# BIOLOGICAL ASSESSMENT

for

# LNFH's Hatchery Water Supply System Rehabilitation Project

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## I. INTRODUCTION

The following Biological Assessment (BA) is to outline Leavenworth National Fish Hatchery's (LNFH's) proposed Water Supply System Rehabilitation Project and to disclose the potential effects of the project on federally listed, proposed, and candidate species and designated critical habitat. It is intended to ensure that proposed management activities will not likely jeopardize the continued existence of the aforementioned species nor adversely modify critical habitat.

## II. LISTED SPECIES IN THE ACTION AREA

Steelhead trout (*Oncorhynchus mykiss*), Upper Columbia River ESU

Spring Chinook Salmon (*Oncorhynchus tshawytscha*), Upper Columbia River ESU

## III. PROJECT LOCATION

### A. Legal Description

Township 24N, Range 17E, Section 23 & 26

### B. General Location

LNFH is located three miles south of Leavenworth, Washington, near the mouth of Icicle Canyon (Figure 1). LNFH withdraws surface water from Icicle Creek at river mile 4.5 and returns water to the creek at approximately river mile 2.8.

## IV. AFFECTED ACTION AREA (ICICLE CREEK)

Icicle Creek is a fourth order tributary to the Wenatchee River. It is 31.8 miles long, with 85 tributaries, and drains a 136,759 acre (211 $mi^2$) basin containing 14 glaciers and 102 lakes. The U.S. Forest Service (USFS) manages 87%, with 74% in the Alpine Lakes Wilderness Area, of the Icicle Creek catchment and manages it as a Tier 1 key watershed under the Northwest Forest Plan (USFS 1994a). Therefore, public lands in the Icicle Creek drainage are managed for at risk salmonids and other fish species. Icicle Creek is rated Class AA (extraordinary) surface water by the Washington State Department of Ecology.

Icicle Creek is primarily snowmelt fed. About 21% of the flow in a hot, dry summer is estimated to originate from glacier melt (Mullan *et. al.* 1992). The measured flow in Icicle Creek ranges from a minimum of 44 cfs to a maximum of 14,100 cfs according to readings taken from the USGS gauging station (rm 5.8) located above all major water diversions. The discharge of Icicle Creek is altered by water diversions which can reduce the flow in the lower reaches to very low levels during the summer and early fall (WRWSC 1998). The City of Leavenworth and the Icicle Irrigation District divert water above the Snow Lakes trailhead (rm 5.7) and LNFH and Cascade Irrigation Company divert water below the trailhead (rm 4.5). Irrigation diversions can remove 48% and 79% of the mean August and September flows, respectively (Mullan *et al.* 1992). To assure cold water for LNFH in dry summers, a supplementary water supply (16,000 acre feet) was developed in Upper Snow Lake, about seven miles from LNFH and one mile above it in elevation. Without the water release of approximately 25 to 30 cfs from Upper Snow Lake, the downstream reaches of Icicle Creek may go dry in some years. Additionally, water diversion dams in Icicle Creek upstream from LNFH may present fish passage problems during low flows. LNFH's regulating and diversion dam (intake) may block fish passage at low flows. There are also several natural fish passage obstacles in Icicle Creek above LNFH (Figure 3). However, none have been proven to be year-round fish migration barriers.

Upstream fish migration in Icicle Creek is currently blocked at LNFH (approximately rm 2.8) by an energy control dam at the base of a by-pass canal and holding dams and weirs in the historic creek channel (Figure 2). However, since 1999 to the present, the USFWS at the request of NOAA Fisheries has been capturing steelhead that have entered the LNFH adult return ladder and releasing them upstream of the hatchery. In the future, fish passage through LNFH will be addressed through the Icicle Creek Restoration Project. Implementation of Phase II of this project is scheduled to begin August 1, 2005 which will provide year around, upstream and downstream passage through LNFH for native fish species.

The Icicle Creek watershed has a long history of human impacts beginning with sheep herding and mining in the late 1800's. Recent uses include timber harvest, road building, fire suppression, campground development, private residences, commercial development, and recreation. Five percent of Icicle Creek's watershed, outside of the wilderness boundary, has been directly impacted by logging (USFS 1994a). Road building has occurred for development, recreation, and timber harvest. Over 11% of the vegetation along lower Icicle Creek has been removed from private property (WRWSC 1998). The Icicle Creek watershed is a popular recreation area for hikers, rock climbers, fishermen, and many others. Natural disturbances such as fires and landslides are prevalent in the watershed. Recently, the 1994 forest fires burned 12% of the watershed (USFS 1994a). In 1999, a landslide introduced a large quantity of sediment into the Icicle just above Snow Creek.

Water quality concerns in Icicle Creek and the mainstem Wenatchee River include not meeting Washington State 303(d) standards for water temperature, dissolved oxygen, pH, in-stream flow (WRWSC 1998), and total PCB's (WDOE 2004).

## V. FORESEEABLE FUTURE ACTIONS IN THE ICICLE CREEK WATERSHED

### A. Icicle Creek Restoration Project

The original design of the Leavenworth National Fish Hatchery, built between 1939 and 1941, involved diverting the majority of Icicle Creek's flow through a canal with an energy control dam at the base and construction of holding dams and weirs in the historic creek channel (Figure 2). Migration of endangered steelhead, threatened bull trout, and many other fish species are affected. To address this issue the USFWS in cooperation with the USFS and Bureau of Reclamation identified and partially implemented a proposed action, the Icicle Creek Restoration Project (USFWS 2001b, 2001c, 2002a, 2002b, & 2004). The Icicle Creek Restoration Project was separated into two phases. Phase I was implemented and completed in 2003. Phase I included removal of Structure 2 except the headgate and removal of all of Structures 3 and 4. Implementation of Phase II is scheduled to begin August 1, 2005. Phase II will include: (1) rehabilitation, mechanical and structural, of the headgate at Structure 2; (2) construction of a vertical slot fishway at the headgate to provide fish passage; (3) modification of Structure 5 to incorporate a seasonal fish barrier with a sorting facility and bypass structures; (4) rehabilitation of existing parts of Structure 5 including the bridge; (5) increasing stream flows in the historic channel up to a maximum of 2,620 cfs; and (6) natural flushing of sediments within the historic channel. With the completion of Phase II of the Icicle Creek Restoration Project, upstream and downstream fish passage through the LNFH will be provided year-round for native fish species.

## VI. LNFH'S CURRENT WATER SUPPLY SYSTEM

Stream flow of Icicle Creek is withdrawn by four different water users (3 consumptive and 1 (LNFH) non-consumptive) at two principle locations. The City of Leavenworth and the Icicle-Peshastin Irrigation District (District) divert water above the Snow Lakes trailhead (rm 5.7) and LNFH and Cascade Irrigation Company (Cascade) divert water below the trailhead (rm 4.5). The upstream water withdrawal operations are discussed in Appendix A. The downstream diversion is discussed below.

