

SECTION 4

Fort Richardson Alternative Concept Plans

Design concepts for the Fort Richardson hatchery include facility location and footprint, layout, and equipment inventory. Conceptual design drawings at the 10 percent level and accompanying system and feature narratives include architecture; civil, structural, mechanical, and electrical engineering; fish production; water supply and treatment; effluent treatment; and disposal and permitting.

All design specifications will require low- or no-maintenance materials; all materials in contact with process water will be fish safe.

In conjunction with the development of design concepts for the new facility, construction and operational cost estimates for the design concepts were developed (Appendix B and C). Estimates at this point in the project should be considered “ceiling level.”

4.1 Alternative I–New Recirculation Facility Concept Description

The Alternative 1 concept design solution consists of two stand-alone fish production modules utilizing current water recirculation technology. The two modules would be located at the existing hatchery site in existing open space and some of the space currently utilized for existing production facilities (Figures 4-1, 4-2, and 4-3). The new production modules will utilize 1,645 gpm of the existing hatchery water process stream and route the process water effluent stream to the existing hatchery settlement ponds. Demolition of existing hatchery production facilities to provide room for the new trout production module will be necessary. The following existing hatchery facilities will be upgraded and remain as functional portions of the hatchery:

- Onsite Housing
- Water Aeration Building
- Water Filtration (Screening) Building
- Shop Complex
- Well Field and Well Water Distribution System
- High Voltage Electrical System
- Domestic Water System

4.1.1 Geotechnical Assessment

The project site is located on floodplain deposits adjacent to and on the north side of Ship Creek (Figure 1-1). One soil boring, dated July 31, 1980, shows the site to generally consist of medium-dense sandy gravel with traces of silt. The water table depth at that time was approximately 9-feet below ground surface. This soil boring is consistent with observations of cut banks in the general vicinity. No problems have been noted with foundations of existing structures; therefore, construction of new structures of a nature similar to the

existing structures would likely utilize the same types of foundations, mainly spread and strip footings and slabs on grade. Construction of new structures located in the empty field just north of the existing hatchery footprint will require soil borings or trenching to verify the soil conditions at that location.

4.1.2 Site Evaluation

4.1.2.1 Flood Potential

The Fort Richardson Fish Hatchery is located on relatively flat ground immediately adjacent to Ship Creek. Flood information is not available from either Fort Richardson or the U.S. Army Corps of Engineers, Alaska District. In the process of researching flood information, it was learned that Ship Creek was channelized with bulldozers in the area in the early 1950s in conjunction with construction of the Fort Richardson power plant. The channelization of the creek may prevent widespread flooding in the vicinity of the hatchery; however, hatchery manager Jeff Milton mentioned that there is occasional temporary flooding caused by the upstream release of ice dams during some winters. Because of this, all concrete foundations for new structures are recommended to be extended aboveground a minimum of 2 feet to prevent building water damage.

4.1.2.2 Environmental Evaluation

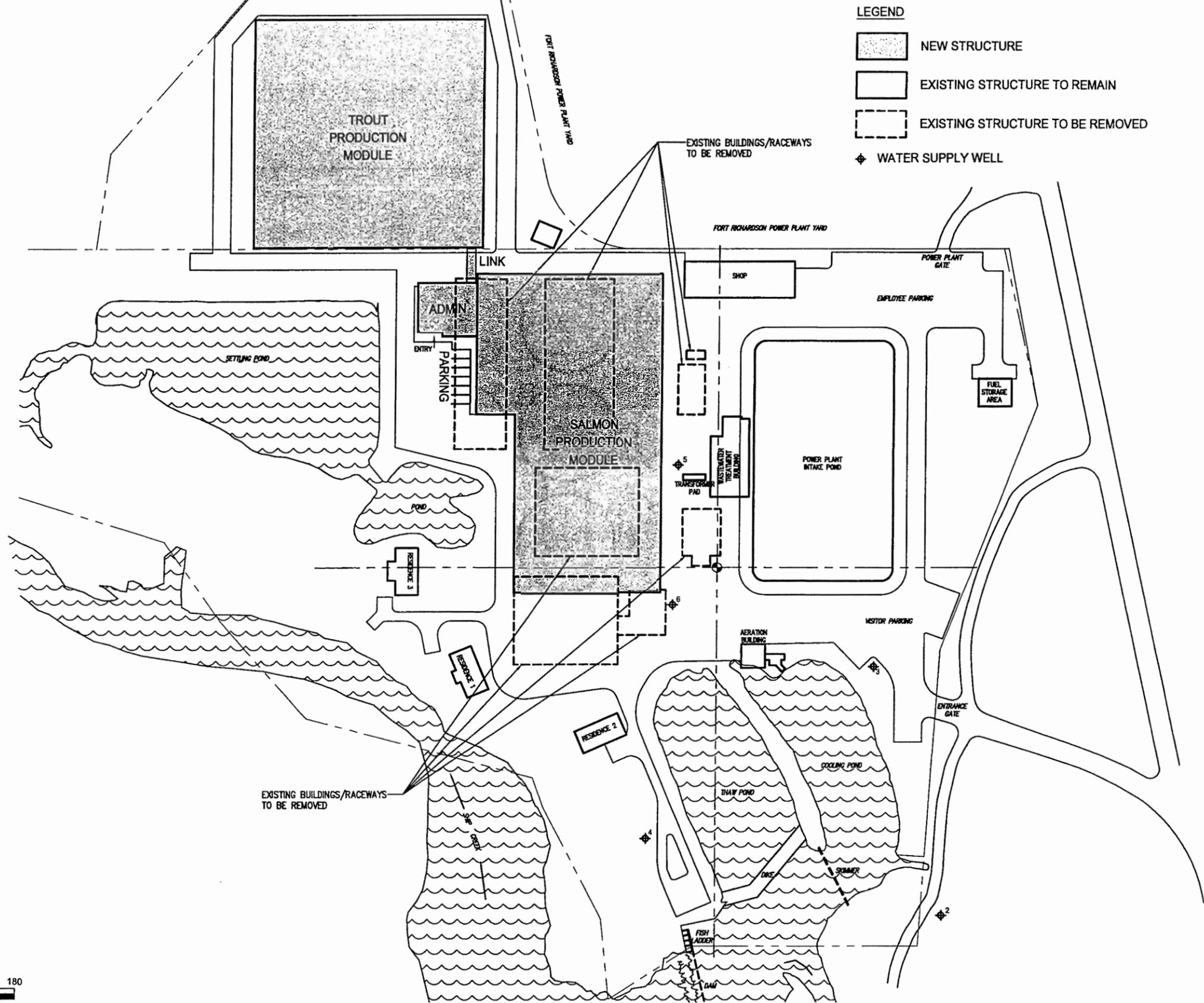
Discussions with onsite personnel have not revealed any pre-existing environmental concerns with the Fort Richardson hatchery site with the exception of a single stockpile of what may be petroleum-contaminated soil on the northwest corner of the site. The stockpile is currently covered with what appears to be an impermeable liner. Sampling and testing of the stockpile is recommended prior to construction in that area to determine if the material must be treated or can be utilized as general fill. Investigations of known subsurface oiled soil will be necessary if the areas fall within the footprint of proposed new construction.

4.1.3 Process Water Source

Process water for all hatchery operations is supplied to the Aeration Building by onsite and remote well fields. All well supply lines discharge into a sump located underneath the facility. Cold water is drawn from the sump by turbine pumps and lifted up to the cold-water aeration towers at the top of the building. From there, the cold water flows by gravity to supply hatchery operations. A separate warm-water system follows a similar path. Water is drawn from the sump, routed through natural-gas-fired heat exchangers, then to the warm-water portion of the aeration tower, and delivered by gravity to hatchery facilities.

The well pumps that feed the sump are constant-speed units. Combined well water flow often exceeds the amount required, and overflow is directed to a pond adjacent to the water treatment facility, which then flows to Ship Creek. A well pump control system will be part of the facility upgrades. Several wells will be selected, based on output capacity and location, for variable-speed control. Feedback from a sump-level sensor will be used to pace the pump motor speed and therefore the flow rate of these wells. The result will be a well-water supply system that matches the variable demand.

Additional upgrades to the Aeration Building will include new doors and hardware, suitable for wet environments. Existing steel walkways will be repaired or replaced as



**FIGURE 4-1
FORT RICHARDSON HATCHERY IMPROVEMENTS, ALTERNATIVE I**



TYPICAL WATER REUSE PRODUCTION UNITS INCLUDES:
 ROTARY MICROSCREEN DRUM FILTER, FLUIDIZED SAND-BED
 BIOFILTER, FORCED AIR CO₂ STRIPPER, LOW HEAD
 OXYGENATOR, UV DISINFECTION.

