well Pump #1 and Well Pump #2 up the road. Staff noted that the generator is more than 20 years old, and it is difficult to maintain and get replacement parts for it. There are intake and exhaust louvers (with backdraft deterrence) in the building for cooling ventilation for the generator engine. These louvers are in poor condition and require replacement. The building has a floor standing portable electric space heater. A 500-gallon propane tank fuels the generator engine.

Figure 4-6: Well House #1

4.3 Well #2

Well #2 was installed in 1967 with a depth of 51 feet. It contains a 20-HP line-shaft turbine pump with 8” discharge. Its motor is 1800 rpm and 3-phase. The discharge is reduced to 6” before going through a check valve and buried gate valve. Originally providing an output of up to 500 gpm when cleaned, is now reduced to around 300 gpm after service. Before it was last cleaned, flow had dropped to 200 gpm. In May of 2022, its discharge pressure gauge read 30 psi. This well was just cleaned last summer and the motor, pump, pipe and shaft were replaced. The flow rate is now approximately 300 gpm.

Buried piping joins water from the wells and it goes to the Blending Tank at Lime Mill. The discharge piping is equipped a low-pressure cutoff switch.

The pump for well #2 is housed within Well House #2, which is constructed of a concrete foundation slab, wood framed walls and roof structure (Figure 4-7). The exterior of the walls are painted wood boards. The roof is a low slope asphalt shingle roof with an access hatch in the middle. The wood framing was observed to be rotted and have noticeable water staining throughout the structure, and the sill plate was rotted and in poor condition. The plywood roof sheathing was observed to be water stained and rotting, with water staining visible on most of the roof rafters. The foundation and building was extended 2 years ago in order to fit a new valve. The walls of this structure are insulated, but no heat or ventilation is present.

Electricity is sub-fed to Well #2 from the utility service at Well #1. Well #2 has an on/off combination starter with pump fail alarm. The electrical equipment is in adequate to poor condition. The pump is connected to the backup generator at Well #1. The well pump has a pump fail alarm that notifies the alarm dialer at the Hatchery Building.

Figure 4-7: Well House #2 Interior

4.4 Third Brook Intake Structure and West Branch Diversion Dams

Water from the West Branch of the Upper Ammonoosuc River and Third Brook feeds into the West Branch Diversion Dam. Third Brook Intake Structure (see Figure 4-8) diverts water to West Branch Diversion Dam through a 10 or 12-inch-diameter pipeline and is used as a supplemental source when needed in the summer. Flow data collected in 2001 shows an average flow rate of 1,865 gpm with maximum flows of up to 2,838 gpm and minimum flows of 500 gpm leaving the West Branch Dam. The Third Brook Intake is used as needed and was not in use during the inspection. The West Branch Dam supplies the Upper Canals and discharges into #9 Brook.

Access to Third Brook Intake Structure is poor and the valve on the pipe inlet there is in poor condition. The concrete of the diversion/intake is in fair to good condition, with moderate bank erosion downstream of the intake box.

The Double-Box concrete spillway portion of the West Branch Diversion Dam intake structure was replaced, including dam boards and two slide gates, in 2003 (see Figure 4-9). This structure is a mass concrete wall across the channel, with vertical steel beams cast into the wall that allow timber boards to be slid into them to increase the height of the impoundment. The concrete of the impoundment wall is worn but in fair condition. A portion of the West Branch of the Upper

Ammonoosuc River (West Branch) is diverted through the recently renovated concrete box intake structure to provide water to Canals A-C. The overflow reenters the West Branch via a channel below the double-box concrete spillway (Figure 4-10). The condition of the concrete diversion structures is good to excellent. There is poor access to the dam pool for sediment removal equipment.

Figure 4-8: Third Brook Diversion and Intake Structure

Figure 4-9: Double-Box Concrete Spillway (intake box is to the left of image (river left side)

Figure 4-10: West Branch Diversion Dam

4.5 No. 9 Brook and Diversion Pond

Diversion Pond is fed by No. 9 Brook and discharges into the West Branch of the Upper Ammonoosuc River. It is a man-made reservoir with an earthen dam that was constructed in 1928 and contains concrete and granite outlets. There is a concrete outlet box that has 20” AC piping to the West Branch Raceways (see Figure 4-11). The structure has a bar screen that must be manually raked clean. The bar screen is accessed by lumber boards placed across the top of the box. The concrete of the box is in fair to good condition. The top and front of the outlet box should be rebuilt to increase safety for staff and the public.

A open concrete box structure on the raceway supply piping approximately 100 feet downstream of the outlet box has a slide gate that can be used to stop or choke flow to the raceways (see Figure 4-12). It has a spillway to the river and is covered with wood planks. The concrete of this structure is in fair condition. The top of this structure should be rebuilt to increase safety for staff and the public.

The second outlet structure in the pond has weir boards and overflows through piping to the river (see Figure 4-13). During some summers there is no overflow to the river. It has an average flow rate of 1,602 gpm with a maximum flow rate of 2,063 gpm and a minimum or low flow of 634 gpm, as per data collection from 2001. The dam failed once and there appeared to be 6 to 8 feet of sediment. The concrete of this outlet box was in fair to good condition, with no need of repairs. The access walkway for personnel should be improved to increase safety for staff and the public.

Figure 4-11: Diversion Pond Outlet Structure to Raceways

Figure 4-12: Gated Pipeline from Diversion Pond to Raceways

Figure 4-13: Diversion Pond Outlet Structure to River

4.6 Water Supply and Control Summary

To summarize, the following limitations, deficiencies, and conditions were noted for the water supply and control structures during the on-site condition assessment:

- The conditions of the supply lines have not been determined since they require special inspection procedures to access. However, hatchery staff did not indicate any concerns regarding the existing water supply lines.
- Cold Brook Diversion Dam:
    - Add a ramp to the right of the inlet box to assist with debris removal.
    - Replace one slide gate and remove slide gate not in use.
- CB Distribution Box:
    - Rehabilitate concrete box including more secure cover.
    - Install a more controllable method of modulating flow to Salmon Pond such as a gate or valve.
    - Add means for sediment removal upstream or integral to this box.
    - Add flow measurement or a means for low flow alarm to alert staff to excessive debris at the screening structure.

- Salmon Pond:
    - Rehabilitate concrete at the outlet box including new metal gratings for increased staff and public safety.
    - Replace slide gate.
- Blend Tank and Lime Mill:
    - Replace plywood cover with grating or solid metal hatch for increased public safety.
    - Replace all gates and valves within this structure.
    - Remove all associated lime mill equipment and demolish timber structure.
- Well #1
    - Replace sub-panel P2 and auxiliary power transformer.
    - Replace backup generator.
    - Replace louvers.
- Well #2
    - Replace roof.
    - Replace electrical equipment in poor condition.
- Third Brook Intake Structure
    - Replace valve on inlet pipe and install stone riprap downstream of intake box.
- West Branch Diversion Dam
    - Improve access to dam pool for sediment removal.
- No. 9 Brook and Diversion Pond
    - Repair Diversion Pond outlet to West Branch Raceway for safety.
    - Repair spillway structure for safety.
    - Replace walkway to West Branch Outlet Box for safety.

5 Incubation and Rearing Facilities

Incubation and early rearing occur in the Headquarters Office and Hatchery Building while intermediate and late rearing occur in four separate raceway trains: Young's Raceway, Foster's Raceway, West Branch Raceways, and B Canal. Each of these facilities and their conditions are described in the sections that follow.