The surface water diversion at rm 4.5 has been maintained and operated by LNFH as part of a 1939 contract between the United States and Cascade Irrigation Company. Through this contract the intake diversion dam and its associated intake structures were rebuilt by the United States so as to supply both the existing 1905 water right held by Cascade and the new water right for the hatchery. The intake withdraws a maximum of 54.4 cfs of water from Icicle Creek and conveys 12.4 cfs to Cascade's water delivery system and a maximum of 42 cfs through a buried pipe system to LNFH.

The hatchery's water delivery system consists of three major components and conveyance systems: (1) the gravity intake on Icicle Creek (rm 4.5), (2) the Snow Lake supplementation water supply project, and (3) the well system on hatchery property. LNFH's water rights for each component are shown in Table 1. Each of these three major components and conveyance systems are described individually below.

### A. LNFH's Gravity Intake

The hatchery's gravity intake facilities (Figure 4) are composed of a number of components. Primary to the system is the original low rubble masonry diversion dam with concrete spillway crest across Icicle Creek. Comprised of a concrete base with flash boards on top, the dam raises water elevations several feet allowing a portion of the flow to be diverted through a grizzly rack (bars spaced at about 6 inches) and into a concrete water conveyance channel. In the late 1980's, the diversion dam was rehabilitated and a fishway constructed at the entrance to the conveyance channel. Because of high bed and suspended sediment loads present in the creek during portions of the year, the pool and weir design of

the fishway proved to be unsuccessful for passing fish. Currently, the fishway has been abandoned as a means of passing fish around the dam. All stop logs have been removed from the fishway chute and it has been operated periodically as a sluiceway to flush accumulated sediment away from in front of the conveyance channel's entrance. Water in the conveyance channel is transported a short distance from the coarse grizzly rack to a small building which houses a fine rack (1 ½ inch bar spacing), an overflow spill section, and a sediment sluicing section. Neither the course nor fine racks qualify as up-to-date fish screening measures. A discharge channel guides the spilled water and sluiced material back to the creek downstream of the building. Water retained in the system is transported from the fine rack into a 33 inch diameter buried pipeline. A slide gate is located at the pipe entrance to regulate flow into the pipe. Normally this gate is left fully open. Approximately 1,260 feet down gradient from the beginning of the pipe system is a gate valve that controls flow into Cascade's pipeline system. Cascade's pipe leads to a small drum screen that provides a means of bypassing fish from Cascade's diversion flow back to the river (rm 4.2). The drum screen has been updated, however the fish bypass system as a whole is presently not up-to-date. Cascade may withdraw surface water from May 1st through October 1st and returns excess "carrying" water to the Wenatchee River.

A maximum of 42 cfs of river water that does not enter Cascade's irrigation system is transported through a 31 inch diameter buried pipeline approximately 5,200 feet to the main hatchery complex. Before water enters the hatchery it is either be routed into a sand settling basin (normal operation) or directly to the hatchery. The sand settling basin has a fish bypass system which empties into the pollution abatement pond. Fish depart the pollution abatement pond volitionally through an overflow weir and pipe which discharges into Icicle Creek at the northern edge of the main hatchery complex (approx. rm 2.7). From the sand settling basin water is transported through the main pipeline to one of two separate screen chambers, the "outside" and "inside" screen chambers. These screens, which are composed of vertical static screen panels, are used to filter fish and debris from the hatchery water supply. Both screen chambers meet the National Marine Fisheries Service (NMFS, NOAA Fisheries) 1994 standards for fish screening. Screened fish and debris exit the outside screen chamber into an open bypass ditch which discharges back into Icicle Creek at rm 3.8. Screened fish and debris exit the inside chamber into the hatchery's discharge system which either empties into Icicle Creek at the base of the adult return ladder (rm 2.8) or the pollution abatement pond. Screened river water exiting the two chambers is used in the hatchery's raceways and then enters the discharge system or is re-used in the adult holding ponds before entering the discharge system. Water exiting through the hatchery's discharge system may enter Icicle Creek at four locations: (1) through the open bypass ditch (rm 3.8), (2) at the base of the adult return ladder (rm 2.8), (3) through the adult return fish ladder (rm 2.8), or (4) through the pollution abatement pond (rm 2.7). The majority of river and well water used for hatchery operations returns to Icicle Creek at the base of the adult return ladder except during pond cleaning and maintenance activities when all water is routed through the pollution abatement pond. All, minus any leakage and evaporation, of the river water and groundwater used at the hatchery is returned to Icicle Creek.

B. Snow Lake Supplementation Water Supply Project

During construction of the hatchery, it was recognized that surface flow and temperatures in Icicle Creek might at times be insufficient to meet production demands. A supplementary water supply project in Snow Lake and Nada Lake was therefore developed and a water right to 16,000 acre feet of Snow Lake was obtained. These lakes are located approximately 7 miles from the hatchery and about 1 mile above it in elevation. A ½ mile tunnel was drilled through granite to the bottom of Snow Lake and a control valve was installed at the outlet end of the tunnel. Snow Lake is accessed by helicopter twice a year to operate the control valve. Operation of the control valve is determined by Icicle Creek flow and water temperature. The control valve is typically opened mid-July or as soon as the creek water consistently reaches 58 $^{0}$F. The control valve is closed at the end of September or when water temperatures in Icicle Creek reach 55 $^{0}$F (Davies pers. comm. 2002). Water drained from Snow Lake enters Nada Lake which

drains into Snow Creek, a tributary to Icicle Creek that enters at rm 5.5. Thus, supplemental flows, ranging from 25 to 30 cfs, from Snow Creek enter Icicle Creek one mile above LNFH's intake system. The supplemental flows enter Icicle Creek downstream of the USGS gauging station (rm 5.8) and are therefore not reflected in the station's flow data. However, Snow Creek's flow is measured by a static, stilling well flow recorder installed and maintained by the USFWS. The USFWS also has discharge estimates from gauging stations located at Snow and Nada Lakes. An average year hydrograph for Snow Creek was developed by ENSR (2000) from data collected at these gauging stations (Figure 5). Snow Creek's flows may also be removed by the District directly into their irrigation canal, as they possess a competing and priority water right to 600 acre feet of bottom storage water from Snow Lake (Appendix A).

C. LNFH's Well System

Groundwater provides the third major component of LNFH's water delivery system (Figure 4). The LNFH operates seven wells, which produce the quality of water needed to sustain the current fish production program (Table 1). The wells are located on the west bank of the hatchery's bypass canal. These wells draw water from two aquifers, one deep and one shallow. The deepwater aquifer is not influenced locally by surface water. Well 5 delivers water from this aquifer while Well 6 has the capacity to draw water from both aquifers. The shallow aquifer is influenced by surface water. Wells 1-4 and 7 draw water from the shallow aquifer. Recharge of the shallow aquifer is affected by how much water is present, and thus percolates into groundwater, in the historic channel and the bypass canal. Water pumped from wells 4, 5, and 6 passes through an aeration chamber before entering the hatchery's pipeline system. Water from wells 1, 2, 3, and 7 directly enter the hatchery's pipeline system at the inside screen chamber. Well water is used to supplement and temper river water to meet production goals. Hatchery production could not be sustained year-around or for long periods of time on either river water or well water alone. When sufficient water is not available for hatchery operations, water may be re-used several times and flow rates in the rearing raceways may be reduced for a limited period of time. These emergency measures may sustain fish production for short periods of time, however, rearing conditions fall below optimum levels. For a typical example of LNFH's combined use of river water, groundwater, and water re-use see Table 6.