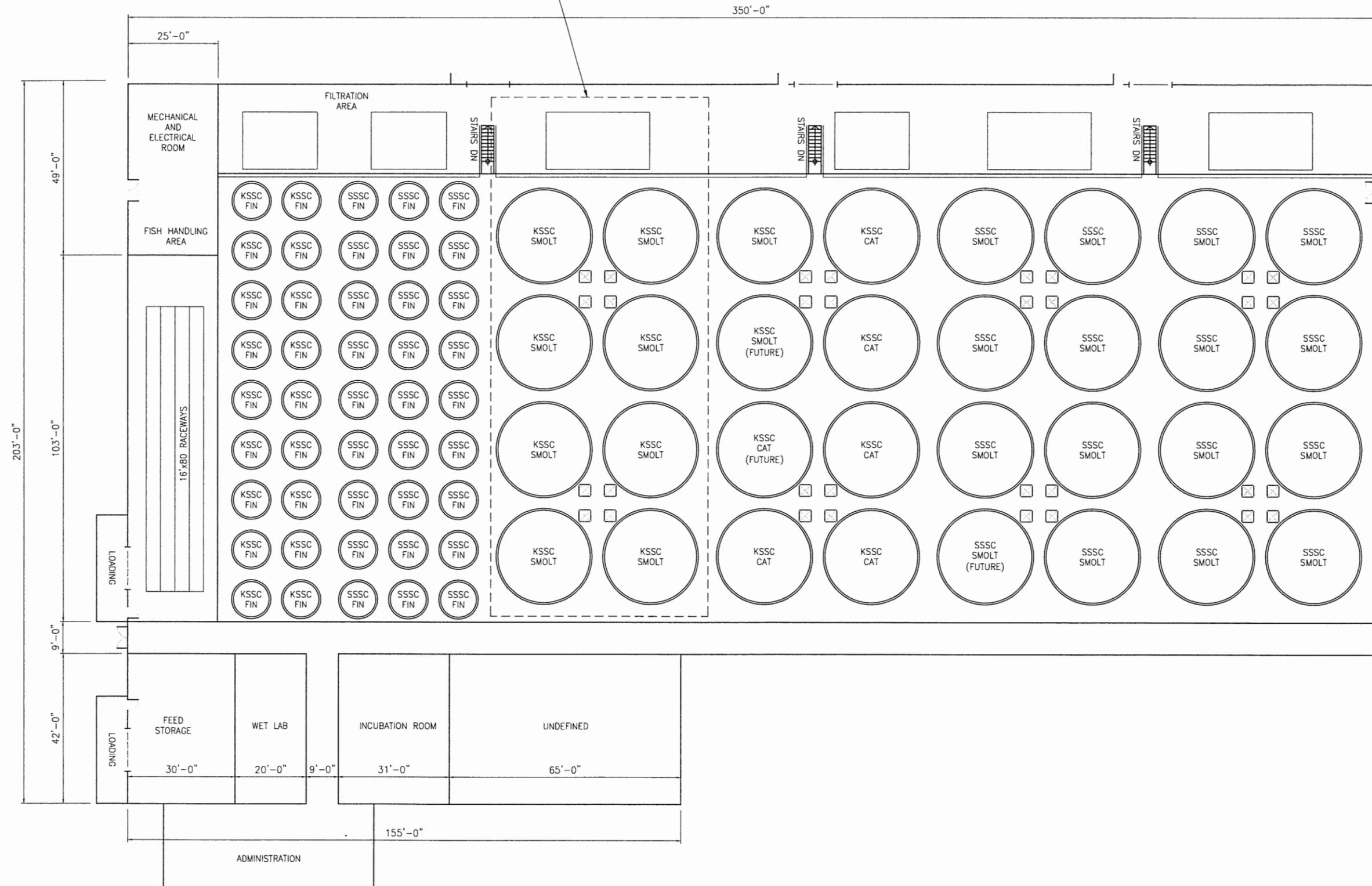
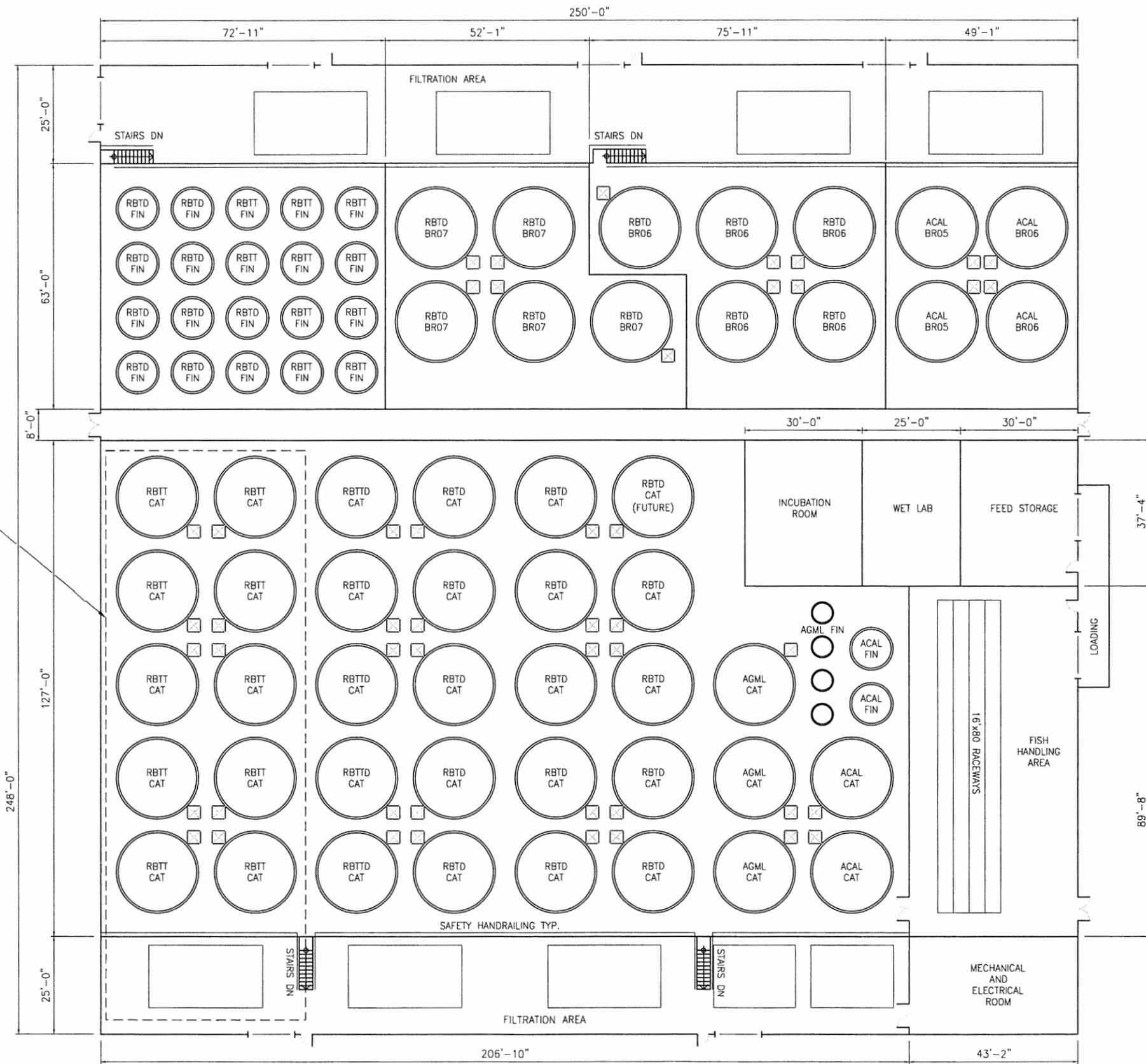


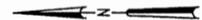
FIGURE 4-2
SALMON PRODUCTION MODULE, ALTERNATIVE I

1"=30'





TYPICAL WATER REUSE PRODUCTION UNITS INCLUDES:
 ROTARY MICROSCREEN DRUM FILTER, FLUIDIZED SAND-BED
 BIOFILTER, FORCED AIR CO₂ STRIPPER, LOW HEAD
 OXYGENATOR, UV DISINFECTION.



**FIGURE 4-3
 TROUT PRODUCTION MODULE, ALTERNATIVE I**

1"=30'



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necessary. The aeration towers will be covered by a metal roof structure, designed to shed snow away from pedestrian areas and driveways. The existing chain link fence surrounding the towers will be modified to provide maximum airflow and prevent birds from entering the area. Structural upgrades to the existing facility will be required. Additional heat and lighting will be provided in the pump room below the aeration towers.

Alternative I also includes upgrades to site piping (complete replacement). Specifically, the cold- and warm-water feeds from the Aeration Building to hatchery facilities require replacement and extension, which will likely preclude the continued use of gravity-fed process water from the water treatment facility. A pumping system would be required to pressurize the warm- and cold-water supply lines to the site. This equipment would be installed in the aeration facility and be integrated with existing systems.

4.1.4 Fish-Rearing Areas

The fish-rearing components are working areas primarily filled with circular water tanks varying in size from approximately 1.2 to 8 meters (4 to 26 feet) in diameter. Each tank or series of tanks will have areas dedicated for the necessary equipment to support the rearing requirements. Dedicated fish culture work areas around each smaller tank will be provided, with catwalks above the larger tanks to allow center access. Other dedicated areas will be provided for forklift maneuvering.

Ceiling heights in this area will be relatively consistent. The floor elevations will vary depending on equipment needs and the ability to move fish with minimal pumping. High windows will bring natural light into the middle of the building to improve fish production and staff work environment and to provide visual relief.

Chemical and food storage areas will be located convenient to rearing tanks and loading docks. Doors into these areas will be wide enough for transport of large pieces of equipment. The layout reflects a logical flow of activities and functions. Trenches for utilities will be provided in the floor at each row of rearing tanks.

4.1.5 General Facility and Culture Systems Characteristics

Tanks will be grouped by species and life stage, each with an isolated water reuse system. Linear arrangement of tank groupings will facilitate isolation of species and/or stocks with curtain walls. Water reuse systems will be grouped together or arranged linearly to facilitate distribution of power from the filtration trench.

The working height of all tanks will be uniform at 42 inches above floor grade. The common elevation of all large rearing tanks will facilitate distribution of feed and movement between various culture systems.

Tanks will be arranged in rows perpendicular to the filtration trench, allowing for logical pipe routing to treatment equipment in the trench. The filtration trench will be situated to allow gravity flow of solids-laden water from tank bottom drains to the effluent drum filters. The trench will be sufficiently large to allow the installation of required recirculation treatment equipment and future system upgrades to achieve higher recirculation rates.

Large roll-up doors in each module will provide access to each filtration trench for movement of equipment and chemicals into the filtration area.

All fish culture systems will be accessible from the main access corridor located opposite the filtration trench. The access corridor will provide for movement of fish pumps, feed, and culture equipment to all tank systems. Movement of small fish between tank systems may also be accomplished within the access corridor.

4.1.5.1 Tank Selection

Table 4-1 shows the dimensions of tanks planned for the new production modules.

TABLE 4-1
Planned Tank Dimensions

Tank Volume (cubic meters [cubic feet])	Diameter (meters [feet])	Wall Height (meters [feet])	Water Depth (meters [feet])	Working Height^a (meters [feet])
1.0 [35.3]	1.22 [4.0]	0.91 [3.0]	0.9 [2.8]	1.07 [3.5]
7.8 [275.5]	3.05 [10.0]	1.22 [4.0]	1.07 [3.5]	1.07 [3.5]
40.0 [1412.6]	6.10 [20.0]	1.52 [5.0]	1.37 [4.5]	1.07 [3.5]
60.0 [2118.9] ^b	8.00 [26.2]	2.00 [6.6]	1.19 [3.9]	1.07 [3.5]

^aWorking height is defined as the wall height protruding from grade level.

^bEight-meter-diameter tanks allow for freeboard of 0.81 meter at the design volume, which may be useful for jump restraint of the catchable fish.

4.1.5.2 Broodstock and Incubation

A broodstock area for rainbow trout and arctic char will be located in the trout module with isolated water recycle systems that allow for separation of year classes. The broodstock area will be located adjacent to the handling area for movement of fry in and out of the facility. This area will be adjacent to a large, wet working area, isolated from the rest of the module by a curtain wall, and equipped with light control to manipulate photoperiod.