5.1 Headquarters Office and Hatchery Building

The Headquarters Office and Hatchery Building (Figure 5-1) consists of the original section, constructed in 1930-1932, along with additions built in 1949 and 1985. The building has a total area of 7,245 square feet, including two floors with a partial basement. The first floor houses the hatchery area, process boiler room, degasser room, and main entrance with a bathroom. The second floor houses office spaces, a break room with kitchenette, storage areas, and a laboratory. The partial basement is a single space located below the main entrance. A water heater and boiler that supports the buildings hydronic space heating resides there.

Figure 5-1: Headquarters Office and Hatchery Building

5.1.1 Process

Egg incubation and early rearing activities are completed within the Hatchery Building. Degassed first-use well water is used for egg incubation. Eggs are placed on trays suspended in aluminum troughs. As the eggs hatch, the sac fry fall through the trays onto the bottom of the trough. Here they will stay until they are ready to be placed in the indoor, concrete raceways. The water flow rate per egg incubation unit varies from 6 to 10 gpm.

Water within the indoor rearing units is also degassed, first-use well water. Berlin operates and maintains twenty-four (24) concrete raceways (see Figure 5-2), allowing for a maximum flow rate of 20 gpm and forty-eight (48) aluminum troughs with capacity for flow rates up to 75 gpm. Hatchery personnel report that the indoor raceways are brushed and cleaned daily.

A Swedish degasser, in a process boiler room, treats influent water. Salt is sometimes added behind the Swedish degasser. The process boiler piping is disconnected, and the process boilers have been abandoned. Aeration columns are located at each raceway inlet.

5.1.1.1 Structural

The Headquarters Office and Hatchery Building is a CMU block building on a concrete foundation with a wood framed second floor and roof structure. The overall structure appears to be in good condition.

The concrete raceways in the Hatchery Building are painted and appear to be in good condition.

Figure 5-2: Interior Raceways

5.1.1.2 Architectural

The Headquarters Office and Hatchery Building roof is a wood framed gambrel style roof with asphalt shingles. The age of the roof is unknown, but the roof appears to be in poor condition, with loose, missing, and replaced shingles scattered over the entire roof. Evidence of leaks from the roof in the form of water staining in the drop ceiling tiles were observed in the main office space. At the roof over the degasser room, the gutter is partially missing, and there is no downspout from the gutter. It is recommended that the entire roof be replaced.

The exterior walls consist primarily of split face concrete blocks on the first floor, and wood siding on the second floor. Other than some minor peeling paint on the wood siding, the exterior walls appear to be in good condition.

The windows on the first floor around the hatchery area are the original wood framed, single pane windows with an outer wood frame storm window. These are in fair condition, but provide limited insulation, especially in the winter. Some of the wood frames were observed to have broken and/or rotted areas. It is recommended that these windows be replaced. The windows on the second floor

and at the main entrance have been replaced with newer vinyl double hung windows. These appear to be in good condition and are operable.

The exterior doors are hollow metal doors, except for the main entrance door, which is solid wood with a vision panel and a storm door. The doors were found to be operable and in fair to poor condition, with signs of rusting of the doors and frames beginning to show. The storm door at the main entrance, which was observed to be in poor condition, cracking, and does not close properly. It was also noted that the doors around the hatchery area typically get a layer of ice on the inside and freeze up during the winter. One leaf of the double door from the degasser room is missing the weather stripping. The concrete sills at west exit door from the hatchery area is spalling. It is recommended that all exterior doors be replaced and damage to sills be repaired.

There are two brick chimneys on the building, one on the north side of the boiler room (Figure 5-3) that serves as exhaust from the boiler room equipment, and the other along the west side of the main entrance where the main entrance and hatchery area intersect (Figure 5-4), which serves as exhaust from the mechanical equipment in the basement. Both chimneys were observed to be in poor condition with spalling and missing bricks near the top. The chimney outside the boiler room also appears to be missing a vent or access hatch near the bottom, leaving approximately an 8” by 8” hole and spalling bricks. The chimney along the main entrance was observed to have water stains, missing mortar joints and moss growing from the mortar joints. The flashing around the chimney where it intersects the roof eaves does not appear to direct water away from the chimney and allows rain water and snow melt to run down the faces of the chimney. It was noted that the interior wall finishes around the chimney in the main entrance have had to be replaced due to water damage, and that the water in the basement appears to be coming from the chimney. It is recommended that both chimneys get repointed with localized brick replacement.

Figure 5-3: Boiler Room Chimney

Figure 5-4: Main Entrance Chimney

The main entrance is approximate 32 inches above grade and is accessed via a set of concrete steps with a shallow landing at the door and metal handrails. The stairs and handrails appear to be in good condition, but do not comply with current building codes. The risers are approximately 8 inches high, which is greater than the 7 inches maximum allowed per building code. The top landing at the door does not meet the code requirements for minimum depth of 48 inches and the storm door swinging out reduces the effect area of the landing to less than half the landing. The handrail does not meet current building code requirements as it does not extend beyond the bottom riser. And there is no code compliant guardrail along the stairs, which is required by the building code for any walking surface greater than 30 inches above grade. It is recommended that the existing concrete stairs be replaced with code compliant stairs and railings, including a properly sized landing at the entrance door.

The main entrance space has a wood floor, gypsum board walls with approximately 5ft high wood paneling, and a gypsum board ceiling. The finishes appear to be in good condition. The only bathroom for the entire facility is located in the main entrance, under the stairs to the second floor. The bathroom is small (approximately 3ft by 6ft) with a toilet and small corner sink. The ceiling height in the bathroom varies from 4’-5” at the back of the toilet to 6’-6” over the toilet, which is less than the 6’-8” minimum headroom clearance allowed per building code, before stepping up to 8 feet at the sink and doorway.

Access between the main entrance hatchery space is provided via a door and step down of approximately 15” consisting of two risers. The riser heights vary from 6” to almost 9”, which exceeds both building code and OSHA standards. The door is aligned with the bottom riser on the

hatchery side, leaving a gap between the top riser and door when the door is closed. Staff noted that this can be a tripping hazard.

It is recommended that the main entrance of the Headquarters Office and Hatchery Building be renovated to address code deficiencies and staff needs, including an adequately sized restroom, and code compliant access between the entrance and the hatchery space.

The hatchery space consists of concrete floors, the interior surface of the concrete block walls, and panel ceilings. The finishes appear to be in good condition. The ceiling panels are believed to be asbestos panels. The walls are not insulated. Styrofoam insulation has been loosely placed into the double door opening to provide insulation at one of the doors to the hatchery.

The boiler room, which is located directly behind the original section of the hatchery space, consists of a concrete floor approximately 4” above the hatchery floor, the interior surface of the concrete block walls, and the exposed wood floor joist and sub-flooring of the laboratory above. Other than some paint peeling off the walls, the finishes appear to be good condition. A set of wood stairs provide access from the boiler room up to the second floor. These stairs appear to be in good condition, and appear to comply with OSHA standards, but do not meet current building code requirements for handrails and guardrails. If the laboratory remains on the second floor, it is recommended that code compliant railings be added to these stairs. However, if the lab space is relocated to the ground level, these stairs can be removed.

The degasser room is accessed from the boiler room, and this space was added as part of the 1985 addition. The room consists of a concrete floor, cement block walls and a gypsum board ceiling. Some peeling paint was observed along the bottom of the walls. Otherwise, the finishes in this room appear to be in good condition.