## VII. PROPOSED ACTION: LNFH'S WATER SUPPLY SYSTEM REHABILITATION PROJECT

The purpose and need for LNFH's Water Supply System Rehabilitation Project is to provide year-round fish passage past the low head dam at its gravity intake facility, update fish screens at the intake's point of diversion, and replace structural components of the gravity intake facility and water delivery system that are degraded and failing (Figures 10 to 69). The proposed actions will only affect structural components of the gravity intake facility on Icicle Creek. The structural components of the Snow Lake supplementation water supply project and the well system on hatchery property will not be changed. LNFH recognizes that baseline flow conditions, which include operation of four water withdrawal systems, within Icicle Creek may not provide adequate stream conditions for fish during August and September from river mile 2.8 to 4.5. The hatchery has voluntarily included a pump-back system component to its proposed project. The pump-back system will allow the hatchery to return up to 20 cfs of water to Icicle Creek at river mile 4.5. Individual components of the proposed project are described below.

A. Fish Passage at Low Head Dam

Structural components (concrete and steel) of the low head dam will be reconditioned and reinforced as needed. In the area adjacent to the intake, approximately 42 feet of dam crest (height = 1189 ft without flashboards installed) will be demolished and reconstructed with a new crest height of 1188.5 feet in

elevation (Figure 13). This will direct water to the area in front of the new intake and provide for sweeping flows that will direct floating debris past the intake and down river. When the forebay is at or below 1189.0 feet in elevation, the majority of the dam (approximately 145 feet) will be dry except for this lowered section. The lower crest area discharges to the new fish ladder. The new fish ladder will be located adjacent to the original fish ladder (Figures 18, 32, & 34). The original fish ladder, built in the early 1980's, was a concrete pool and weir ladder that filled with debris, rocks, and gravel after just one season. Shortly, thereafter, it was converted to a sediment sluice. This sediment sluice will be lengthened to meet the length of the new fishway and its side walls will be raised in height (Figure 32). The new fishway will be configured as an approximately 100 foot long by 40 foot wide roughened stream channel with a 5% slope. The fishway will be composed of grouted and loose boulders and cobbles. The fishway will include a series of grouted rock weirs and will have loose boulders, smaller rocks, and gravels placed between the grouted weirs that will operate more like a natural stream channel with pools and riffles along its length. The head of the ladder will be at the new lowered dam crest (1188.5 El.). The head of the ladder will feature a shallow pool approximately one foot lower than the upstream dam forebay. A notch will be located in the weir to allow slot passage in addition to jumping over the weir crest. With no flow over the lowered crest, this notch will discharge approximately 6 cfs. When the forebay is at El. 1189.0 (flow through the lowered crest area of the dam), the discharge through this lowered crest section and consequently down the ladder, will be approximately 53 cfs (including notch flow). A supplemental water supply will be built in at the head of the ladder for use during extreme low flow conditions in Icicle Creek when the pump-back system is operating (Figures 25, 32, & 34).

B. Replacement of Intake Structural Components Including Fish Screen

Replacement of structural components at the intake will occur within the original footprint of the facility and all demolition work will be conducted without explosives. The intake at the point of diversion will be reconfigured so that debris and sediment will pass parallel to the face of the entrance rather than perpendicular, as it is currently (Figures 13, 18, & 32). Flow into the intake will be controlled by an electrically actuated headgate which discharges to a conveyance channel leading to a new screen building. All components of the current screen building will be replaced because the existing structure does not meet current federal building codes (Figures 13 & 33 to 39). The fish screens in the new building will be Coanda screens (Figure 47) designed through consultation with NOAA Fisheries (Nordlund 2002 pers. comm.). A Coanda fish screen offers the potential for high-capacity, low maintenance screening of fish and fine debris from water diversions where sediment loads are significant. These structures make use of an inclined wedge wire screen panel installed in the sloping downstream face of an overflow weir. The diverted flow is drawn by gravity and the hydraulic Coanda effect through the screen into a conveyance channel beneath the weir structure, while bypass flow, fish, and debris are carried off at the toe of the screen. This type of screen is substantially self cleaning for most types of debris due to the high sweeping velocity along the screen face. The Coanda screen design was selected because it essentially eliminates the need for direct maintenance vehicle access to the screen building required for more complex mechanical/electrical screen systems; the reduction in the frequency of flooding common with other screen systems; and its projected superior performance with the frazil ice conditions commonly encountered at the intake. The headgate will be operated to maintain a water surface downstream in the conveyance channel at approximately 1188.5 El., critical for the proper performance of the Coanda screens. At this surface elevation, the head on the Coanda screens would be about 115 inches. The headgate maintains the water surface elevation by taking input from a water level sensor reading the water level in the screen building in front of the Coanda screens. During low flow periods, the headgate can no longer control the downstream water surface elevation, the control of which becomes a function of total creek flow and screen settings. The Coanda screens will prevent fish from entering the hatchery's pipeline and guide them efficiently and safely back to Icicle Creek. A fish bypass pipe will lead from the screen structure to an outlet channel located at a point on the creek downstream of the sediment sluice (Figures 18 & 38). The maximum estimated time of

potential fish entrapment from the point of diversion at the intake to the outlet channel, assuming a free floating body, is 70 seconds over a distance of approximately 160 feet.

C. Water Supply Pipeline and Pump-back Pipeline

The water supply pipeline from the intake to the main hatchery facilities is deteriorating rapidly and is no longer efficient or reliable. This section of pipeline, approximately 6,500 feet of 30 to 33"pipe, will be replaced with 6,500 feet of 30 to 36" pipe (Figures 13 to 29). Additionally, a second pipeline for the pump-back system will be placed parallel to this new pipe. The pump-back pipeline will extend from the head of the new fish ladder to the main hatchery grounds, approximately 7,300 feet of 24" pipe. All pipe except for approximately 200 feet of the pump-back pipeline, section connecting to the head of new fish ladder, will lie above the ordinary high water elevation (Figure 32). However, this section of pipe will be in areas that were significantly altered during the construction of the original water delivery system. Also, all pipe will lie within the current pipeline location on hatchery grounds and within easements. The entire length of the water supply pipeline corridor lies above the ordinary high water elevation. The current pipeline and intake structure for Cascade will also be abandoned or removed and replaced (Figures 12, 14, & 29). One 18" pipeline will tie into the hatchery's main supply pipeline and one 18" pipeline will tie into the pump-back line. The tie in will occur near the south end of the Icicle RV Park at approximately Sta. 13+50. These two pipes will be able to carry water from the hatchery's main lines to Cascade's existing irrigation ditch, an approximate distance of less than 50 feet. The intended operation of these two pipelines is that Cascade's priority water right will be delivered to their conveyance system through the hatchery's main supply pipeline. Water will only be delivered to Cascade's conveyance system by the pump-back pipeline upon their voluntary request and agreement with LNFH. All work conducted on Cascade's water supply system will occur within the original footprint and within all easements.