The incubation room will be located near broodstock tanks, handling area, and wet working area to facilitate egg-taking and -receiving operations. A wide access corridor will allow easy movement between the broodstock tanks, incubation area, and early rearing tanks. The incubation area will also be elevated to facilitate gravity transfer of fish to the early rearing tanks.

4.1.5.3 Fish Handling and Transfer

The fish-rearing area has been designed to allow ease of movement of fish throughout the facility by life cycle and species. Key fish handling and transfer components are as follows:

- Elevated incubation area for movement of fry by gravity flow into the tanks at ponding. Draining fry from the incubators through optical microcounters would be possible if desired in the future. Such a system is currently not included in the facility plan.
- Collocation of all tanks by species where possible or by tank size where more feasible for a logical flow of fish through the facility as their life cycle progresses.

- Fish pump sized to handle the total predicted size range of fish in the modules. This pump will be able to be flushed and disinfected between uses. Flexible hoses with cam lock connections may be used to pump fish between any two tanks in the module, to fish batching/loadout tanks, or to an elevated grader, as required.
- Loadout batch tanks sized to allow for any predicted batch size to be held prior to truck loading.

4.1.5.4 Mechanical and Electrical Room

Mechanical and electrical equipment will be located in a separate room to reduce noise concerns. This room will be located to provide a logical path for distribution of power to filtration equipment. The mechanical function will be collocated in this room to accommodate building heating systems, pumps, fire protection, and domestic water systems. A penthouse fan room will be located centrally to contain air handling systems.

4.1.5.5 Feed Storage

The feed storage area will be located close to the later-life-stage rearing tanks, where the greatest quantity of feed will be used. The feed room will be separated from incubation and early rearing areas to minimize contamination during feed delivery operations. A wide corridor will provide access directly from the feed storage room to all rearing systems.

4.1.5.6 Water Recycle System Overview

The fish tanks to be used for this facility are designed to maximize self-cleaning properties. High-flow rates and directional spray-bar systems will be used to induce a rotational flow in the tank, conveying solid wastes to a central drain at the bottom of the tanks and removing most of the heavy solids. The bottom drain of the tanks will consist of a circular, slotted aluminum screen and a conical sump designed to prevent solids collection. A standpipe, external to the tanks, will be tied into the bottom drain to control the tank level.

A double-drain system is planned, the principal advantage of which is the decoupling of the total tank flow from the flow through the bottom drain that carries the solids. This separation of flow will allow for very high tank flows without inducing large-tank vortex problems while still maintaining low discharge rates. With a double-drain system, between 25 and 50 percent of the total flow containing a high concentration of solids will be removed through a drain at the bottom of the tank for direct discharge to waste or treatment with advanced recirculation systems and then returned to the tanks. The remainder of the flow, which will be relatively clean, will discharge through a drain located high on the wall of the tank, pass through a basic water conditioning system, then return to the tanks for recycle. The side drain will consist of an open-topped box attached to the side of the tanks. Between the tank and the box, a slotted screen outlet will be sized to prevent flow restrictions and the impingement of fish upon the screens. This screen will be located high enough on the tank that it can act as both a side drain and an overflow drain should the water level rise too high in the tank.

Each production cell, exclusive of the incubation systems, is to have an independent water recycle system. Early rearing modules (1- and 7-cubic-meter [m³] tanks) are to have low-rate water recirculation systems allowing recycle of 75 percent of the total flow. To minimize equipment requirements and complexity of maintenance and operation, all tanks for

individual species are to share a recycle system. Gas balancing (carbon dioxide [CO₂] removal and aeration) and reoxygenation of the reuse water are the primary processes required because buildup of ammonia and fine dissolved solids are controlled by the flushing effect of new water. For later-life-stage modules (40- and 60-m³ tanks), more advanced water recirculation systems are to be utilized to achieve reuse of 95 percent of the total flow. This will be accomplished with a mixture of per-tank water treatment on side-drain process flows and centralized treatment, by species module, on the bottom-drain process flows. Gas balancing and reoxygenation equipment, as per early rearing systems, will be utilized at each individual culture tank, providing for the use of a modular equipment design and increased safety through equipment redundancy. Centralized treatment systems will add solids removal, biofiltration, and disinfection processes to allow higher recirculation rates to be achieved.

4.1.5.7 Gas Balancing and Reoxygenation

CO₂ removal and aeration of the water to saturation will be accomplished simultaneously using a forced-air CO₂ stripper. Ducting will be used to directly exhaust air to the outside from the CO₂ stripping chamber, minimizing moisture and CO₂ loads on the structure and noise levels within the building.

A low head oxygenator (LHO) will be used to complete the gas balancing and to achieve supersaturation of the water with oxygen as well as decrease nitrogen gas to less than 100 percent. The LHO will consist of an inlet trough and a series of contact chambers. Depending on design and method of operation, dissolved oxygen (DO) levels of up to 180 percent of saturation may be reached with this system. Either generated or bulk oxygen may be used with LHO units.

The LHO will be designed to work integrally with the CO₂ stripper, the two units stacked with the CO₂ stripper on the top and the LHO on the bottom. The combined CO₂ stripper and LHO unit will be placed in a header tank, which will provide partial submergence of the LHO and a collection point for the water prior to recycling it to the culture tanks.

4.1.5.8 Advanced Water Treatment Systems

The advanced water treatment systems required to achieve high recirculation rates will include the following additional processes:

- **Solids removal** is performed as quickly as possible using rotary microscreen drum filters to prevent the degradation of solids during pumping and the fouling of subsequent filtration processes. Drum filters operate by gravity and have automated backwash systems to periodically flush solids to waste. Clean water from the drum filter passes into a collection sump from which water is pumped to subsequent filtration processes.
- **Biofiltration** is a process that utilizes the metabolic activity of microorganisms, which form a biofilm on a media substrate to convert toxic ammonia-nitrogen to less toxic nitrate through a process called nitrification. Fluidized sand-bed biofilters, selected for this project, use the process water flow to hold a large quantity of sand in suspension. The sand acts as the filter media, providing surface area on which the nitrifying bacteria grow.

- **Disinfection** is accomplished with irradiation with ultraviolet light, which in the 254-nanometer wavelength range, has proven to be an extremely effective means to destroy waterborne pathogens, bacteria, mold, viruses, and algae. Water clarity is paramount for this process to work effectively.

4.1.5.9 Proposed Feeding Systems for the Production Modules

The feeding system selected for the production modules will be multifunctional and adaptable for the wide range of species and size of fish to be reared. The proposed system will consist of centrally controlled, automated Arvo-Tec drum feeders. With this system, individual distribution units with integral feed hoppers are attached to the side of each tank. For small-diameter tanks, the feed falls from a hopper into a drum that is rotated by a small electric motor. The hopper is manually filled with feed and holds the amount required for 1 or 2 days of feeding. Both the hoppers and drums are interchangeable and allow for between 2 and 1,000 liters of feed to be stored at the tank and adjustment of feed rates from 1.5 to 25 kilograms per hour. The hopper size used for each tank will vary according to feed requirements for the species and size of fish being cultured. The distribution units for the larger tanks are fitted with a pneumatic spreader to facilitate even distribution of feed. Compressed air from a central location distributes the feed across the water surface. Both the electric and pneumatic feeders would be controlled from a central panel located in the hatchery office. The control system can automatically calculate feed amounts based on user inputs and features integral warning alarm and status indicator lights. The control system can be driven either by a small LCD screen or by a connection to a standard personal computer.

4.1.5.10 Proposed Alarm Systems for the Production Modules

The production modules will have an integrated alarm and water quality monitoring system, the key component of which is a multichannel water quality monitoring feature, such as the Point Four Systems PT4 monitor. Such monitors provide the ability to continuously monitor parameters such as DO, temperature, pH, conductivity, and salinity and may also be configured for inputs from level and flow sensors. Additionally, such monitors may provide programmable control functionality for the operation of devices such as solenoids and metering pumps, to further manipulate water quality, based on monitored parameters.

For the production modules, as a minimum, DO and temperature will be monitored in each of the 40- and 60-m³ culture tanks and on each grouping of smaller (1- and 7.8-m³) tanks. This will allow for continuous monitoring of the operation of each water reuse system. Monitors will be installed local to each of the groups of tanks to minimize probe wiring, facilitate probe calibration, and facilitate direct reading of water quality parameters by personnel working with the fish at the tanks. In addition to the local digital readout, the multiple monitors will be linked to a centrally located personal computer for data logging and real-time trending. The monitoring system will also be sized to provide room for expansion to include additional probes and control functionality as required.

The water quality monitors may be programmed with multiple set-point alarm conditions for each monitored parameter. The monitors will be linked to a central alarm panel located in the hatchery office. When an alarm condition occurs, a local audible and visual alarm is

sounded by the monitor, and an alarm relay sends an alarm condition to the central alarm panel. From the central panel, in-building audible and visual alarms will notify hatchery operators of the alarm condition. The central alarm panel will also be linked to an autodialer that runs a pager system. The pager system will feature numerical codes that convey the urgency and possibly the nature or location of the alarm condition. Pagers will be carried by onsite and offsite on-call staff.

4.1.6 Effluent Treatment

The double-drain tank design, which rapidly concentrates and removes solids from the tanks, is key to initial effluent treatment. The discharge flow from the bottom drains of the culture tanks will be passed immediately to microscreen drum filters, located in a lowered trench alongside each of the culture systems, for further concentration and removal of solids. The trench will provide the necessary elevation drop for sloped gravity flow from the tank-bottom drains to the drum filters. One drum filter will be required for each of the larger tank systems, and a common drum filter will be used for the combined smaller tank systems. From the drum filters, the following two waste streams will be developed:

- Clarified filtrate from the drum filter—For systems operating at low recirculation rates (75 percent by flow), this flow will be discharged directly to the settlement ponds to facilitate the removal of any residual solids prior to discharge back to Ship Creek. For systems operating at high recirculation rates (95 percent by flow), only a small portion (5 percent) will be passed to the settling ponds with the remainder being passed through biofiltration, gas transfer, and disinfection processes before being returned to the culture tanks for reuse.
- Intermittent backwash flows from the drum filters—These flows will carry the bulk of the solids produced in the system and will also be directed to the settlement ponds to facilitate the removal of solids prior to discharge to Ship Creek.

4.1.7 Solids Waste Disposal

The following waste streams will be associated with hatchery operations:

- Solids from drum filters (volume dependant on feed input and extent of dewatering)
- Feed packaging
- General office waste
- Existing waste stream from the Shop Building

Solids from the drum filter associated with each fish-rearing system will be drained or pumped to the existing sewer system. All waste streams from the hatchery and shop will be transported to an enclosed dumpster located adjacent to the shop complex.