The basement is a single room located below the entrance area and is accessed from the hatchery space via a set of wood stairs. These stairs have a typical riser height of 8 inches, except at the bottom riser, which is approximately 9inches, and have a tread depth of 9 inches. These do not comply with standard building code requirements for the stair treads and risers. The riser heights do comply with OSHA standards, but the treads do not meet the OSHA minimum requirement of 9.5 inches for tread depths. These stairs should be replaced with OSHA compliant stairs.

The basement space is used for hatchery storage, and a mechanical space housing a boiler, hot water heater and a sump pit. The basement floor and walls are concrete while the ceiling is asbestos paneling. Water was observed on the floor and water staining was visible on the wall around the chimney. The floor does not appear to slope properly to the sump pit to prevent ponding water. The bottom of the wood storage racks along the south wall were observed to be rotted. It is recommended that the floor be sloped to allow for proper drainage. Wood storage racks should be replaced by ongoing maintenance activities.

The primary access to the second floor is via a set of stairs from the main entrance. The grooved tread covering is either missing or broken on most treads. The stairs only have a handrail on one side of the stairs, which does not comply with the current building codes. It is recommended that new code compliant railings be installed along these stairs.

The second floor is broken into four primary spaces: (1) staff office space; (2) break room with kitchenette; (3) laboratory; and (4) manager’s office with conference table. The staff office space currently has only two desks, so each staff member does not have their own desk, and three closets. The closets are not large enough to store all of the equipment, so some of the doors cannot close, and items were observed spilling out of the closet onto the floor.

The breakroom includes two tables and a kitchenette and appears to be sufficiently sized for the staff. Staff noted that some parts of the floor in the breakroom feel “soft”. This may be due to moisture from the hatchery space below affecting the wood sub-flooring. The floor is covered with carpeting, except for the kitchenette, which has tile flooring. Both look to be in good to fair condition, but the sub-flooring was not visible for inspection. The walls and ceiling are both gypsum board, which also appear to be in good condition. It is recommended that further investigations be performed verify the condition of the subfloor. Since the ceiling panels from the hatchery space are asbestos paneling, it is recommended that a section of the flooring on the second floor be removed to inspect the condition of the subflooring and joists.

The laboratory is located above the boiler room, and has vinyl flooring, and gypsum board walls and ceiling. Room finishes appear to be in good condition. However, the laboratory being located on the second floor was noted as an issue, as carrying materials up and down the steps tends to lead to spills. It is recommended that the lab be relocated to the first floor and this space be renovated into a new restroom to serve the second floor.

The manager’s office is connected to the break room by a hallway including a set of steps, since the manager’s office is approximately 3ft higher than the breakroom floor. Attic storage spaces are located on both sides of the corridor.

The manager’s office consists of two workstations and a large table that is used as a conference table. The floor is covered with vinyl sheet flooring, which appears to be in good to fair condition. The walls are finished with wood paneling which appear to be in good condition. The ceiling is 2’ x 4’ ceiling tiles, which appear to be in good condition, except near the southwest corner, where water staining on the tiles is visible. These tiles should be replaced as part of ongoing maintenance.

Staff noted that it is sometimes difficult to keep the second floor warm in the winter. It is unknown if there is insulation behind the wall finishes, however, in the storage spaces, there is no insulation present on the underside of the roof, which would indicate that there is no insulation in other spaces. It is recommended that insulation be added to all walls and roof / ceiling spaces on the second floor.

No spaces in the Headquarters Office and Hatchery Building are ADA accessible. This is not required for the hatchery area, but additional information from the NHFGD is required to confirm that the office spaces are not required to be accessible. Based on the current staff, it is our understanding that Berlin Hatchery employees are required to be mobile in order to perform their daily functions, which would not require these spaces to be accessible. However, if these spaces are to be used by visitors, for purposes such as meetings, these spaces may be required to be made accessible. It is recommended that NHFGD confirm that job descriptions for the staff that use the spaces on the second floor of the hatchery require mobility that would not require accessible accommodations. If there is a need for visitors, that could require accessible accommodations, it is recommended that another facility with first floor access be retrofitted for this purpose.

Staff noted that there are no locker rooms or other areas for staff to change or keep clean or dirty clothes.

5.1.2 HVAC & Plumbing

There is a 5,000 gallon buried oil tank for the boilers and furnaces. Staff noted that they usually only keep it filled to approximately 2,000 gallons.

The central boiler for the building is a 180 MBH oil fired boiler located in the basement mechanical space. Two process boilers are abandoned in place in the hatchery area. The hatchery area is

heated by two ceiling hung 106,250 btu/hr oil fired furnaces. The hatchery foyer is heated by two floor mounted hot water radiators. The degasser room is heated by a hot water unit heater. The second floor contains office areas, laboratory, and a breakroom kitchen area. The lab has a radiator, and the office area has two radiators. The central boiler and oil-fired furnace appear to be in good condition. The hot water radiators and unit heater appear to be at the end of service life and should be replaced. Staff noted that it is difficult keeping the hatchery space and office spaces heated in the winter months.

Domestic hot water is provided by a 40-gallon electric tank water heater. The water heater appears to be in good condition. The hatchery building water is supplied a small free flowing spring, located on a ridge above the facility. When the springs have a low flow, staff have to carefully manage their water consumption. The spring was producing low flows during the site visit, and it was observed that the toilet took several minutes to refill after flushing.

5.1.2.1 Electrical

Electricity to the Headquarters Office and Hatchery Building is providing at 240/120V, 3 PH (high-leg), 4W from the 45kVA utility service in the hatchery area. A slack span is routed overhead from the 240V distribution line to the 400A service disconnect on the north side of the building. The distribution line also supplies power to the garage and storage facilities located near the Hatchery Building.

The “Main Panel” is located inside the building near the generator room. The panel is rated 240/120V, 225A 3 PH. Loads are primarily lighting, receptacles, and HVAC systems. There are no other significant process loads. Electrical panels and conduit/wire is aged, but in adequate condition. Replacement should be included in any major building renovations or planned for soon. Capacity is sufficient for the current requirements of the facility.

A 45kW propane generator is located inside the facility to provide backup power to the entire building. The generator is connected to an automatic transfer switch to facilitate quick transfer of power upon loss of utility supply. The generator was installed in 1986 and is considered to be beyond expected operational life. The unit is becoming difficult to maintain and will require replacement soon.

Building lighting is provided by surface-mount fluorescent fixtures. Light levels in the hatchery area, as well as the administrative areas, are insufficient for facility operations. Fixtures in the hatchery area are not rated for the damp environment. Berlin personnel have noted that lighting upgrades are required.

There is no coordinated SCADA system for facility operations. Currently in-place flow meters are not operational. An alarm dialer in the hatchery building notifies key personnel for power outages, and well pump failures.

5.2 Young’s Raceways

Young’s raceways (1-12) were constructed in 1994, with concrete walls and base slabs (Figure 5-5). Raceways have the dimensions of 73’ x 8’ x 3’ and an operating depth of 1.7’. They are laid out in six side-by-side paired units (out-to-out width of each pair is 17 feet), allowing water to flow by gravity serially from the upper pair nearest the headquarters building to the lower pair above the Display Pool.

5.2.3 Process

Water from the hatchery building and from the Blending Tank at Lime Mill enters a distribution box which sends flow out via three pipes. One supplies the top of each pair of units, one supplies the top of each pair of the Foster's Raceways units, and the last supplies the Display Pool. Flow meters had been installed on one or more of these pipes in the past, but the meters are no longer functional.

Average flow for each raceway of the 1st pair is 450 gpm and peak is 600 gpm. Flow through the 1st pair of raceways flows over stop logs and serially through the others. Each raceway has a settling zone near its end with standpipes that can be removed to send settled waste to Flat Pond.