D. Operation of Pump-back Pipeline and Other Components of the Water Supply System

As stated earlier, LNFH recognizes that baseline flow conditions, which include operation of four water withdrawal systems, within Icicle Creek from river mile 2.8 to 4.5 may not provide adequate stream conditions for fish during August and September. The hatchery has voluntarily included a pump-back system component to its proposed project. The pump-back system will allow the hatchery to return up to 20 cfs of water to Icicle Creek at river mile 4.5. The hatchery also has the option to use its Snow Lake supplementation water supply and well system to alleviate low flow conditions in Icicle Creek (rm 2.8 to 4.5). These three systems will be operated, within current water rights and with the primary goal of meeting production responsibilities, to supplement flows in Icicle Creek during August and September. Additional water will be added to ensure that total flows between rm 4.5 and 2.8 do not fall below 20 cfs.

## VIII. PROJECT IMPLEMENTATION

All construction activities will take place on hatchery grounds or within its easements. Construction will occur from March to December 2005 and again from February to December 2006. All in-stream work will occur within the window of time determined by the Washington Department of Fish and Wildlife (WDFW), which typically begins August 1st. Construction will require LNFH to operate on a temporary water supply to maintain and meet production (reduced) goals during both construction time periods. The temporary water supply will be operating from August 1st through December 31st of the first year (August = setup, September = testing, October – December = full operation) and August 1st through December 31st of the second year (August through November = testing and full operation, December = testing and finalizing intake system). While the main water supply is shut down, the temporary water supply system will involve pumping up to a maximum of 54.4 cfs (LNFH & Cascade; dependent on

time of year) from the spillway pool (rm 2.8) to the hatchery's sediment setting basin. However, the hatchery expects to reduce the amount of water pumped to 20 cfs by operating under re-use conditions and potentially reducing production. Pumps will be properly screened and cleaned as necessary to prevent entrapment of fish and sediment and to ensure a reliable water source to the hatchery. All construction activities will occur above ordinary high water except in the following four areas: (1) screen building and bypass outlet channel, (2) point of diversion and sluice area, (3) new fishway (Figure 70), and (4) spillway pool (temporary water supply intake). All these areas have been significantly altered by the original construction of and maintenance of hatchery facilities. Backfill will be placed below ordinary high water in three of the above four areas. In the area of the screen building and bypass channel 130 cy, at the point of diversion and sluiceway 150 cy, and at the new fishway 100 cy of material will be placed. All in-stream work will occur within the window of time determined by the WDFW, which typically begins August 1st. The majority of in-stream work is proposed for the 2006 work window. Coffer dams made of clean fill material will be used to isolate the immediate vicinity of in-stream work areas (Figure 18). The area of impact will be snorkeled for fish presence before cofferdams are placed. Coffer dams will not span the entire channel width allowing for flows and fish to bypass them. Water trapped within the dammed work areas will be pumped back (properly screened) into the main channel. If any fish are inadvertently trapped within the sectioned off work areas, they will be removed by dip-netting or through electrofishing and placed in the main creek channel prior to water removal. As water is drained from the work areas, the areas will be monitored to ensure that no fish are left stranded. All in-stream work will be conducted in the dry, sectioned off stream areas except for the placement of coffer dams. Access to work areas will occur via existing roads and along the pipeline easement. Access to the intake area by Icicle Road may require the need to lower equipment and materials over the steep road embankment. All pipeline removal and placement will occur within the 40 foot wide pipeline easement/corridor. In the past, the pipeline easement has not been honored or maintained. Non-governmental structures that lie within the pipeline easement will be demolished and removed (Figures 13 to 17). Additionally, all vegetation within the easement boundaries will also be removed (clearing and grubbing). Approximately 36 mature (dbh > 20") deciduous and evergreen trees will be removed within the entire project area during clearing and grubbing. Once the pipelines are in place, a minimum of 5 feet of fill (required), from on-site or imported as necessary, will be placed over the pipe for protection. Once construction is complete the pipeline easement will be maintained as a maintenance corridor. This corridor will remain clear of non-governmental structures and vegetation and the pipeline will be protected as necessary. All construction work will occur within the footprint of the current water delivery system and hatchery facilities.

## IX. SPECIES/CRITICAL HABITAT DESCRIPTION

### Steelhead trout (*Oncorhynchus mykiss*)

*Status*

Three steelhead evolutionarily significant units (ESUs) are listed as threatened (Snake River and Lower Columbia River) or endangered (Upper Columbia River) and one ESU is proposed for listing (Middle Columbia River). Threats to steelhead trout include: grazing, water diversions, hydroelectric development, forestry and associated road building (Yee and Roelofs 1980; Platts 1981; Chamberlin 1982) which contributes to habitat degradation (Busby *et al.* 1996); plus failure of natural stocks to replace themselves, genetic homogenization due to hatchery supplementation, and high harvest rates on steelhead smolts in rainbow trout fisheries. On April 30, 2002, the U.S. District of Columbia approved a NMFS Consent Decree withdrawing a February 2000 critical habitat designation for the Upper Columbia River ESU and for 18 other ESU's. Currently, critical habitat is under development.

*Range*

Steelhead trout are found from central California to the Bering Sea and Bristol Bay coastal streams of Alaska. Most streams in the Puget Sound region, and many Columbia and Snake River tributaries have populations of steelhead trout present (Pauley *et al.* 1986). Winter steelhead populations have been documented to occur in the following Washington rivers: Soleduck, Bogachiel, Hoh, Humptulips, Chehalis, Willapa, Cowlitz, Toutle, Kalama, Lewis, Washougal, Nisqually, Puyallup, Green, Snoqualmie, Skykomish, and Skagit (Pauley *et al.* 1986). Summer steelhead populations have been documented to occur in the following Washington rivers: Elwha, Queets, Wynochee, Cowlitz, Toutle, Kalama, Lewis, Washougal, Wind, White Salmon, Klickitat, Walla Walla, Snake, Yakima, Columbia, Wenatchee, Methow, Green, Skykomish, Stillaguamish, and Skagit (Pauley *et al.* 1986).