4.1.8 Offices and Administrative Areas

A new office building will be located between the two production modules and connected to each by a covered walkway. The design of the structure shall attempt to provide all staff work spaces with windows, if practicable, or other means of natural light. The conference room/lunchroom will be located conveniently for staff and should provide exterior windows. A common copy and document prep area shall be provided for daily

administrative copying tasks as well as preparation of newsletters and pamphlets. Locker rooms, rest rooms, and showers will be provided for men and women. Also a gear/transition room will be located between the rearing tank areas and the offices. All office and administrative areas will be in compliance with current Americans with Disabilities Act (ADA) requirements.

4.1.9 Shop and Maintenance Area

The existing shop/maintenance complex is adequate to serve the needs of the hatchery operations for the next 15 to 20 years. The cold storage bay currently has a gravel floor that will be covered by a concrete slab as part of this project to facilitate movement of materials and equipment in and out of this area. The exterior of the shop complex will also be upgraded with new, galvanized, finished metal siding.

4.1.10 Building Services

Building services, loading dock, and mechanical and electrical spaces will occupy the “backdoor” component of the new production modules. The loading dock will be used primarily for major deliveries (fish food, chemicals, and equipment). A second loading area will be located next to the fish raceways and will be primarily used for fish delivery. An enclosed dumpster will be located near the service loading dock area. Daily incoming and outgoing deliveries will be handled at the front door via the office area.

4.1.11 Utility Tie-ins

Sewer, domestic water, and gas for the new facility will be tied into existing Fort Richardson utilities. General location, size, and capacity of each utility are as follows:

- Sewer–The existing sewer system consists of an 8-inch-diameter sewer pipe and four manholes. The existing tie-in is along the north property boundary and is expected to have sufficient capacity to handle demand from the new facility.
- Domestic Water Supply–The existing domestic water supply furnishes potable water for occupant use and fire protection. The existing tie-in is along the north property boundary adjacent to the Shop Building. The 3-inch-diameter domestic water supply should provide adequate capacity to handle demand from the new facility.
- Natural Gas–The existing natural gas main enters the site in the northeast corner, north of the cooling pond. Another gas main runs along the north property boundary. It is expected that these gas mains will have sufficient capacity to handle demand at the new facility.

4.1.12 Facility Power Supply, Distribution, and Controls

The following testing, studies, designs, and installations are recommended as part of the upgrades and new facilities required for power supply, distribution, and controls in support of Alternative I:

- Perform a survey of the onsite MV distribution system. The personnel for this task should include land surveyors, a lineman, and an electrical engineer. The lineman will enable safe access for examination and documentation of all of the MV equipment and

circuits. The surveyors will accurately document the existing location of the buried MV feeders. The electrical engineer will assess the condition of the equipment and design of the system.

- Once the MV system is documented, make engineering/ design decisions to increase the reliability of the onsite MV distribution and the process power in general. The goal will be to reconfigure the systems so that recovery from a failed cable section may be realized in minutes instead of days (likely at the present time). To realize this goal, installation of MV switches and small sections of cable will be strategically added to the existing distribution system, essentially eliminating single points of failure where possible and economically feasible.
- Perform short-circuit and protective device coordination studies for existing equipment to be reused as well as the proposed new MV equipment to be installed from the ML&P point of common coupling up to and including each distribution transformer.
- Consider replacement of the existing standby generation system with a system to backup the MV distribution system. The current system is not and cannot be configured to back up all necessary systems for fish production. An assessment of the impact that loss of the ML&P source would have on the hatchery process for varying periods of time should be conducted.
- Prepare contract documents for construction specifically directing the contractor as to how each piece of MV equipment should be labeled. This should match the site single-line diagrams posted for ready examination and use by maintenance personnel.
- Survey the existing configuration of site and facility LV distribution systems and inspection of LV equipment as part of the work scope of Alternative I. At that time, the existing systems will be documented with necessary repairs only to the extent that those systems will be reused/rebuilt to drive the new process. Systems to be retired will simply be documented for removal. Design and install improved exterior (perimeter and parking lots) lighting systems.
- Design and install electrical, control, and telecommunication systems to supply power to two new facilities for facility lighting, building mechanical systems, and hatchery process loads. A new 300-kilovolt-ampere (kVA), 480-VAC distribution transformer; 600-amp MCC; two 50-kVA dry-type, step-down transformers; and four facility distribution panels are estimated for design and installation in each facility. Design and install PLC-based control systems for integration into existing SCADA system. Design and install a new facility telephone system.
- Design and install water storage level, flow, and well pump controls. Integrate into the existing SCADA system. This system may include installation of most or all of the following components:
 - Flow and level sensors
 - Variable-speed drives on a few well pumps

- Well reservoir level monitoring
- Remote monitoring and control of well pump operation from the existing SCADA system

4.1.13 Building Mechanical Systems

Given the project location, special consideration must be given to mechanical systems with regard to environmental conditions. Design strategies will be employed to protect mechanical systems and components from the elements. Outside air intakes will be designed to avoid snow and rain entrainment. Automatic positive-shutoff control dampers will be provided on all outside air intakes and exhaust outlets.

Mechanical systems will be designed in accordance with applicable codes, references, and practical engineering methods for subarctic environments. Performance, simplicity, durability, and functionality are the basis of the conceptual design. High-quality, energy-efficient equipment will be selected, and control systems will be designed to maximize energy conservation. Equipment location and arrangement will be selected for maintenance accessibility.

4.1.14 Ventilation

Ventilation systems will be designed to maintain interior temperature and humidity conditions appropriate for the space and for the occupants and processes therein. The facility consists of several distinct areas, each with a unique function and different heating and ventilation requirements, necessitating a division of heating, ventilation, and air conditioning (HVAC) systems and control strategies as follows:

- **Fish-rearing areas** will be served by a dedicated central air handling system. This will be a single-zone, constant-volume arrangement that will supply conditioned air at a temperature setpoint just above the average water temperature in the rearing tanks. Supply air will be distributed by overhead ductwork with individually balanced air diffusers. The design will assure complete mixing of air in the space because of the relatively low discharge temperature, which will minimize heat stratification and buoyancy issues. Interior humidity will be controlled by air exchange. A humidity sensor in the main return air duct will control the ratio of outside air to recirculated air, keeping the space humidity within a specified range. During winter months, heat will be provided by a hydronic heating coil located in the air handler. Cooling in the summer will be accomplished by economizer operation (free air cooling). No mechanical cooling is anticipated.
- **Office and administration areas** are similar in space heating, cooling load, and occupancy-based ventilation requirements and will be served by a separate ventilation system, a constant-volume reheat type, which will provide individual heating and cooling control for each zone. In general, each enclosed office, conference room, or similar space will be separately zoned, and large, open areas may have more than one zone. This system will allow the flexibility of simultaneous heating and cooling. Heat will be provided by hydronic heating coils located in the air handler and in the spaces served. Auxiliary heat will be provided by perimeter hydronic baseboard units. Cooling will be by outside air economizer operation.

- **Locker rooms, toilet rooms, and gear rooms** will be provided with exhaust fans that discharge directly outside. No air from these spaces will be recirculated.

4.1.15 Heating

Building heating will be provided by central hot-water boilers. Two constant-speed building circulator pumps, in a primary/standby configuration, will supply heating water to the facility. The system provides 100 percent redundancy so that one pump can be removed without loss of service. For ease of maintenance, the pumps will be vertical in-line, split-coupled type.

Terminal heating devices will be served by reverse return piping systems, where practical. The terminal units and the main heating system branches will be provided with isolation valves. Heating water temperature will be reset based on outside air temperature and will be controlled to maintain a minimum return temperature to the boilers. This will improve heating system performance by maintaining higher temperatures during times of high heating demand and will increase energy savings by reducing warm-weather standby losses.

A centrifugal air separator will be provided for the heating loop, with high-capacity automatic air vents. In addition, automatic air vents will be provided at all high points and hydronic terminal units. Diaphragm-type expansion tanks will compensate for thermal expansion and contraction of heating water. These tanks will be located in the mechanical room. Hydronic heating units will be provided as follows:

- **Fish-rearing areas** will have hydronic unit heaters for auxiliary heating. In conjunction with the ventilation system, which supplies constant-temperature air, unit heaters will operate on individual thermostats to provide additional heat in specific areas as needed.
- **Office and administration areas** will have hydronic baseboard heating units on outside (perimeter) walls to provide additional heat. These will be zoned the same as and operate in parallel with the ventilation terminal units. This approach assures adequate heat for external walls, keeps windows from fogging, and reduces the amount of forced air required for space heating. Arctic entry vestibules will be provided with cabinet unit heaters.

4.1.16 Domestic Plumbing Systems

Plumbing systems for this facility include domestic hot and cold water, sanitary drainage and venting, roof drainage systems and interior fuel gas distribution. The location of plumbing fixture groups will dictate the routing of service lines, but the layout should be as centralized, simple, and efficient as possible.

Sanitary drainage systems and domestic water distribution will be designed to support all plumbing fixtures within the facility. Rainwater collection and drainage systems will be designed to collect rainfall and snowmelt runoff from low-sloped portions of the roof.

4.1.16.1 General Strategies

Cold-climate design strategies will be applied to the plumbing systems in the hatchery. Plumbing fixture groups will be located away from exterior walls so plumbing lines will not

freeze. Roof drainage outlets will include electric heat trace to prevent ice blockage. Exterior hose connections will be frost-proof, drainable type, each with an isolation valve. These measures and others will combine to create a facility appropriate for the climate.

4.1.16.2 Equipment and Fixtures

Specified plumbing fixtures will be heavy-duty, commercial quality. Toilets, urinals, and lavatories will be vitreous china. Sinks and drinking fountains will be stainless steel. Fixtures will be low-consumption, water-conserving type where practical and will be ADA compliant where required. Floor drains will be provided in all multi-stall restrooms, locker rooms, janitor closets, mechanical rooms, and other locations as required. All floor drains subject to infrequent use will be equipped with automatic trap priming devices.

4.1.16.3 Sanitary Waste and Vent

All plumbing fixtures and the discharge from the drum filters will be connected to the sanitary sewer system. The system will drain by gravity to the site sewer connection. In the event that a lift station is required, drainage will be by gravity to a sump with a duplex sewage ejector. The lift station will discharge to a force main, which is then routed to the main sewer connection. Sanitary vent piping from plumbing fixtures will be combined, where practical, inside the building and terminate at insulated vents through the roof.