Young's Raceways are protected against predation by metal-framed canopies covered with open netting. These canopies were just installed within the last year and are in new condition.

5.2.4 Structural

The concrete is in fair to good condition, with minor surface cracking of the walls spaced every 10-15 feet. Expansion and contraction joints in the walls have required periodic maintenance to correct spalling and cracking dating from construction (Figure 5-6). Water stops were not used during construction, which have caused leakage and wall lifting. Young's Raceways are protected against predation by metal-framed canopies covered with open netting.

Figure 5-5: Young's Raceway

Figure 5-6: Young's Raceway Concrete Condition

5.2.5 Electrical

There is no electrical power or lighting at Young's Raceway.

5.3 Display Pool

Berlin maintains and operates one (1) twenty-five (25) foot diameter concrete show pool (Figure 5-7) which is located directly below Young's Raceways. The unit is used for display only and is not used for production. The water supply is a pipeline from the distribution box at the north end of Young's Raceways. The Display Pool overflows into the same drain line that serves Young's Raceways, this line carries used culture water to Flat Pond. Hatchery personnel report that the unit typically receives a flow rate of 30 gpm.

The show pool experiences a high magnitude of fish losses due to predation (15-20%), which are difficult to replace.

The Display Pool is a circular inground tank with concrete bottom and walls and a surrounding at-grade concrete slab. The concrete is in good condition, with minor surface erosion of the walls and bottom below normal water line, but with no aggregate exposure.

The Display Pool is surrounded by a chain-link fence with no overhead protection against predation. This results in the Display Pool experiencing a high magnitude of fish losses due to predation (15-20%), which are difficult to replace. It is recommended that increased predation protection be installed at the Display Pool.

Figure 5-7: Display Pool

5.4 Foster's Raceway

The Foster's raceways were constructed in 1979. They are laid out in four groups of four raceways, two-wide by two-long and are covered, see Figure 5-8 and Figure 5-9. Water flows by gravity serially from the upper quartet to the lower quartet.

5.4.5 Process

Foster's is supplied with water from two sources. One of the water supplies is a pipeline from the distribution box at the north end of Young's Raceways. It runs along the west side of the raceways and has branches and valves to every raceway. The second source is the used culture water from Young's Raceways. Water flowing over the stop logs of the last pair of Young's Raceways is piped to a box slightly north-northeast of Foster's Raceways and from there, through a buried valve, to the first pair of Foster's Raceways.

Each raceway in the first pair has average flow of 480 gpm and peak of 600 gpm. Flow through the first pair of raceways flows over stop logs and serially through the remaining two. Each raceway has a settling zone near its end with standpipes that can be removed to send settled waste to Flat Pond. The raceways are brushed clean weekly.

Foster's Raceways are protected from predation by metal-framed Quonset-hut style enclosures with weatherproof fabric covers. The covers have deteriorated over time and have several tears and failed sections in them and should be replaced. Staff note that removal of snow from the covers is difficult and time consuming.

5.4.6 Structural

The raceways have concrete walls and base slabs with dimensions 76' x 8' x 3' with an operating depth of 1.8'. They are protected from predation by metal-framed Quonset-hut style enclosures with weatherproof fabric covers. The covers have deteriorated over time and have several tears and failed sections in them. They should be replaced. The concrete of these raceways is in good condition, with minor surface erosion below normal water line and minor surface cracking.

5.4.7 Electrical

Foster's Raceway has receptacles embedded in the concrete structure for the purpose of plugging in aerators. Electrical power is routed in conduit embedded in the concrete. The receptacles do not have mechanical protection. Many receptacles have been damaged and are no longer operational. The equipment has also caused the concrete to prematurely degrade. There is currently no need to replace these receptacles unless there is a new need to supply aeration devices in this raceway. There is no lighting at Foster's Raceway.

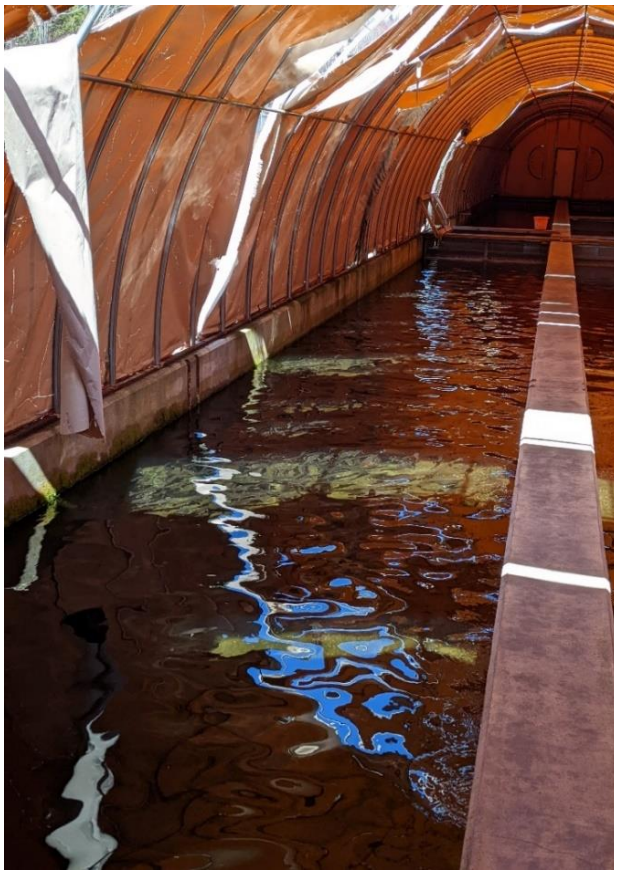

Figure 5-8: Inside of Foster's Raceway

Figure 5-9: Outside of Foster's Raceway

5.5 Flat Pond

Flat Pond was constructed in 1930 with an earthen dam and contains a concrete spillway (Figure 5-10). Flat Pond's dam failed in 1998 and accumulated sediment was lost with discharge into Cold Brook. The pond has never been dried since it contains no bypassing capabilities.

Flat Pond receives both overflow culture water and cleaning water from brushing operations from Foster's and Young's raceways. Removal of solids from the pond appears to be a difficult operation. The pond is approximately 12-ft deep and the current hatchery manager, who started in 1985, has never seen it dredged. Additionally, the pond is not lined which might allow nutrient leaching into the local groundwater.

The pond has a screened overflow structure piped to a ditch that flows to Cold Brook. Hatchery staff indicated that this piping from the dam is undersized for heavier flows and that the dam is prone to overtopping. They indicated that the addition of an overflow spillway is needed to ensure the dam remains functional long-term. There is a paved vehicular access roadway on top of the dam, with a visible low point and evidence of newer stone embankment armoring adjacent to the concrete outlet box. The slopes of the earthen dam both toward the pond and down to Cold Brook were vegetated and appeared stable. The concrete of the outlet box was in fair to good condition, with minor spalling at the corners of the top of the walls (Figure 5-11).

Should this pond be determined to be reused as part of the facility after the improvements required to meet anticipated phosphorous effluent limits it is likely that this pond will be required to be dredged. Lining of the pond may be required should it be used for solid waste storage.

Figure 5-10: Flat Pond

Figure 5-11: Flat Pond Outlet to Cold Brook

5.6 A, B, and C Canals

West Branch Diversion dam feeds A Canal which flows serially to B and C Canals. From here, used culture water then discharges into No. 9 Brook, discharging into Diversion Pond. These Canals can hold flow rates of up to 2,800 gpm, with average flow rates of 1,865 gpm. A Canal is a sandy-bottom channel with stone-sloped embankments. It is not protected by fence or netting. Debris builds up in this canal, which is technically considered a part of the waterway. Hatchery staff cannot modify anything within this canal to improve operations.