*Habitat Requirements*

*O. mykiss* exhibit a great diversity of life history patterns, and are phylogenetically and ecologically complex. *O. mykiss* exhibit varying degrees of anadromy, differences in reproductive biology, and plasticity of life history between generations (Busby *et al.* 1996). Different life history forms include anadromous or non-anadromous, winter or summer, inland or coastal groupings, and half-pounder strategies. Steelhead along with cutthroat trout can spawn more than once (iteroparity), all other species of *Oncorhynchus* spawn once and then die (semelparity). North of Oregon repeat spawning is relatively uncommon and more than 2 spawning migrations is rare. Iteroparity occurs predominantly in females (Busby *et al.* 1996). Anadromous forms can spend up to seven years in freshwater and three years in the ocean prior to their first spawning (Busby *et al.* 1996).

In North America, *O. mykiss* is split into two phylogenetic groups, inland and coastal (Busby *et al.* 1996). These two groups both occur in Washington, Oregon, and British Columbia (Busby *et al.* 1996) and are separated in the Columbia and Fraser River systems in the vicinity of the crest of the Cascade Mountains (Reisenbichler *et al.* 1992). Coastal steelhead occur in a diverse array of populations in Puget Sound, coastal Washington, and the lower Columbia River with modest genetic differences between populations (Busby *et al.* 1996). Inland steelhead are represented only by populations in the Columbia and Fraser River basins and consistent genetic differences have been found between populations in the Snake and Columbia Rivers (Busby *et al.* 1996). Inland and coastal forms apply to both anadromous and non-anadromous forms, which means that rainbow trout east of the Cascades are genetically more similar to steelhead from east of the Cascades than they are to rainbow trout west of the Cascades (Busby *et al.* 1996). Large genetic differences between coastal and inland groups have been demonstrated for both anadromous and non-anadromous forms (Busby *et al.* 1996). In Washington, total age of coastal populations at maturity is typically 4 years, with 2 years in freshwater and two years in the ocean. For Columbia River Basin inland populations, total age at maturity is 4 years with 2 years in freshwater, 1 year in the ocean, and 1 year in freshwater as an adult prior to spawning (Busby *et al.* 1996). Steelhead with different run timing (summer or winter) in the same geographic area may be more genetically similar to each other than to fish from another area with similar run timing (Busby *et al.* 1996).

*O. mykiss* have two basic reproductive ecotypes based on the state of their sexual maturity at river entry and the durations of the spawning migration (Burgner *et al.* 1992). These reproductive ecotypes are 1) stream maturing or summer steelhead, and 2) ocean maturing or winter steelhead (Busby *et al.* 1996). Summer steelhead enter fresh water from May to October in a sexually immature state, migrate upstream during the spring and summer, and hold in areas of protected cover such as deep pools, undercut banks, overhanging vegetation or large woody debris or boulder structures until they become sexually mature. These summer steelhead hold over fall and winter in freshwater and spawn the following spring (Pauley *et al.* 1986).

Inland steelhead from the Columbia River Basin, and especially the Snake River Basin, are split into two groups, A- and B-run steelhead. This split is based on a bimodal migration of adult steelhead at Bonneville Dam and differences in age at return and adult size (Busby *et al.* 1996). Adult A-run steelhead enter freshwater from June to August and have predominantly spent only one year in the ocean before returning to spawn (IDFG1994). A-run steelhead occur throughout steelhead bearing streams in the Snake and Columbia River basins (IDFG 1994). Adult B- run steelhead enter freshwater from late August to October, and have predominantly spent two years in the ocean before returning to spawn (IDFG 1994). B-run steelhead are thought to reproduce only in the Clearwater, Mid-fork Salmon, and South Fork Salmon rivers in Idaho (IDFG 1994).

Winter steelhead enter their natal stream in various stages of sexual maturation from November to April and spawn within a few months of entering the river between late March and early May (Pauley *et al.* 1986). Winter steelhead are the most widespread of the two reproductive types. Coastal streams are dominated by winter steelhead, and there are only a few occurrences of inland winter steelhead populations (Busby *et al.* 1996).

Some basins have both summer and winter steelhead present. Where they both occur, they are often separated by a seasonal hydrologic barrier such as a waterfall (Busby *et al.* 1996). It appears summer steelhead occur where habitat is not fully used by winter steelhead, and summer steelhead spawn further upstream than winter steelhead (Withler 1966; Roelofs 1983; Behnke 1992). Almost all inland Columbia River Basin steelhead are summer steelhead. Winter steelhead may have been excluded from the inland Columbia River Basin by a seasonal barrier at Celilo Falls or the great migration distance from the ocean (Busby *et al.* 1996).

Steelhead also exhibit a “half-pounder” life history strategy. Half-pounders are immature steelhead that return to freshwater after only 2-4 months in the ocean (Busby *et al.* 1996). These steelhead over-winter in freshwater and out migrate again the following spring. Occurrence of half-pounder steelhead has been reported to occur in southern Oregon and northern California rivers (Barnhart 1986).

Non-anadromous forms of *O. mykiss* have been called rainbow or redband trout. For example, the inland non-anadromous form is typically called the Columbia River redband trout (Busby *et al.* 1996). Non-anadromous and anadromous forms co-occur more frequently in inland populations than coastal populations (Busby *et al.* 1996) In coastal populations where they co-occur, the forms are usually separated by a migration barrier, either natural or manmade (Busby *et al.* 1996). Where the two forms co-occur, offspring of resident fish may migrate to sea, and offspring of anadromous steelhead may remain in streams as resident fish (Burgner *et al.* 1992; Shapolov and Taft 1954). In the Methow River, Mullan *et al.* (1992) found evidence that due to very cold stream temperatures, juvenile steelhead had difficulty attaining size for smoltification. He concluded that most of the juvenile fish present that do not emigrate downstream early in life, do not grow enough due to the cold temperatures and are hence restricted to a resident life history, regardless of anadromous or non-anadromous parents.

After hatching and emergence, steelhead move to deeper parts of the stream, establish territories, and change their diet from microscopic aquatic organisms to larger organisms such as isopods, amphipods, and aquatic and terrestrial insects that are primarily associated with the stream bottom (Wydoski and Whitney 1979). During rearing, streamside vegetation and submerged cover (logs, rocks and aquatic vegetation) are important. Densities of juvenile steelhead are highest in areas containing in-stream cover because cover provides food, temperature stability, and protection from predators (Narver 1976; Reiser and Bjornn 1979; Johnson 1985). Juvenile steelhead remain in freshwater for 1-4 years before smoltification. In areas where anadromous and non-anadromous forms co-occur in sympatry, habitat partitioning occurs (Allee 1981). Smoltification may be initiated by environmental factors such as photoperiod, water temperature, and water chemistry (Folmar and Dickhoff 1980; Wedemeyer *et al.* 1980). Steelhead remain in the ocean for 2-3 years, occasionally for 4 years (Shapolov and Taft 1954).