4.1.16.4 Domestic Water Systems

Domestic water service will be connected to the Fort Richardson potable water distribution system. It is assumed that adequate water pressure exists to serve all plumbing fixtures in the facility. Domestic water piping will be type L copper, fully insulated, with a vapor barrier to prevent condensation and heat loss. Piping will be routed to fixtures throughout the facility. Branch lines to main fixture groups or remote fixtures will be provided with accessible isolation valves and water hammer arresters as necessary. Potable hot water (120 degrees Fahrenheit) will be produced by a gas-fired, storage-type hot-water heater and circulated throughout the facility to maintain temperature at remote fixtures.

4.1.16.5 Rainwater Drainage

Portions of the building with a low-slope roof design will be provided with roof drainage including primary and secondary (overflow) systems. Primary rain leader piping will collect water from the roof drains and direct the flow to storm drainage piping that terminates outside the building. The overflow roof drain system will be comprised of parapet scuppers at the roof perimeter. All rain leader piping will be routed within the building, fully insulated and jacketed, and piping will be heat traced within 1 meter of any wall or roof penetration to prevent ice blockage.

4.1.17 Architectural Code Analysis

The following codes apply to the Anchorage hatchery project:

- 2000 International Building Code (IBC)
- 2000 International Fire Code

- ADA Accessibility Guidelines, CABO/ANSI A117.1-1992, “Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People”
- ICC/ANSI A117.1-1998, “Accessible and Usable Buildings and Facilities”
- Municipality of Anchorage local amendments

4.1.17.1 Occupancy Types

The buildings of the Fort Richardson hatchery facility shall be classified as Group B Occupancy.

It is not expected at this time that the quantities of hazardous materials stored will exceed the limits set forth in IBC Tables 307.7(1) and 307.7(2); therefore, no specific delineation of H-occupancy is anticipated. This information will be explored further and a final determination made in the next phase of design.

Incidental-use areas including the vehicle bays, furnace and boiler rooms, and storage rooms exceeding 100 square feet shall comply with the separation and/or sprinkler requirements of IBC Table 302.1.1.

4.1.17.2 Type of Construction

IBC Type III-B construction applies to the context, program needs, and space allowances for this facility. This construction type allows interior building elements to be constructed of any materials permitted by the IBC but requires exterior walls to be constructed of noncombustible materials. This type of construction will be confirmed in the next phase of design.

4.1.17.3 Fire Protection Systems

An approved automatic fire sprinkler system will be provided throughout the facility, in accordance with IBC Section 903.3.1.1.

4.1.17.4 General Building Limitations

The allowable building height and area limitations for this facility are determined by IBC Sections 503 through 507. For Group B buildings of Construction Type III-B, the base allowable floor area is 19,000 square feet per floor, and the building height is limited to four stories. The provision of an approved automatic fire sprinkler allows the base area to be increased by 300 percent for single-story buildings, resulting in an allowable floor area of 76,000 square feet.

4.1.17.5 Occupant Load

The design occupant load for this facility is calculated per IBC Section 1003.2.2.2 and Table 1003.2.2.2. Although higher than the actual occupant load, the design occupant load is used to determine other code requirements for the buildings. The design area quantities used to calculate the design occupant load are based on the concept design floor plan. Tables 4-2 and 4-3 contain information on the design occupant load.

TABLE 4-2
Building 1–Design Occupant Load

Building Function	Area (gross square feet)	Floor Area per Occupant (gross square feet)	Occupant Load
Salmon Hatchery	60,175	300	200.6
Mechanical/Electrical/Storage	2030	300	6.8
Total	62,205		208

TABLE 4-3
Building 2–Design Occupant Load

Building Function	Area (gross square feet)	Floor Area per Occupant (gross square feet)	Occupant Load
Office/Administrative	3,700	100	37.0
Trout Hatchery	60,175	300	200.6
Mechanical/Electrical/Storage	2,030	300	6.8
Total	65,905		245

4.1.17.6 Means of Egress

Based on the occupancy type, design occupant load, and other aspects of the current design, the following egress component requirements apply:

- Minimum Mechanical/Electrical Stairway Width: 36 inches (IBC 1003.3.3.1, Exception 1)
- Minimum Corridor Width: 44 inches (IBC 1004.3.2.2)
- Minimum Mechanical/Electrical Corridor Width: 24 inches (IBC 1004.3.2.2, Exception 1)
- Required Minimum Door Width: 32 inches (IBC 1003.3.1.1)
- Required Minimum Number of Exits: 2 (IBC 1005.2.1) per building
- Minimum Number Exits Mechanical/Electrical: 1 (IBC Table 1004.2.1)
- Maximum Exit Access Travel Distance: 300 feet maximum (IBC Table 1004.2.4)
- Maximum Dead-End Corridor Distance: 50 feet maximum (IBC 1004.3.2.3, Exception 2)

4.1.17.7 Plumbing Fixture Requirements

Table 4-4 presents minimum plumbing fixture quantities determined in accordance with the requirements of IBC Table 2902.1 and other Chapter 29 requirements.

TABLE 4-4
Plumbing Fixture Quantities per Building

Fixture Type	Requirement	Total Required
Water Closets, Male	One per 50 occupants	3
Water Closets, Female	One per 50 occupants	3
Lavatories, Male	One per 80 occupants	2 (one per toilet room minimum)
Lavatories, Female	One per 80 occupants	2 (one per toilet room minimum)
Drinking Fountains	One per 100 occupants	3

Final fixture quantities will be confirmed in the next design phase.

4.1.17.8 Acoustical Design Criteria

4.1.17.8.1 Room Acoustics. The acoustical design of the office areas will vary with use. Rooms should be echo free and not have excessive reverberation. Background noise levels from speech and occupant activity should be moderate. Room finishes shall be selected to promote intelligibility of speech. For rooms requiring speech communication, the reverberation time should be controlled to 0.4 to 0.8 seconds in the mid-frequencies.

4.1.17.8.2 Mechanical System Noise Criteria. Noise design criteria apply to intrusive noise, not occupant-generated noise. Major noise sources include mechanical equipment, HVAC duct-borne noise, fume hood exhaust noise, and adjacent spaces that generate noise. Table 4-5 provides anticipated noise design criteria.

TABLE 4-5
Anticipated Noise Design Criteria

Type of Area	NC Value
Fish Production Area	To Be Determined
Conference Room	NC-25
Private Office	NC-35
Reception Area, Lobby, Open Office	NC-40
Laboratory	NC-45
Corridor	NC-50

Source: Illumination Engineering Society of North America, *Lighting Handbook: Reference and Application*, 9th ed., 2000

4.1.17.8.3 Sound Isolation Criteria. The walls, floors, and ceiling systems will be designed to control noise to the noise criteria outlined in Table 4-5.

4.1.18 Lighting

The goal of lighting is to create the visual environment that best accommodates the functions intended. The following subsections provide general design considerations, strategies, and illumination levels for achieving good lighting.

4.1.18.1 General Design Considerations

Essential elements of lighting design that provide the appropriate quantity and quality of light in laboratory buildings are as follows:

- Daylighting should complement electrical lighting. When daylighting is sufficient, luminaires should operate at lower illumination levels or be turned off. Lighting controls should be coordinated with furniture placement, space use, and work zones.
- A task/ambient combination lighting layout should be investigated to provide a uniform lighting pattern with emphasis at task locations to achieve the agency-required illumination level at work surfaces while providing a lower level of general illumination for the space.
- Daylighting should be used to supplement or replace artificial lighting when appropriate. A checklist for daylighting design is as follows:
 - Complement daylighting with electrical lighting. (Use electric light sources near walls opposite windows, where desired illumination levels cannot be achieved by daylighting.) Avoid direct sunlight on critical visual tasks.
 - Provide systems to baffle daylighting during periods of the year when sun angles are low, such as large-scale elements (horizontal overhangs, deep reveals, light shelves), fine-mesh screens, patterned glazing, or narrow-slat blinds that can be adjusted or raised when not needed. Exterior shading devices (louver overhangs) can mitigate unwanted direct sunlight, while still permitting natural light.
 - Use horizontal elements to project related ground light into rooms. Consider the reflectance of snow-covered ground during winter months and different reflectance characteristics of corresponding vegetative areas in the summer months (generally limited to areas within 40 feet of buildings for one-story consideration).
 - Increase the level of daylight in rooms with reflectors or top lighting (clerestories, monitors, light shelves with reflective top surfaces) to project daylight deep into interior spaces.

4.1.18.2 General Strategies

Where illumination level requirements are not constant, use dimmers or multilevel ballasts for fluorescent lamps. Avoid block or group switching of fixtures, which may provide unused light.

Open-plan areas with partial-height barriers can reduce the amount of light that otherwise would be absorbed by walls in small, enclosed rooms. In open plans, separate circulation lighting avoids the use of unnecessary ceiling fixtures.

4.1.18.3 Illumination Levels

Table 4-6 shows design illumination levels for different building areas.

TABLE 4-6
Lighting Level Standards

Type of Area	Footcandle Level at 36 Inches above Floor
Corridor	30
Lobby, Stair, Store Room	30-50
Circulation around Work Area, Restroom	30-50
Conference and Computer Room	40-60
Office	40-60
Laboratory	80-100
Fish Rearing	40-60

Source: Illumination Engineering Society of North America, *Lighting Handbook: Reference and Application*, 9th ed., 2000

4.1.18.4 Natural Light

Offices and shop work areas are planned for the building perimeter where possible to allow supplementary illumination (daylighting) on work surfaces as well as provide visual relief for persons confined within a visually limited space. Conversely, support spaces and other specialty functions, where natural lighting is not as important or is objectionable, shall be located internally. The fish-rearing areas, with the exception of the incubation area, will have clerestory windows above the tanks and service areas, thus reducing the artificial lighting requirements during the spring, summer, and fall months.

4.1.19 Architectural Elements

4.1.19.1 Exterior Finishes and Materials

The exterior architectural finishes should provide a durable, low-maintenance, cost-effective, and appropriate architectural statement of the ADF&G's mission in Alaska. The materials must be able to respond to the rigors of the Alaskan climate, including large swings in temperature, periodic high-wind conditions, and low sun angles during the winter.

4.1.19.2 Roofs

The concept design portrays a structure with a low-sloping metal roof with 3- to 4-foot overhangs. The roof will be sloped to eaves, and the eaves will have gutters to control roof runoff. Keeping the roofs low sloping is advantageous for economy of the system and

ability to reduce snow sliding, an important factor in the operation and maintenance of the facility with this amount of roof area and building height. This system will allow snow to slowly melt off the roof. Problems such as snow sliding off a high roof and snow removal from walking areas and entrances can be mitigated.

The roofing material will likely be a standing-seam metal applied over a steel deck, sheathing, and insulation. The final insulation design and resulting R-value will be determined in conjunction with the engineering team's energy calculations to be performed in the next phase of design. Roof panels will be mechanically hemmed with a concealed fastening system. Metal flashing to match roofing will be provided at roof penetrations and edges.