There are flared concrete walls at A Canal's outlet to B Canal (Figure 5-12). The concrete walls are in good condition. Only B Canal is used for fish production and is constructed of has a concrete floor, concrete walls, screens, and stop logs (Figure 5-13). B Canal's vertical concrete walls were cast in long segments with expansion joints to allow the canal channel to curve to the left. B Canal is enclosed by chain link fence for predator protection and has monofilament lines above the fences for avian protection. The concrete condition of B Canal is fair to good, with minor spalling at the wall expansion joints.

Portable gasoline powered pumps are used for aeration during low dissolved oxygen situations. The water is so cold in winter that B-Canal surface freezes and wood boxes are put through the ice to feed the fish. Winter feeding is slow enough that the fish produce very little waste and B Canal is not cleaned in winter. B Canal is vacuumed routinely in non-winter months and the vacuumed waste is land applied.

C Canal is like A Canal, with a sandy bottom and stone-sloped embankments. The concrete outlet at the end of Canal C diverts flows to No. 9 Brook and can divert flow to Trap Pond. The outfall pipe to No. 9 Brook is causing erosion that is starting to undermine the adjacent roadway embankment. It is recommended that compacted gravel is installed to fill the eroded embankment and that stone riprap is placed around the toe of slope at the outlet pipe to prevent future erosion (Figure 5-14).

Figure 5-12: Canals A and B

Figure 5-13: Canal B and C

Figure 5-14: Outfall 005 Embankment at End of Canal C

5.7 West Branch Raceways

West Branch raceways (1-20) were constructed in 1951 out of concrete with dimensions 107’ x 8’ x 2.7’ and an operating depth of 1.8’. They utilize serpentine flow configuration in pairs. The West Branch Raceways are fed reused culture water from the Canals mixed with surface water from No. 9 Brook through Diversion Pond.

5.7.1 Process

West Branch raceways are fed from Diversion Pond through a 24” diameter AC pipe (1,113’) flowing in series with a 20” diameter AC pipe (752’) that was installed in 1951. Each pair of raceways has an average flow rate of 800 gpm and a maximum flow rate of 1,050 gpm. The rearing water temperatures are too warm in the summer and cold in the winter. In winter the raceway surfaces freeze; so, wood boxes are cut through the ice to get fish feed into the raceways.

There are old 10” drains in the floors of the quiescent zones located at the tail end of each raceway. Some of these drains are not used. Only those with a standpipe are used and discharge to Unnamed Pond. The final two pairs of raceways are used for settling waste. In non-winter months they are vacuumed occasionally and the vacuumed waste is land applied. The West Branch raceways discharge into York Pond via Outfall 008.

West Branch raceways have electrical service but no automatic fish feeders are utilized.

5.7.2 Structural

The West Branch Raceways have concrete base slabs and concrete walls, are laid out parallel to each other along their long sides and are constructed in pairs, with a dividing wall between the individual units of each pair (Figure 5-15). The 8 upper pairs are protected by open metal-framed enclosures topped by netting for predation protection. The 2 lower pairs were unprotected at the date of the inspection. The current netting system is very labor intensive. The concrete condition of the raceways is fair to poor. Many of the raceways have spalls at the top of the walls measuring 3” wide by 3” deep, spaced every few feet along their perimeter and worse spalling (Figure 5-16 and Figure 5-17). Hatchery staff indicated that each year they perform local patching of the worst areas of the walls, and there are many previously repaired areas. The walls have map cracking and efflorescence over up to 50% of exposed surfaces. There is surface erosion of the wall surfaces below normal water lines up to ¼" deep, with exposed aggregate. There are many locations in the raceway system where spalling at vertical slots which accept timber boards to allow the flow in the raceways to be dammed results in the boards leaking. The raceways freeze during the winter but use of Styrofoam/wooden feeding boxes allows for fish feeding during that time. Raceways are equipped with a drain, small quiescent zones and a drain plug.

5.7.3 Electrical

Power is provided to the West Branch raceways area by a separate utility service. 240/120V, 1 PH power is provided from a pole-top transformer on the distribution line that runs along the nearby road. Power is routed overhead from the transformer to the main utility service point at the sampling shed. Power is distributed overhead from the sampling shed to the west branch garage, the old salmon hatchery building, and to raceway lighting and receptacles (aerators). Electrical infrastructure is in good condition.

The West Branch Raceway has receptacles surface-mounted to the concrete structure for the purpose of plugging in aerators. Electrical power is routed from the perimeter light poles. Raceway lighting is provided by pole-mounted metal-halide luminaires. Light levels are adequate, though it would benefit from energy efficient LED luminaires.

Figure 5-15: West Branch Raceways

Figure 5-16: West Branch Raceways Concrete Condition

Figure 5-17: West Branch Raceways Settling Chanel

5.8 West Branch Sampling Shed

West Branch Raceways' effluent main recently had a water flow meter and automatic sampler added in a dry vault covered with a shed (Figure 5-18). This sampling shed appears to be in good condition, other than some minor cracking of the vinyl siding. The shed has a 240/120V, 200A panelboard to provide power to raceway lighting/receptacles, the West Branch Garage, and the Old Salmon Building. The electrical infrastructure is in good condition. The sampling shed is heated by a portable space heater.

Figure 5-18: West Branch Sampling Shed

5.9 Incubation and Rearing Facilities Summary

To summarize, the following limitations, deficiencies, and conditions were noted for the water supply and control structures during the on-site condition assessment:

- The conditions of water lines have not been determined since they require special inspection procedures to access.
- Headquarters Office and Hatchery Building:
    - Replace entire roof and water damaged ceiling tiles.
    - Replace single pane windows on the first floor with double paned windows.
    - Replace all exterior doors and repair damage to sills.
    - Install insulation along the roof or ceilings and along exterior walls.
    - Renovate main entrance to meet OSHA and code requirements, including new restroom and new access to hatchery.
    - Rebuild exterior concrete stairs into the main entrance.

  - Improvements to the stairs up to the second floor to meet OSHA / Building Code requirements.
  - Laboratory should be relocated to main floor. Existing laboratory space to be renovated into a restroom.
  - Further investigations should be performed to verify the condition of the second floor subfloor.
  - Insulation should be added to all walls and roof / ceiling spaces on the second floor.
  - Basement floor should be re-finished to provide adequate slope to the sump pit and access stairs should be replaced.
  - Replace unit heaters in the degasser room and hot water radiators in the entryway.
  - Replace electrical conduit, wiring, and lighting within the building.
  - Replace backup generator.
  - Repoint chimneys with localized brick replacement.
- Young's Raceways
  - Replace any sticking or non-operational valves supplying culture water.
- Display Pool
  - New overhead predation protection.
- Foster's Raceways
  - Replace any sticking or non-operational valves supplying culture water.
  - Replace weatherproof fabric enclosures.
- Flat Pond
  - Dredge and install impermeable lining.

6 Garages and Storage Areas

Berlin State Fish Hatchery includes several support buildings that provide storage, shop, and garage spaces for the facility.

6.2 Feed Storage Building

The Feed Storage Building was constructed in 1953 across from the Hatchery Building. It is a two story building that was built into the side of the hill, so that the lower level is accessed from one side, and the upper level is accessed from the back side at the top of the hill. This building currently serves as storage for feed and miscellaneous equipment (see Figure 6-1 and Figure 6-2).