Distribution in the ocean is hard to track due to a lack of school formation and steelhead do not use areas where commercial harvest of other Pacific salmon stocks occur (Pauley *et al.* 1986). Distribution at sea appears to be influenced by surface water temperature and conforms closely to the $5^0$C isotherm on the North and the $15^0$C isotherm on the south (Sutherland 1973).

*Upper Columbia River Steelhead Trout ESU*

This ESU occupies the Columbia River Basin upstream from the Yakima River, and includes the Wenatchee, Entiat, Methow, and Okanogan River basins (Busby *et al.* 1996). This ESU also includes Wells Hatchery stock. All upper Columbia River steelhead are summer steelhead (Busby *et al.* 1996). Streams of this region drain the northern Cascade Mountains of Washington and flow is provided by glacial runoff or snowmelt. This results in extremely cold water temperatures that can retard growth and maturation of juveniles, hence some of the oldest smolt ages, up to 7 years, are reported within this ESU and residualization of juvenile steelhead that fail to smolt also occurs (Busby *et al.* 1996). The relationship between anadromous and non-anadromous *O. mykiss* is unclear in this geographic area. NMFS is listing only the anadromous life forms of *O. mykiss* in this ESU (NMFS 1997). However, on May 28, 2002 NOAA Fisheries (formerly NMFS) proposed to change UCR steelhead, whose population includes resident rainbow trout, from endangered to threatened. Only naturally spawned populations of steelhead and their progeny that are part of the biological ESU residing below long-term, natural, and man-made impassable barriers (i.e. dams) are listed (NMFS 1997). The Wells Hatchery stock of steelhead is included in this ESU because it is essential for recovery, as it probably retains the genetic resources of steelhead populations above Grand Coulee Dam that are now extinct from their native habitats (NMFS 1997).

*Icicle Creek Steelhead*

Evidence suggests that historically Icicle Creek produced wild steelhead (Brennan 1938, Fulton 1970, Mullan et al. 1992). However, the present population size of wild steelhead native to this creek is unknown. In 1941, the first release of hatchery steelhead occurred in Icicle Creek. LNFH raised summer steelhead from 1940-1951 and from 1977-1995 with the last release in 1997. The brood stock for the program was collected at Rock Island Dam and in low return years, supplemental eggs from Wells State Fish Hatchery were used. The program was ended at LNFH and moved to Winthrop National Fish Hatchery because of an inadequate water supply, low adult returns, and concern over using non-Wenatchee River stocks (USFWS 1998). Between 1978 and 1997, a total of 1,372,789 steelhead were released into Icicle Creek. All releases occurred below the hatchery. Also, since 1982, the Washington Department of Fish and Wildlife (WDFW) has released 331,657 hatchery summer steelhead into Icicle Creek, either at or below LNFH and approximately 3.7 million into the Wenatchee River Basin. All hatchery produced steelhead since 1986 have been marked by adipose clipping before release. The percentage of wild steelhead in the adult returns to LNFH for the years 1987, ‘88, ‘91, and ‘93 averaged 21% (range = 4-41%) (USFWS 1998). In 1999 and 2000, thirty-two and twenty-three, respectively, steelhead were captured in the ladder at LNFH. Four (‘99) and one (‘00) of these were not adipose clipped and may have been wild steelhead. In both years several steelhead redds were observed in the lower Icicle below LNFH. Additionally, in 2000, one radio tagged female steelhead from Icicle Creek was identified by the Chelan Public Utility District in the vicinity of Rock Island Dam approximately 10 days after release. This steelhead may have been a kelt returning to the ocean (USFWS 2001a). In 2000, WDFW conducted a steelhead spawning ground survey from March 3$^{rd}$ to May 20$^{th}$ in the lower Icicle, downstream of LNFH. Twenty redds and twenty adults were observed with an estimated total number of adult steelhead ranging from 40 to 50 (Viola pers. comm.). In 2001, WDFW recorded 19 steelhead redds between April 2$^{nd}$ and June 4$^{rth}$ in lower Icicle Creek (Viola pers. comm.).

Chinook Salmon (*Oncorhynchus tshawytscha*)

*Status*

Three Chinook salmon ESUs are listed as threatened (Snake River fall and spring) or endangered (Upper Columbia River) and two ESUs are proposed for listing (Lower Columbia River and Puget Sound). On April 30, 2002, the U.S. District of Columbia approved a NMFS Consent Decree withdrawing critical habitat designations established in February 2000. Threats to the Chinook salmon ESUs include watershed development such as forest practices, mining, agricultural land use, urbanization, hydropower development, and water manipulation and withdrawal. Over fishing, artificial propagation, and introduction of non-native species has also impacted Chinook salmon ESUs. Forest practices, mining, agricultural land use, urbanization, hydropower development, and water withdrawal have resulted in increased sedimentation, changes in flow regimes and channel morphology, decreases in water quality and quantity, loss of riparian habitat, loss of large woody debris and recruitment, higher water temperatures, decreased gravel recruitment, reduction in pools, reduction in spawning and rearing areas, rerouting of stream channels, degradation of stream banks, and loss of estuarine rearing areas (Bishop and Morgan 1996, Myers *et al.* 1998). These changes have impacted the spawning and rearing environment of Chinook salmon. Harvest and hatchery practices and the introduction of nonnative species have also impacted the expression of the varied life history strategies of Chinook salmon within these ESUs.

*Range*

In North America, the historical range of Chinook salmon extends from the Ventura River in California to Point Hope, Alaska. In northeastern Asia, the historical range extends from Hokkaido, Japan to the Anadyr River in Russia (Scott and Crossman 1973).

*Habitat Requirements*

The generalized life history of Pacific salmon involves incubation, hatching and emergence in freshwater, migration to the ocean, and subsequent initiation of maturation and return to freshwater for completion of maturation and spawning (Myers *et al.* 1998). Chinook salmon exhibit two generalized freshwater life history types, "stream-type" and "ocean-type" (Gilbert 1912). There is further life history variation within each type which allows full utilization of freshwater, estuarine, and ocean environments (Spence *et al.* 1996). In order to successfully complete these life history strategies, Chinook salmon need access to freshwater, estuarine, coastal and open ocean environments. In these environments they require adequate: water quantity, quality, temperature, and velocity; substrate, cover and shelter, food resources, riparian vegetation, space, and safe passage conditions. The range of ocean residence for Chinook salmon is from 1-6 years. A small proportion of yearling males, called "jacks" mature in freshwater and return after 2-3 months in saltwater (Myers *et al.* 1998; Spence *et al.* 1996). In general Chinook salmon spawn in small to medium-sized rivers, however they may also spawn in larger river systems such as the main-stem Columbia River (Spence *et al.* 1996).