4.1.19.3 Exterior Walls

A pre-engineered, insulated metal panel system is being considered for use as the exterior wall finish. The metal finish on the inside and outside will be a factory finish requiring little maintenance. In the fish-rearing area a minimum 48-inch curb will protect the wall area from the daily work and service being done around the rearing tanks. Further exploration of materials and finishes will occur in the next design phase.

4.1.19.4 Windows

Exterior windows will consist of fixed and operable windows. During the next design phase, the design team will investigate the inclusion of room-occupancy sensors, locations of operable windows, and zoning of the HVAC system. At that time, the design team will work with the users to identify acceptable temperature control, building security, and HVAC solutions.

Window frames will be institutional-quality aluminum material with a factory-applied anodized or fluoropolymer coated finish. The glazing will be double-insulated tinted glass, selected for aesthetics as well as to provide optimal performance for heat loss and solar gain. Further exploration of materials and finishes will occur in the next design phase.

4.1.19.5 Interior Finishes

A very basic outline for standard finishes for fish-rearing spaces is presented below. Further exploration of materials and finish systems will occur in the next design phase. Additional information is as follows:

- **Floors**—All finish flooring material will be selected for durability and application appropriate for the intended use of the space. Seamless flooring is anticipated for the lab, locker, toilet rooms, and maintenance office. Administrative offices and support spaces will have carpet. Loading docks, maintenance/shop, and fish rearing areas will have sealed concrete finishes.
- **Walls**—Interior wall construction will consist of galvanized metal studs. The metal studs will be of a size and gauge required for the spaces to be partitioned. Appropriate backing will be provided for wall-mounted equipment. Metal stud walls will be fitted with sound insulation material to achieve the required acoustical ratings. Stud wall sheathing will typically be gypsum wallboard, and finishes will be based on the use of the space. Special reinforced epoxy wall paint systems or other reinforced impervious

wall finishes may be considered in areas where disinfection and durability are of prime concern (lab, incubation, and other wet areas).

- **Ceilings**–Lay-in acoustical tile ceilings shall be provided in typical lobby office areas, with some use of gypsum board soffits or other feature elements. Special lay-in ceiling systems may be provided in the lab area. Hard ceilings (gypsum board) will be in the locker, toilet, janitor rooms, and similar “wet” spaces. All ceiling suspension systems will be designed to applicable seismic bracing and support standards. Ceilings in the fish rearing will have gypsum wallboard above the exposed structural system painted with a light color for good reflective coefficient.
- **Wall Protection Systems**–Wall protection systems consisting of protective wall surfacing material, bumper guards, and corner guards will be provided in applicable locations.
- **Doors**–The project will include entrance doors, nonrated doors, fire-rated doors, and rated exit doors. In general, natural-finish wood doors set in metal frames will be provided in office areas. Some glazing will likely be incorporated into the doors or integral sidelights for visual control and where determination of spaces in use is applicable. The main public entry doors will be aluminum frame with full-height tempered glazing. The doors leading into and around the fish rearing area will be either galvanized, HDPE, or fiberglass with frames to match the door material. All exterior entry/exit doors will be equipped with card readers to control access to the building. Hardware will consist of heavy-duty commercial mortise locksets, hinges, closers, kickplates, exit devices, and other devices required by the door function. All door hardware will be institutional grade.
- **Glazed Partitions**–In certain rooms, glazed partitions will be required to provide visual control of adjoining spaces. These partitions will be constructed of wire glass set in metal frames, rated where required. Glazing as part of the wall system is being considered to provide the opportunity to observe activities in the fish rearing area from the office/administrative and visitor areas.

4.1.19.6 Specialties

Special features of the Fort Richardson fish hatchery are as follows:

- **Toilet Partitions, Showers, and Accessories**–Individual-user, fully accessible toilet rooms will be provided. The toilet rooms will be equipped with framed mirrors, grab bars, recessed paper towel and sanitary napkin dispensers, and surface-mounted toilet paper dispensers. A convenience shelf will be located between the lavatories and the mirror. All toilet accessories will be satin-finish stainless steel. The showers will be premanufactured units meeting ADA requirements; one shower shall be provided in each locker room. Changing areas and lockers will also be provided.
- **Visual Display Devices**–Conference room, laboratory and shop spaces will be equipped with color marker boards (porcelain enamel on sheet steel for use with liquid markers). Tackboards will be fabric wrapped over a wood-framed backer board. The location of these items will be determined in the next design phase according to individual room requirements.

- **Furnishings**–Furnishings include but are not necessarily limited to blinds, shades, foot baths, and floor mats. The requirements for and locations of these items will be determined in the next design phase according to individual room requirements. These items are frequently categorized as furnishings to be provided as part of the furniture, fixtures, and equipment (FF&E) design and budget as they relate directly to items considered during the FF&E design effort.
- **Signage**–The project will have exterior and interior directional signage to assist individuals in wayfinding. A single manufacturer will provide the signage system. Interior signage will be constructed of plastic materials and will have the capability to be modified by onsite maintenance staff. Exterior signage will include a lighted sign at the entrance road to the facility, directing both visitors and deliveries.

4.1.20 Required Permits

This subsection describes key permit issues and the scope of work required to obtain each.

4.1.20.1 Federal Permits

4.1.20.1.1 Wetlands. Wetlands are defined as lands either permanently or intermittently covered or saturated with water. Wetlands lie between terrestrial (upland) and aquatic (water) systems and have unique traits and characteristics, including the following:

- Flooded or saturated soils for significant time periods
- Special vegetation because of wet soil conditions
- Swamps, marshes, bogs, sloughs, estuarine areas, mudflats, and shallow lakes and ponds with emergent vegetation

Based upon preliminary inspections of the project site the proposed construction is not anticipated to impact any wetland areas. However, during the design phase of the project, it is recommended that a wetland specialist visit the site to make a final determination.

4.1.20.1.2 National Pollutant Discharge Elimination System Construction Discharge. A Notice of Intent will be required if construction of the facility shall disturb 1 or more total land acres and result in discharge of storm water to surface water or to a storm sewer. Even when a permit is not required, erosion and sediment control is required on all sites to prevent entry of sediment-laden storm water into any surface water.

4.1.20.1.3 U.S. Fish and Wildlife Service. The Endangered Species Act of 1973 (Title 16, Section 1531, of the *U.S. Code* [USC]), as amended, prohibits any activity threatening the continued existence of a federally designated endangered or threatened species. If threatened or endangered species are potentially present in the proposed project area, then ADF&G must contact the State Fish and Game Commission or the U.S. Fish and Wildlife Service representative for assistance in determining whether the project is located in the range or habitat of endangered or threatened species.

4.1.20.1.4 Digging. The U.S. Army Department of Public Works (DPW) requires that a digging permit be obtained prior to completing any construction activity on Army property. The permit form is USAGAK 81-e(a), *Excavation Clearance Request DPW, Fort Richardson*. This

form can be obtained from the Fort Richardson Customer Service Desk (Building 730, 384-3177 or 384-3664) and must be approved and date stamped by Customer Service Desk personnel.

Construction activities requiring a digging permit include the following:

- **Addition-Expansion-Extension:** A change to a real property facility that adds to its overall external dimension.
- **Alteration:** Change to interior/exterior facility to upgrade the facility for its current purpose. Includes installed equipment made part of the existing facility.
- **Construction:** Erection, installation, or assembly of a new facility. The addition, expansion, extension, alteration, conversion, or complete replacement of an existing facility. Relocation of a facility from one installation to another. Installed equipment made a part of the facility from one installation to another. Installed equipment made a part of the facility, related site preparation, excavation, filling, landscaping or other land improvement.
- **Conversion:** Work required to adjust interior arrangements or other physical characteristics of an existing facility or part thereof so that it may be used for a new purpose. This includes equipment installed in, and made a part of, the existing facility. Repair work required because of the conversion is classified as construction. A conversion always results in a change in the facility category code in the real property records locally and at the U.S. Department of Army.

4.1.20.2 State and Local Permits

4.1.20.2.1 State Historic Preservation Office. A review by the State Historic Preservation Office will be needed prior to construction to ascertain whether the site is of historical significance.

4.1.20.2.2 State Fire Marshall. The state Fire Marshall does not have jurisdiction on federal property; however, coordination with this department will be conducted as well as with the Fort Richardson Fire Department.

4.1.20.2.3 Anchorage Building. For construction activities at Fort Richardson, local building permits are not required if the construction and demolition are completed on federal property.

4.1.20.2.4 State of Alaska Department of Administration. A coastal zone management consistency review application will probably not be needed because the project will not fall within the designated area of Alaska's coastal zone.

4.1.20.2.5 Alaska Department of Environmental Conservation. Currently hatcheries within the State of Alaska are permitted to discharge waste water under Alaska Department of Environmental Conservation (ADEC) General Industrial Wastewater Permit 9640-DB005. This permit, however, expired in March 2003, and existing hatcheries have been granted extensions by ADEC, which is currently developing a new industrial wastewater general permit for hatcheries. The new permit will probably specify the same effluent limitations as in the existing permit.

ADEC also delegates the certifications under Section 401 of the Clean Water Act of 1977 (33 USC 1251), as amended, which prohibits federal permitting or licensing agencies from issuing authorizations for construction activities having discharges into navigable waters until the appropriate water quality certifying agency has issued a water quality certification or waiver procedures have been satisfied.

4.1.20.2.6 Department of Natural Resources. A water rights application will need to be submitted prior to drawing water from any wells and/or surface water sources.

4.2 Alternative II–New Recirculation Module for Production of Catchables and Improvements to Existing Infrastructure

This alternative is presented as a lower-capital-cost option to allow ADF&G to maintain current Region II hatchery production. This option consists of the design and construction of a recirculation module for the production of catchable fish only with improvements to the existing infrastructure to allow continued production of smolts and fingerlings over the next 20 years of operation. The location of the new catchable fish production module (Figure 4-4) is shown in Figure 4-5. This option requires all of the well water that is currently available at the Fort Richardson site plus an additional 450 gpm of makeup water for the new recirculation module. Additional wells could probably be drilled in the area to obtain the required additional water; however, if this is not the case, then it may be necessary to consider placing the catchable module at the Elmendorf hatchery location.

The following subsections describe the configuration and operation of the new recirculation module as well as the proposed improvements to the existing infrastructure. Architectural, civil, interior electrical, and mechanical elements of the new module and improvements are consistent with those described for Alternative I, and therefore no additional discussion on these will be provided. A description of power supply and distribution is provided. Permitting considerations for this alternative are also consistent with those of Alternative I.