6.2.1 Structural

The building construction consists of a concrete foundation, with concrete and concrete block first floor walls, a concrete second floor, and wood framed roof. The first/lower level is partial-height concrete walls topped by masonry-block, with concrete header beams, which support precast concrete beams, which support the upper level (Figure 6-3). The structure appears to be in good condition.

6.2.2 Architectural

The roof is a gambrel style roof with asphalt shingles and forms the walls of the second floor. The age of the roof is unknown but it appears to be in a deteriorated condition with missing and damaged shingles, and is in need of replacement.

The upper level exterior finish is wood siding, which appears to be in good condition, but peeling paint was observed on the majority of the southern façade. The concrete block first floor walls appear to be in good condition.

The upper level is an open barn-style storage area used for the storage of feed and light equipment. The primary access to the space is provided by an overhead roll-up door on the south façade. The space is large enough for the feed storage, but there are no accommodations for unloading the feed from the truck. Staff also noted that in the winter, trucks have a difficult time getting to the top of the hill to offload near the roll-up door. Since feed deliveries for Twin Mountain facility gets delivered to this site, then transported down to Twin Mountain, the loading and unloading of feed is an important aspect of operations. The upper level is not insulated, and there are no means of maintaining a consistent temperature range for the feed.

The lower level consists of a front storage area, a small bathroom, and two smaller insulated storage areas, which were originally refrigerated storage. The two insulated storage areas are not currently refrigerated and are currently used for miscellaneous storage. These storage areas were observed to be in poor condition, with black mold growing on the ceiling insulation, and the ceiling insulation falling down in other portions of these rooms, especially under the access hatch to the upper level. The insulation material is unknown but is believed to be asbestos. It is recommended that this hazardous material be removed.

The upper and lower floors are connected via a concrete stair. There is a handrail along the open side of the stairs, but there are no guardrails along the open edge of the stairs complying with

building code or OSHA. Half of the stairs are currently taken up by wood boards used to create a slide for passing feed from the upper level to the lower level.

The concrete stairs that provide access to the first floor door are spalling and deteriorated, and do not have any handrails or guardrails. It is recommended that these stairs be rebuilt.

The wood header at the roll up door to the upper level is cracked and splitting. The door to the lower level is a hollow metal double door, which is dented and showing signs of rusting near the bottom, and the door trim is starting to separate from the door.

6.2.3 Electrical

The feed storage building has a 240V, 3-phase (high-leg) service. The main panel is an antiquated and obsolete fuse box that is aged/degraded beyond expected operational life. The remainder of the building electrical infrastructure is of a similar age/condition. The equipment cannot be relied upon to operate safely and should be replaced. The capacity of the service appears sufficient for the current operational requirements.

Lighting is a combination of surface-mounted fluorescent fixtures and incandescent fixtures that have deteriorated and have been damaged and are no longer functional. The fixtures have no lens or other means of physical protection. The interior lighting levels are insufficient for safe utilization of the space.

6.2.4 HVAC

The Feed Storage Building is heated by a single 106,250 BTU/HR oil fired furnace with a short supply duct run with short branching cylindrical ducts to distribute air. The oil-fired furnace vent is routed along the first floor ceiling and up through the roof. The furnace appears to be in fair condition.

Figure 6-1: Feed Storage Building Front Facade

Figure 6-2: Feed Storage Building – Upper Floor Interior

Figure 6-3: Feed Storage Building – Front Steps

6.3 Pipe Shop

The Pipe Shop is located next to the Headquarters and Hatchery Building and consists of two floors with an attic (Figure 6-4). This building is currently used for miscellaneous storage as the building is not heated and is too cold during the winter to work. Like the Feed Storage Building, the Pipe Shop has been built into the side of the hill, so both the lower and upper levels have direct access from grade.

Figure 6-4: Pipe Shop Overall View

6.3.1 Structural

The building is constructed with concrete foundation walls around lower level, concrete block walls for the upper level and wood framing for the attic and roof. The upper floor is concrete slab and beams supported by the foundation walls and intermediate steel tube columns on the lower level. The lower level is a gravel floor, with no finished floor slab. The structure appears to be in good condition.

6.3.2 Architectural

The interior of the lower floor is unfinished and is accessed via three sets of carriage style garage doors. These doors are in poor condition and should be replaced due to the following deficiencies (Figure 6-5 and Figure 6-6):

- Some of the glass vision panels are broken;
- One of the door panels has been replaced with a solid wood panel;
- The bottom of the doors are rotting;
- The concrete pad outside the doors is cracking;
- The slider channel is rusted
- The doors are difficult to operate.

Figure 6-5: Pipe Shop Lower Level Carriage Style Garage Doors

Figure 6-6: Pipe Shop Lower Level Interior

Access to the upper level is provided by a man-door, which is in good condition, and a carriage style garage door, which is in fair condition (Figure 6-7). The windows are the original wood frame single-pane glass double-hung windows. The frames appear to be in fair condition, however, the windows on the east façade have been boarded up. It is recommended that the windows be replaced with insulated glazed windows. If the windows on the east façade are not wanted, these should be blocked up instead of being replaced.

The upper level is divided into two sections: a smaller tool storage area with lockable cabinets; and a larger shop area, which is currently used for miscellaneous storage. The ceiling in both spaces is an acoustic drop ceiling, which is in fair to poor condition, with both missing and water-stained ceiling panels. The floor is an unfinished concrete slab. The walls are either painted concrete blocks or wood paneling directly over the concrete block, with no insulation. It is recommended that insulation be installed along the exterior walls, ceiling and under the floor slab.

Figure 6-7: Pipe Shop Upper Level Interior

The attic space is accessed via a wood stair in the shop area and an access door in the ceiling. The stairs include a partial railing along the open side of the stairs, which does not meet current OSHA requirements (Figure 6-8). The attic is an open storage area with wood flooring and exposed roof rafters. There is a door at one end of the attic, which does not appear to properly fit the door frame, as light can be seen coming through the gaps between the door and the frame.

The roof is an asphalt shingle roof (Figure 6-9). The eastern low slope portion of the roof has recently been replaced. The remaining portion of the roof appears to be in fair to poor condition with missing and damaged shingles. It is recommended that this roof be replaced.

6.3.3 Electrical

Power to the pipe shop is provided by a 240/120V, 100A load center. Loads are primarily light/receptacles, and HVAC. The panel and wiring are in adequate condition. The capacity of the service appears sufficient for the current operational requirements.

Lighting is provided by recessed fluorescent fixtures on the main level, and incandescent bulbs in the lower level and attic. The fixtures are in adequate condition, but several are not operational. The lighting levels are insufficient for safe utilization of the space.