Stream-type Chinook salmon, which is characteristic of spring fish (Spence *et al.* 1996), reside as fry or parr in freshwater for a year or more before migrating to sea. They perform extensive offshore oceanic migrations and return to their natal river during the spring and early summer, several months prior to spawning. (Healey 1991). Stream-type Chinook salmon tend to enter freshwater as immature or "bright" fish, migrate far upriver, and use upper watersheds for spawning in late summer and early autumn (Myers *et al.* 1998). Stream-type juvenile Chinook salmon exhibit downstream dispersal and utilize a variety of freshwater rearing environments during their one to two years of freshwater rearing before migration to the ocean (Meehan and Bjornn 1991). Stream-type juvenile Chinook salmon fry feed on drift insects (Rutter 1904, cited in Allen and Hassler 1986) but zooplankton are more heavily preyed on in main river systems and estuaries (Allen and Hassler 1986). As Chinook salmon grow they move from shallow littoral habitats into deeper river channels and their prey base changes from shallow epibenthic prey to larger pelagic species (Allen and Hassler 1986). Cool, clean water and diverse habitat

that provides pools, riffles, off-channel habitat, undercut banks, and large woody debris or boulder structures that provide cover and shelter from predation and storm events are important habitat elements. Riparian vegetation provides the following to Chinook salmon rearing: shade for temperature regulation, vegetation inputs for food resources, stream bank stabilization from roots and large woody debris recruitment. Stream-type life history strategies may be adapted to watersheds or parts of watersheds that are more productive and less susceptible to dramatic changes in water flow, since the long rearing period requires more stable less degraded habitats (Miller and Brannon 1982, Healey 1991). ESUs with stream-type life history strategies are: upper Columbia River spring ESU; and the Snake River spring/summer ESU (Myers *et al* 1998).

*Upper Columbia River spring Chinook salmon ESU*
This ESU includes stream-type Chinook salmon spawning above Rock Island Dam in the Wenatchee, Entiat, and Methow Rivers. All Chinook salmon in the Okanogan River are considered ocean-type and are considered part of the Upper Columbia River summer and fall ESU (NMFS 1998a). Only naturally spawned Chinook salmon are proposed for listing at this time. The brood stock returning to LNFH is not listed. Additionally, Icicle Creek does not support listed UCR spring Chinook salmon (NOAA Fisheries 2003).

*Icicle Creek Spring Chinook*
Spring Chinook entering Icicle Creek are primarily adults returning to LNFH. One wild stray from the Chiwawa River stock entered LNFH in 1994. LNFH has raised spring Chinook since 1940. The original Leavenworth stock was collected at Rock Island Dam (1940-1943) and supplemental eggs have been imported from other Columbia River hatcheries, mainly Carson, Cowlitz, and Little White Salmon NFH. Since 1985, no eggs or fish have been imported to LNFH (USFWS 1998). The production goal for the hatchery is 1,625,000 fish. The average adult return to LNFH from 1980 to 1997 is 3,425 (range = 462-7,232). From 1984-1997, LNFH's contribution to the Wenatchee sub-basin spring Chinook run averaged 49% (range = 28.8-69%)(USFWS 1998). Spring Chinook returning to Icicle Creek not only provide the broodstock for LNFH but also allows for a sport and tribal fishery.

The Leavenworth spring Chinook stock is not listed under ESA, however, wild strays may enter Icicle Creek. Wild, ESA listed spring Chinook spawn in Nason Creek, and in the Chiwawa, Little Wenatchee, upper main Wenatchee, and White Rivers (Chapman *et al*. 1994). Spring Chinook also spawn in the lower Icicle. From 1989 - 1993 an average of 41 (range = 24-53) and from 1994-1999 an average of 14 (range = 6-33) spring Chinook redds were counted in lower Icicle Creek below LNFH (Mosey and Truscott 1999; Mosey pers. comm.). These naturally spawning spring Chinook are thought to be of LNFH origin (Peven and Mosey 1996).

## X. CURRENT CONDITION OF HABITAT

Following is a discussion of the current habitat conditions in Icicle Creek from its confluence with the Wenatchee River to its headwaters located at Lake Josephine. The current condition of habitat has been evaluated in terms of the USFWS Matrix of Diagnostics/Pathways and Indicators. For a summary of baseline habitat conditions see Table 2.

### A. Water Quality

#### 1. Temperature

High and low temperature extremes occur in all reaches of Icicle Creek. Icicle Creek is on the Washington State 303(d) Clean Water Act list for not meeting temperature criteria (WRWSC 1998). Water temperatures in summer months can exceed $15^0$C ($59^0$F) and during the winter temperatures can fall below $1^0$C ($34^0$F) (WRWSC 1998). Temperatures as high as $21^0$C ($70^0$F) have been recorded in Icicle Creek (Mullan *et al.* 1992). The USFS 1994 stream survey conducted from August 13 - October

17 reported a maximum temperature of $18^0$C ($64^0$F) and a minimum of $8^0$C ($47^0$F) with temperatures in river miles 4.8 to 17 not meeting Forest Plan standards. The USFS stream temperature monitoring (1997) information indicates that temperatures in Icicle Creek exceeded the Wenatchee National Forest and Washington State Water Quality standards on 15 days for the maximum temperature and 37 days for the seven day average temperature. This happened in 1997 when low flows were relatively high all year due to the extensive snow pack that was received the previous winter. Water temperatures are highest in August.

High water temperatures can reduce the biotic potential of a stream by reducing the amount of dissolved oxygen and increasing metabolic reactions (Horne and Goldman 1994). For example, as temperatures increase, fish growth decreases. High temperatures decrease salmonid production (Bjornn and Reiser 1991). Bull trout distribution is limited if temperatures exceed 54.5 $^0$F (15 $^0$C) and optimum temperatures for bull trout incubation are 35.6-39.2 $^0$F (2-4 $^0$C) and for rearing are 44.6-46.4 $^0$F (7-8 $^0$C) (Rieman and McIntyre 1993). The temperature regime of Icicle Creek has not been fully documented. However, available data shows that overall Icicle Creek does not meet the water temperature requirements for bull trout incubation, rearing, or spawning and could limit bull trout production. Steelhead prefer temperatures of 50-55.4 $^0$F (10-13 $^0$C) and their lethal limit is 75.2-86 $^0$F (24-30 $^0$C) (Bjornn and Reiser 1991). Temperatures during steelhead spawning are well within the accepted range but are often exceeded for migration and rearing. Fish may migrate downstream to the Wenatchee River to avoid unfavorable conditions; however, this river is also on the state's 303(d) list for not meeting temperature standards. Water temperatures in the mainstem Wenatchee River may fall below $1^0$C during the winter and rise above $15^0$C during the summer (WRWSC 1998).

This criteria is rated, from the available data, as **Not Properly Functioning**.

2. Sediment/Turbidity

Data on fines (<0.85mm) in gravel has not been collected in Icicle Creek. Related information is presented below.