4.2.1 New Catchable Recirculation Module Description

The concept design for Alternative II is much in keeping with the design methodology adopted for Alternative I; however, new facilities have been limited to later-life-stage, catchable programs and are to be located in a single new building. Existing hatchery infrastructure will be used for incubation and early rearing facilities. As in Alternative I, the catchable production modules are to have state-of-the-art, high-rate water recirculation systems, inclusive of biofiltration, to reduce overall water consumption and effluent volumes. However, to minimize capital cost and simplify operation, centralized treatment systems, to be located in the filtration trench, are to be used for each production module. This style of treatment system is consistent with the simplicity of the rearing program for this building and the reduced requirement for temperature manipulation at each culture tank. The new production modules will utilize 425 gpm of the existing hatchery water process stream.

4.2.2 Improvements to Existing Infrastructure

Improvements are proposed for the following existing structures:

- Aeration Building–Improvements to the Aeration Building will be consistent with that described in Alternative I.
- Broodstock raceways–The broodstock raceways will be drained and cleaned. Any visible cracks will be grouted and sealed. The entire inner surface of the raceways will be covered with an impervious liner. A steel-framed structure with insulated metal panels will then be erected over the entire bank of raceways. The structure will include personnel doors and overhead doors as necessary for operations and mechanical and electrical equipment to provide light and heat. This new structure will also extend beyond the broodstock raceways to the east to incorporate the early rearing and laboratory functions now contained in the Broodstock Building. The existing Broodstock Building and laboratory will be demolished to provide space for this new building extension. Code issues related to building proximity make this a more cost-effective option than trying to incorporate the existing Broodstock Building into the new structure that will cover the raceways. The new laboratory space will include wet and dry lab space, appropriate ventilation, and safe storage for chemical agents.
- Outdoor rearing raceways–Both banks of existing outdoor raceways will be drained, cleaned, and lined with an impervious liner. Any cracks in the existing structures will be grouted and sealed prior to liner placement. The raceways will then be covered with a single metal-framed/steel sandwich panel structure on a shallow concrete foundation. The structure will include personnel doors, lighting, and nominal heat and ventilation for the comfort of workers. The wide space between the existing bank of raceways will remain as a traffic corridor for movement of fish and feed by vehicle. Overhead doors will be provided on each end of the building to provide for large vehicle access.
- Water Treatment Building–The existing equipment inside the Water Treatment Building (pumps, drum filters, electrical switchgear) will be removed from the building. The sump area where the drum filter currently resides will be framed and covered with a floor surface capable of supporting normal storage loads. An overhead door will be added on the south side of the building to facilitate movement of materials in and out of the building, which will be utilized for warm, dry storage.
- Existing office space–The existing office structure will be converted into a warm, dry storage building. The non-load-bearing interior walls of the building will be removed, and a 4-foot-high protective wainscot on the exterior walls will be provided. The exterior of the building will be retrofitted with steel siding to match the new structures, and doors will be replaced as required for movement of materials into and out of the building.
- Existing Visitor Center–The visitor center structure is in better condition than the current office structure and is larger. The visitor center will be remodeled into new office space to support the ongoing hatchery operations, including but not limited to the removal and addition of partition walls, new painting and carpet, refurbishing of the restrooms, and the addition of windows. Exterior work will include new doors and trim as required.

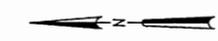
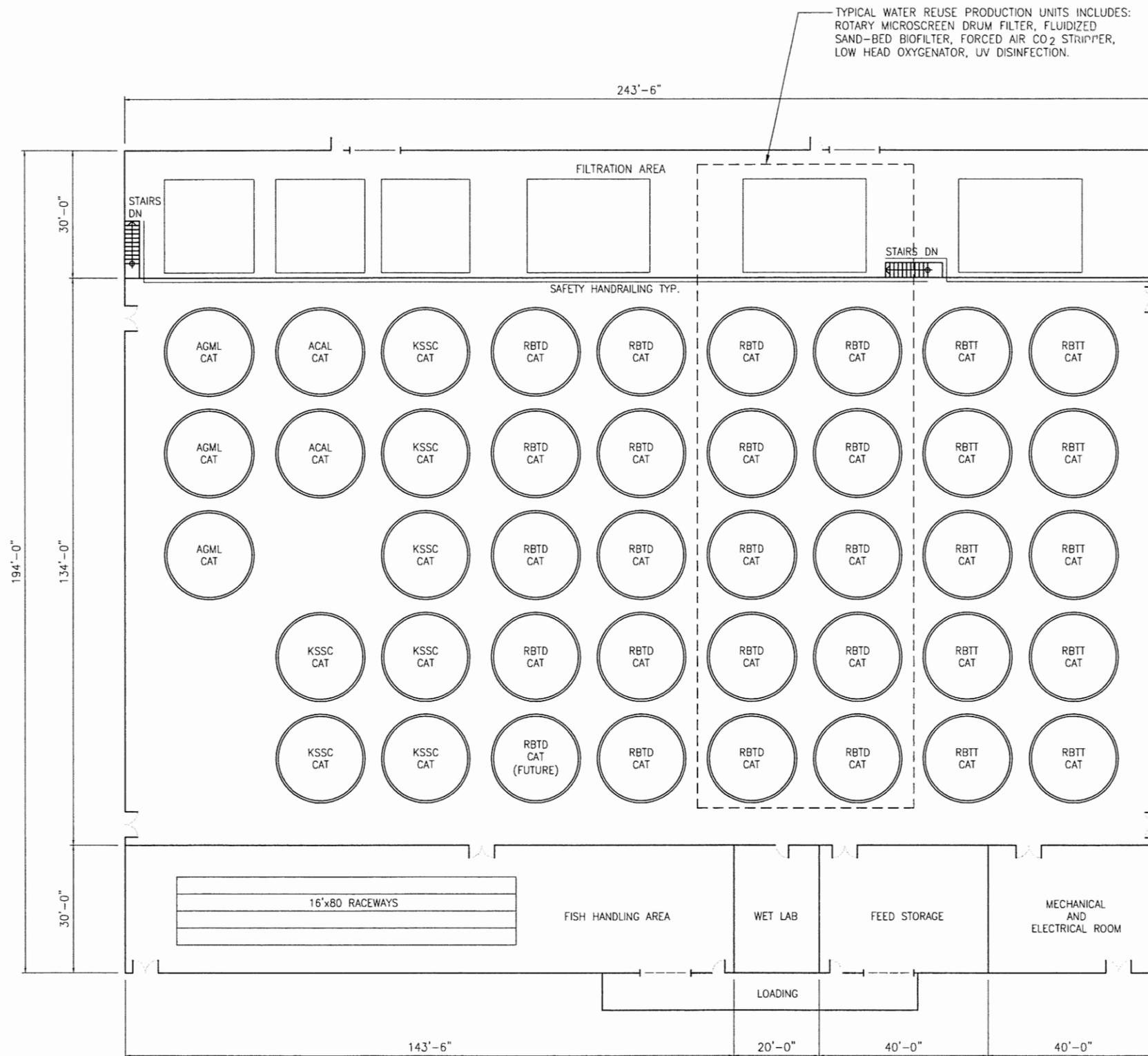
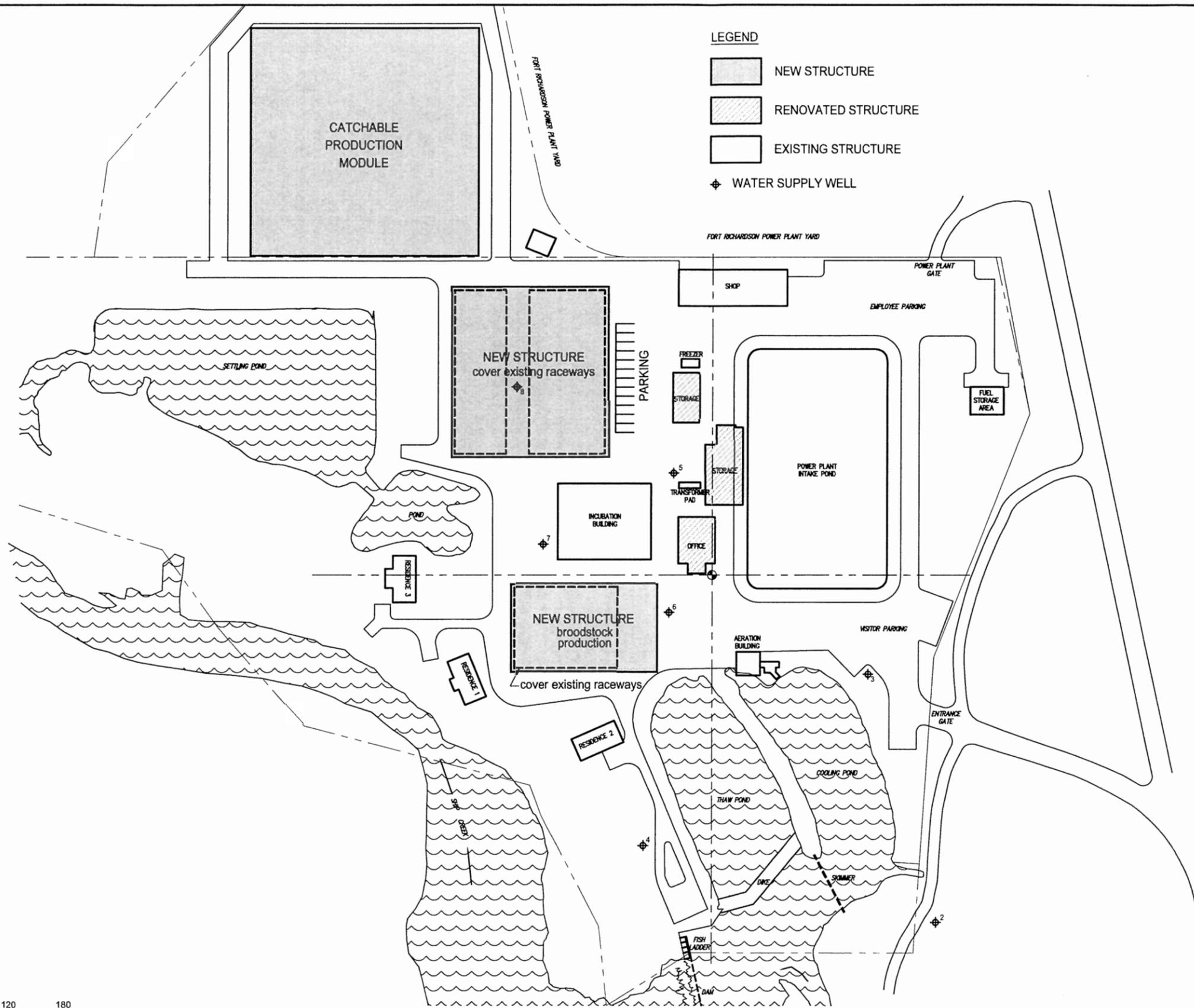


FIGURE 4-4
CATCHABLE PRODUCTION MODULE, ALTERNATIVE II
 1"=30'



**FIGURE 4-5
FORT RICHARDSON HATCHERY IMPROVEMENTS, ALTERNATIVE II**



- Incubation Building–The Incubation Building will be left intact under this alternative. The exterior will be resided with galvanized metal siding and associated flashings and trim, and the roof will be repaired to stop the minor leaking problems currently encountered.
- Shop Complex–Maintenance-free metal siding will be installed on the exterior of the Shop Building, and a concrete slab will be poured in the cold storage bay at the east end of the structure. The existing trusses will be analyzed for compliance with current-code snow loadings and upgraded if required. A dedicated welding fume exhaust system will be installed in the welding bay to bring ventilation up to code requirements.