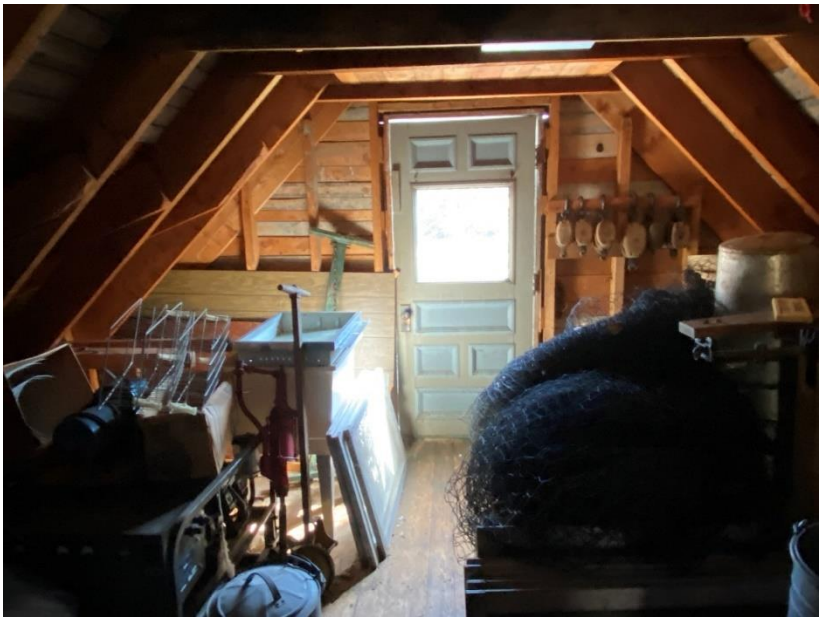

Figure 6-8: Pipe Shop Attic Level

Figure 6-9: Pipe Shop East Facade and Roof

6.3.4 Electrical

Power to the pipe shop is provided by a 240/120V, 100A load center. Loads are primarily light/receptacles, and HVAC. The panel and wiring are in adequate condition. The capacity of the service appears sufficient for the current operational requirements.

Lighting is provided by recessed fluorescent fixtures on the main level, and incandescent bulbs in the lower level and attic. The fixtures are in adequate condition, but several are not operational. The lighting levels are insufficient for safe utilization of the space.

6.4 Carpenter's Shop

The Carpenter's Shop, which is located near the main access road on the other side of Cold Brook from the Display Pool was originally constructed as a stable, and later converted into a workshop. The building consists of two floors with an attic space. The lower level is used as maintenance bays for small equipment and trucks, while the upper level serves as the carpenter's shop, and the attic is used for general storage.

6.4.1 Structural

The Carpenter's Shop is constructed with concrete foundation walls at the lower level, concrete second floor, concrete block walls at the second floor, and a wood frame roof and attic floor. The structure appears to be in good condition (Figure 6-10 and Figure 6-11).

Figure 6-10: Carpenter's Shop South and East Facades

Figure 6-11: Carpenter's Shop North and West Facades

6.4.2 Architectural

The lower level of the Carpenter’s Shop consists of three garage bays and a workshop area in the front and three smaller areas behind the workspace for parts storage and mechanical equipment (Figure 6-12). Each of the garage bays is accessed by a roll-up garage door, which are all operable and appear to be in good to fair condition. The sloped concrete pad in front of the garage doors is cracked and deteriorated. The workshop area can be accessed from a wood door, which appears to be in fair condition. The floor is a concrete slab on grade that has a slight pitch towards the garage doors and is in good to fair condition. There are two large windows over the work bench that are the original wood frame, single-pane windows. These appear to be in fair condition but they provide little insulation during the winter. There is no access from the lower level to the upper level.

Figure 6-12: Carpenter's Shop Lower Level Garage Bays

The upper level is a single open space that serves as a carpenter's shop. The interior finishes include unfinished concrete floor, unfinished concrete block walls with no insulation, and an asbestos panel ceiling, all of which appear to be in good condition (Figure 6-13). The windows are the original wood frame, single-pane double hung windows. A sheet of plastic has been installed on the inside of each of the windows to provide some additional insulation.

The attic space can be accessed from the Carpenter's Shop via a wood stair and access door in the ceiling. The stairs have a handrail on the open side, but does not meet current OSHA regulations. The attic consists of wood flooring and exposed roof rafters.

Figure 6-13: Carpenter's Shop Interior

Along the north side of the building, there is a single-story garage space measuring approximately 10ft x 20ft that is attached to the lower level, but there is no interior connection between the spaces. This garage is currently used for miscellaneous and hazardous storage, such as used oil. The roof over this space consists of the original concrete roof with a concrete slab on top of the original in order to provide pitch and to allow for embedded posts of a railing system to prevent people from walking onto the roof. There is no roofing membrane on top of the roof structure. At the northeast corner of the roof, severe spalling of the concrete was observed, exposing the railing post embedment. This should be corrected through ongoing facility maintenance.

In front of the single-story garage is a gas pump with a concrete pad and buried gas tank. The pump is operable and appears to be in good condition (Figure 6-14).

There are no bathrooms or sinks where staff can clean up within the Carpenter's Shop.

6.4.3 Electrical

The carpenter's shop has a dedicated utility service from the utility distribution line. The main panel is 240/120V, 200A and powers lights/receptacles as well as shop equipment. 220V receptacles are provided for shop equipment such as welders, saws, bench tools, etc. HVAC equipment includes gas pumps and oil burners. The electrical infrastructure is in good working condition. The capacity of the service appears sufficient for the current operational requirements.

Lighting is provided by surface-mounted fluorescent fixtures. Light levels appear to be adequate for the space, although may be improved with energy-efficient LED fixtures.

6.4.4 HVAC

The lower level of the carpenter's shop is heated by a 90 MBH oil fired furnace. There is a 330 gallon oil tank located in the room next to the 90 MBH oil fired furnace. The upper level is heated by a 95 MBH oil fired furnace. Both furnaces appear to be at the end of service life and should be replaced.

Figure 6-14: Carpenter's Shop Storage Garage and Gas Pump

6.5 Pole Shed

The Pole Shed is a heavy timber structure with a dirt floor, corrugated metal roof, and three open sides that is used for the storage of large pipes, tubes, and sand. Partial height corrals have been set up around the sand storage to keep it from flowing into the rest of the shed. The metal roof is significantly rusted and in poor condition and should be replaced. The heavy timber columns, beams and roof rafters appear to be in good condition. Staff have noted that the open sides allow for water to get into the shed, minimizing what they are able to store in this structure (Figure 6-15).

Figure 6-15: Pole Shed

6.6 Pole Barn

The Pole Barn is heavy timber structure similar to the pole shed, except that it is enclosed on all sides. The two sides and back are enclosed with corrugated metal siding, while the front of the barn consists of a series of sliding doors. This structure is used for storing larger vehicles and equipment or materials, especially during the winter. The heavy timber structure appears to be in good condition. The walls and doors appear to be in good and operable condition. The roof is rusted and in poor condition and should be replaced (Figure 6-16).

Staff noted that the barn works for the storage of the larger vehicles in the winter, but this structure is not insulated or heated, so it cannot be used for vehicle maintenance during the winter.

A cylindrical aboveground 330-gallon petroleum storage tank with a mounted fueling pump is located in the pole barn. The tank appears to be in good condition.

Figure 6-16: Pole Barn

6.7 West Branch Garage

The West Branch Garage was constructed in 1986 adjacent to the West Branch Raceways. The garage consists of wood framed structure on a concrete foundation. The structure appears to be in good condition. The garage is approximately 504 square feet and is used for feed and miscellaneous storage for the West Branch Raceways (Figure 6-17).

There is a man door and overhead roll-up door at the front of the shed, which both are operable and appear to be in good condition. The roof was recently replaced and is in good condition. The exterior is finished with vertical wood siding. At some locations, the bottom of the siding is beginning to rot and found to be soft to the touch. This condition has superficially been covered up by a recent coat of paint.

There is an attic above the main floor that can be accessed via an access hatch and ladder from inside, or a large access door on the front. The attic is not currently used due to an infestation of bats or rats. This is recommended for correction through ongoing maintenance activities.

Figure 6-17: West Branch Garage

6.7.1 Electrical

The garage power is sub-fed from the utility service at the sampling shed. Power is distributed from a 120V, 60A load center. The electrical loads are lighting and receptacles. The equipment is in adequate working condition. The capacity of the service appears sufficient for the current operational requirements. Lighting is provided by LED bulbs on the ceiling. Light levels may be improved to support task work.