In addition to the improvements listed above, the entire area immediately around the new and existing structures will be paved to minimize dust intrusion into the buildings.

4.2.3 Electrical Power Supply, Distribution, and Controls

The electrical work to be performed for Alternative II is consistent with that required for Alternative I, with the exception of the following:

- LV equipment and distribution system–A survey of the existing configuration of site and facility LV distribution systems and inspection of LV equipment should be performed during the redesign of the hatchery. At that time, the existing systems will be documented with necessary repairs if those systems will be reused or rebuilt to drive the new process. Systems to be retired will simply be documented for removal. This process is expected to be much more of an extensive effort compared to the same work for Alternative I. Based upon the site visits performed to date, this effort will include many of the following tasks:
 - Rebuilding of the LV switchgear
 - Replacement of main feeders (and maybe standby feeders if existing generator is retained) to each building
 - Identification and repair or reconfiguration to address electrical code and safety violations found throughout the facilities
- Electrical, control, and telecommunication systems for the new catchable module–Electrical systems required to supply power for facility lighting, building mechanical systems, and hatchery process loads will be designed and installed. A new 150-kVA, 480-VAC distribution transformer; 600-amp MCC, 50-kVA dry-type, step-down transformers; and two facility distribution panels are estimated for design and installation in new facility. PLC-based control systems will be designed and installed for integration into the existing SCADA system. A new facility telephone system will be designed and installed.

Elmendorf Hatchery Visitor Center

5.1 Elmendorf Hatchery Visitor Center

As part of the effort to upgrade the Anchorage-area hatchery program, upgrades to the Elmendorf hatchery will be implemented to allow for an improved interpretive and educational experience for the public. These improvements would be part of the program for either Alternative I or II. The location of the Elmendorf hatchery allows for visitation by the public without having to pass through military security. This is not the case for the Fort Richardson hatchery, which lies entirely within the confines of Fort Richardson. The Elmendorf hatchery is also well suited for public visitation because it is located adjacent to a drop structure on Ship Creek that is a barrier to salmon returning upstream. There are significant opportunities at this location for the public to view salmon as they prepare to spawn.

Public access to the Elmendorf hatchery currently exists. Parking is to the north of the cooling pond (Figure 5-1), and visitors can make their way from the parking area along the cooling pond, through a gate, and down into the hatchery. A lock on the pedestrian gate and/or with a rope currently controls access across the drive lane that traverses the area from the Intake Building to the main hatchery area. The public can view salmon as the fish leap at the falls on Ship Creek, or if the rope is not in place on the drive lane, visitors can move down into the hatchery and view fish in the raceways.

The number of public visitors varies widely according to the season, with summer months seeing the largest number of visitors, often in excess of 10,000 annually. Although Alternatives I and II do not provide for continuing improvements at the Fort Richardson hatchery, the Elmendorf hatchery, with the exception of the salmon broodstock collection, will continue to present significant opportunities for interpretive and educational visits by the public. The following upgrades would greatly increase the enjoyment and safety of the public:

- Expand and pave parking lot at the north end of the cooling pond to provide access for tour buses and separate parking for individual automobiles.
- Provide signage on Post Road and Fifth Avenue directing visitors to the hatchery location.
- Pave the walkway from the parking lot to the hatchery area. Include a handrail to facilitate access by handicapped visitors.
- Install a security fence on the north side of the cooling pond. Currently, access to the steep sides of the cooling pond is unobstructed, posing a potential hazard to visiting children.
- Install a visitor kiosk between the creek and the Intake Building (Figure 5-1). This 400-square-foot covered facility would contain displays pertaining to the life cycle of

salmon. An ADA-compatible walkway would lead from the kiosk to viewing platforms adjacent to the creek.

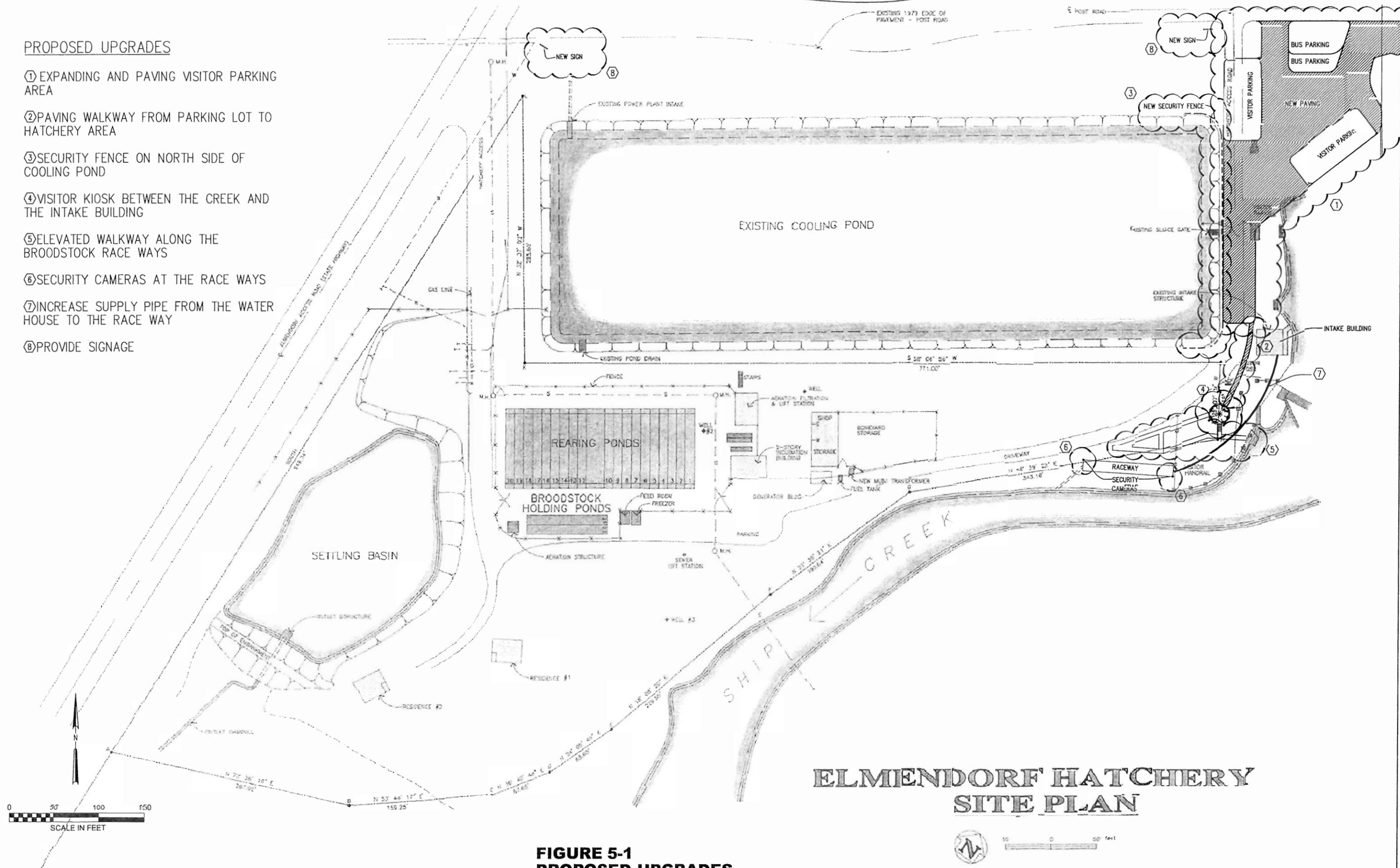
- Install an elevated walkway along the broodstock raceways to allow visitors to view the broodstock and egg-collection process.
- Install security cameras at the raceways.
- Increase the size of the water supply pipe from the Intake Building to the broodstock raceways.

No additional involvement by ADF&G personnel is anticipated beyond periodic maintenance of the displays and ground care required to support the improvements once they were complete. The hatchery tour would be self-directed by signage. The estimated cost for these improvements is included in Appendix D.

The existing hatchery facilities will remain in place for the near term with the possibility of demolition and site restoration at a future date.

PROPOSED UPGRADES

- ① EXPANDING AND PAVING VISITOR PARKING AREA
- ② PAVING WALKWAY FROM PARKING LOT TO HATCHERY AREA
- ③ SECURITY FENCE ON NORTH SIDE OF COOLING POND
- ④ VISITOR KIOSK BETWEEN THE CREEK AND THE INTAKE BUILDING
- ⑤ ELEVATED WALKWAY ALONG THE BROODSTOCK RACEWAYS
- ⑥ SECURITY CAMERAS AT THE RACEWAYS
- ⑦ INCREASE SUPPLY PIPE FROM THE WATER HOUSE TO THE RACEWAY
- ⑧ PROVIDE SIGNAGE



**ELMENDORF HATCHERY
SITE PLAN**

**FIGURE 5-1
PROPOSED UPGRADES**



SECTION 6

Cost Estimates

6.1 Capital Costs

A preliminary capital cost estimate based on the concept-level design is included as Appendix B and C. An overall contingency of 15 percent on the entire project reflects the current level of design detail.

6.2 Annual Operational Costs Exclusive of Labor

6.2.1 Alternative I

6.2.2 Alternative II

SECTION 7

References

Alaska Department of Fish and Game, Sport Fish Division. February 2002. *Fisheries Bioengineering Services for Hatchery Evaluation and Water Use/Water Treatment Recommendations: Fort Richardson State Fish Hatchery*. Prepared by The Conservation Fund Freshwater Institute.

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