6.8 Upper Canal Garage

The Upper Canal Garage was constructed in 1983 across the road from the B Canal. The garage consists of a wood frame structure on a concrete slab, with an area of 352 square feet. The structure is in good condition (Figure 6-18).

The exterior walls are vertical wood siding over plywood sheathing, and the roof is an aluminum roof. Both the siding and roof are in good condition. The shed is accessed via an overhead roll-up door, which is in good condition. The shed has no electricity or mechanical equipment.

The shed is used for miscellaneous storage for the Upper Canal, and for feed storage for the B Canal. The feed is stored in trash cans to prevent rats and other animals from getting into it, as there is no area to safely keep the feed.

Figure 6-18: Upper Canal Garage

6.9 Visitor's Center

The Visitor's Center is visitors center is located between Young's Raceways and the Display Pool. The building was built in 1987 (Figure 6-19 to Figure 6-21).

6.9.1 Structural

The Visitor's Center is a single-story concrete block building on a concrete foundation with a wood framed roof. The structure appears to be in good condition.

6.9.2 Architectural

The interior consists of two display areas and a separated storage room. The interior finishes consist of carpeted floors, gypsum board walls, and acoustic tile ceilings. All of the finishes appear to be in good condition, however there was a strong odor that smelled like mold and mildew. No visual signs of water damage were observed.

Figure 6-19: Visitor's Center

Figure 6-20: Visitor's Center Display Area 1

Figure 6-21: Visitor's Center Display Area 2

The windows are wood framed casement and fixed windows. The casement windows are operable, and all windows appear to be in good condition. There are access doors located on the east, south and west sides of the building. Each access door is a wood framed door with a vision panel, and they are all in good condition. However, there is a concrete lip at the threshold for each of these doors that exceeds the 1/4” maximum vertical rise allowed per ADA. The access doors were measured at 32”, which is the minimum door size allowed per ADA. On the north side, there is a hollow metal emergency exit door that is in fair to poor condition with noticeable rusting at the bottom of the door and along the top of the frame. There is no threshold at this door, and light can be seen coming in from under the door (Figure 6-22). This is believed to be the source of the water infiltration into building, soaking into the carpet and creating the moldy / mildew smell. Carpet removal is recommended.

There is an attic space above the visitor’s center that has an access door on the north facade. No interior access to the attic was observed, and the attic was not inspected (Figure 6-23).

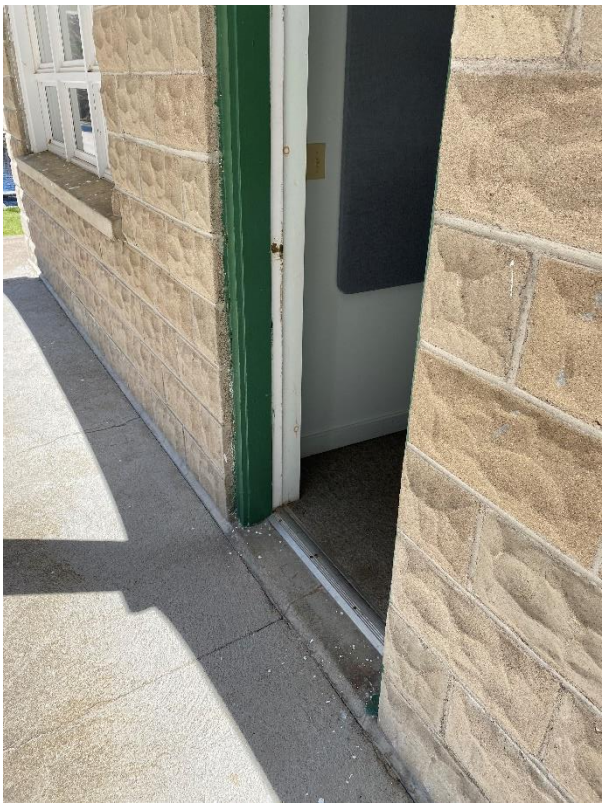

Figure 6-22: Visitor's Center Door Sill Lip

Figure 6-23: Visitor's Center Egress Door and Attic Access

6.9.3 Electrical

Power to the Visitor's Center is powered from the main hatchery utility service pole. There is an overhead span that is routed through the trees to the visitor center. This line has been damaged due to a falling tree, and the building is currently without power. The cables have been coiled up on each end of the line (pole and building). It may be possible to re-power the building from the utility service that powers the Carpenter's Shop, which would avoid having to route cables through trees. Alternatively, an underground feed could be installed.

The building is powered from a 240/120V, 60A load center. Loads are lighting, receptacles, and minor HVAC equipment. The panel appears to be aged, but in working condition. Electrical capacity appears to be adequate for the facility. The lighting is provided by surface-mount fluorescent fixtures and track lighting for displays. Lighting appears to be sufficient and in good working condition.

6.10 Q2 Residence Building

The Q2 Residence Building is located near the middle of Foster's Raceways, and consists of a partially below grade basement, first and second floors (Figure 6-24 and Figure 6-25). It's constructed of a concrete foundation, concrete block walls at the first and second floors, and a wood framed roof. The building is not currently in use, and was observed to be in poor condition, with broken windows, a damaged and leaky roof, missing exterior stairs, rotted trim and doors, and moss growing on the walls. However, the structure appears to be intact.

Berlin staff noted that this building is not used and has not been maintained because it is believed this building was intended to be demolished by the Federal Fish Hatcheries when the Berlin facility was transferred from the federal system to the NHFGD. Staff noted that since the structure is intact, they would like to use the basement of this building for storage. Determination if the federal hatchery system intends on demolishing this building needs to be made before any recommendations can be made for this.

Figure 6-24: Q2 Front Facade

Figure 6-25: Q2 Rear Facade

6.11 Garages and Storage Areas Summary

To summarize, the following limitations, deficiencies, and conditions were noted for the garages and storage areas during the on-site condition assessment:

- Feed Storage Building:
    - Replace roof.
    - Removal of hazardous materials.
    - Improvements to stairways to meet OSHA requirements.
    - Replacement or rehabilitation of front access steps.
    - Replacement of rollup garage door and double doors.
    - Replacement of main panel, conduit, and wiring.
    - Replacement of lighting fixtures.
- Pipe Shop
    - Replacement of carriage style garage doors.
    - Replacement of windows with insulated window. On the east façade, block up the window openings if these windows are no longer wanted.
    - Rehabilitate attic doors and doorways for proper fit.

  - Improvements to stairways to meet OSHA requirements.
  - Replace Roof.
  - Install insulation at walls, ceiling and floor slabs.
  - Increase lighting levels to ensure safe utilization of space.
  - Install heating system so this space may be used in the winter.
- Carpenter's Shop
  - Improvements to stairways to meet OSHA requirements.
  - Replace furnaces-downstairs and upstairs
  - Install insulation at walls, ceiling and floor slabs
  - Replacement of windows with insulated window.
  - Replace front and rear (upstairs) standard doors.
  - Replacement of rollup garage doors.
- Visitor's Center
  - Improvements to entryways to meet ADA requirements.
  - Replace exterior doors and threshold for weather security.
  - Carpet removal.
  - Restore power.
- Additional General Facility Needs:
  - Improvements for feed delivery and off-loading
  - Improvements for secure, temperature-controlled feed storage.
  - Public restroom addition given the remote nature of the facility.
  - Heated garage space for maintenance on hatchery vehicles in the winter season.
  - Addition of a locker room at the Headquarters Office and Hatchery Building.