High sediment loads occur and historically occurred in Icicle Creek. All of the dominant land types in the Icicle Creek watershed have high sediment delivery hazards and background hill slope erosion rates for the watershed are high and estimated to total over 4,500 tons/year (USDA 1995). Sediments are filling pools and embedding channel substrates. USFWS biologists conducted five Wolman (1954) pebble counts in the stream restoration project below LNFH in 1998 and 1999. Salmon have been documented spawning in the restoration project area. The amount of substrate less than 2mm in size ranged from 13 to 32% with an average of 24% in 1998 and 6-26% with an average of 18% in 1999. Additionally, pebble counts were conducted in spawning gravel patches in the lower reach. Substrate less than 2mm in size in these patches ranged from 3 to 9%. Sediment in spawning gravels was not assessed during the USFS 1994 stream survey. However, high sediment delivery rates were reported in a majority of the upper reaches surveyed. The surveyors also reported that sedimentation appeared to be a problem throughout the system. USFWS biologists conducted four pebble counts in the upper reaches of the Icicle in 1999 during a spawning gravel survey. The amount of substrate less than 2mm in size recorded in these counts ranged from 0 to 15 percent.

Sediment loading is mainly due to urbanization, clearing of riparian zone vegetation, recreational use, road building, logging, landslides, fires, and flooding. Eleven percent of the riparian vegetation along the lower portion of Icicle Creek, below LNFH, has been removed for housing developments (WRWSC 1998). Approximately 12% of Icicle Creek's watershed was burned by forest fires in 1994 (USFS 1994). These forest fires have and will continue to increase sedimentation in Icicle Creek (WRWSC 1998). Approximately 5% of the Icicle Creek watershed, outside of the Wilderness boundary, has been impacted by logging (USFS 1994). Also, natural landslides often occur in this drainage. Recently, in

June 1999, a landslide occurred in the watershed on a flanking slope of the draw that descends from Icicle Ridge. The failure was approximately 120 feet wide and 300 feet long with a slide plane that was 10-15 feet below the pre-failure surface. The slide began at an elevation of 4800 feet. Consequently, the resulting volume of material delivered to the valley bottom (Icicle Creek) was many times greater than the initial failure. The main body of the failure remains unstable (Karrer pers. comm.).

This criteria is rated, from the available data, as **Functioning at Risk**.

3. Chemical Contamination/Nutrients

Icicle Creek is on the Washington State 303(d) Clean Water Act list for not meeting temperature, dissolved oxygen, pH, in-stream flow (WRWSC 1998), and total PCB concentration (WDOE 2004) criteria. Water quality standards for Icicle Creek, a Class AA stream, are listed in Table 5. Water quality data for Icicle Creek has been collected over the years as a component of the Wenatchee Watershed Planning Project. Water quality samples were collected from Icicle Creek (rm 1.5 & rm 9.3) on the same day and at least once per month. The data for 1992 - 1993 and 1995 - 1996 indicates similar profiles with respect to dissolved oxygen, pH, and temperature between both stations. Minimum dissolved oxygen levels (> 9.5 mg/L) were met 69% of the time at the upper station and 72% of the time at the lower station. The standard range of pH (6.5 - 8.5) was achieved 28 of 30 times (93%) at both stations. Temperature standards (< 16 $^{0}$C) were met in all samples (WRWSC 1996). Between 1997 and 1999, the Environmental Protection Agency and WDOE sampled fish tissue from Icicle Creek spring Chinook salmon and mountain whitefish for contaminants (WDOE 2004). Total PCB concentrations in fish tissues exceeded criteria. DDT analogs were also detected but concentrations did not exceed criteria. The contaminant source in unknown and under investigation.

This criteria, it is rated as **Functioning at Risk**.

B. Habitat Access

1. Physical Barriers

The original design of LNFH involved diverting the majority of Icicle Creek's flow through a canal with an energy control dam at the base and construction of holding dams and weirs in the historic creek channel (Figure 2). These structures effectively block fish passage (at approximately rm 2.8) to the upper Icicle and are no longer needed for hatchery production operations. During several months of the year, downstream fish passage to the lower Icicle may also be hindered by structures in the historic channel and little to no flow in the canal. Upstream and downstream fish passage through LNFH for native species will be provided once the Icicle Creek Restoration Project is complete. Completion of this project could occur as soon as December 2005. However, completion is dependent upon securing funding and permits.

Two water diversions in Icicle Creek upstream from LNFH at river mile 4.5 and 5.7 may present fish passage problems. LNFH's intake (rm 4.5) may block fish passage at low flows. There are also several natural fish passage obstacles in Icicle Creek above LNFH (Figure 3). However, none have been proven to be year-round fish migration barriers.

This criteria is rated, from the available data, as **Not Properly Functioning**.

C. Habitat Elements

1. Substrate

High sediment loads occur and historically occurred in Icicle Creek. All of the dominant land types in the Icicle Creek watershed have high sediment delivery hazards, and background hill slope erosion rates for the watershed are high and estimated to total over 4,500 tons/year (USDA 1995). Sediments are filling pools and embedding channel substrates. Visually assessed substrate embeddedness in the lower reaches of Icicle Creek is greater than 30%. The USFS 1994 Icicle stream survey of the upper Icicle reported that all reaches had embedded substrate with the percentage of units embedded per reach ranging from 31 - 100%.

From the available data and professional judgment, this criteria is rated as **Not Properly Functioning**.

2. Large Woody Debris

In the winter of 1998, USFWS biologists surveyed the lower 2.8 miles of Icicle Creek. In this section, woody material is limited with only 4-10 pieces of wood observed. Urbanization, livestock grazing, and road building in the lower part of Icicle Creek has reduced the riparian zone in structure and function. Eleven percent of the riparian vegetation along the lower portion of Icicle Creek, below LNFH, has been removed for housing developments (WRWSC 1998). Thus, sources for short and long-term recruitment of large woody debris are lacking. Stream reaches in upper Icicle Creek do not meet Northwest Forest Plan standards for large woody debris per mile (USFS 1994). Higher elevation stream reaches contain more woody debris. However, these reaches are in the Alpine Lakes Wilderness and must meet west side criteria (USFS 1994). In the USFS 1994 stream survey, LWD was measured in terms of Northwest Forest Plan standards. From information presented in the survey report, it appears that three of the six reaches surveyed meet the matrix criteria for LWD. Sources for short and long-term recruitment have been reduced by human and natural activities in the upper Icicle.

Woody material plays an important role in defining stream habitat characteristics. Woody material in a stream functions to provide cover and refuge for stream inhabitants, creates deeper areas, dissipates energy, protects stream banks, captures substrate, provides nutrients to the stream, and slows the movement of organic matter.

This criteria is rated as **Functioning at Risk**.

3. Pool Frequency

The wetted width of lower Icicle Creek falls within the range of 40 to 65 feet. Recommended pools per mile for streams this wide is 23 to 26. This criteria is not met. The pools that do exist are deep, > 1 meter, however, there is no cover for fish other than depth. Lower Icicle Creek lacks features such as woody debris and large boulders that function in pool creation and maintenance. Pool volume has been reduced by deposition of fine sediments. Summer pool water temperatures are not known but temperatures in excess of 21$^{o}$C have been reported for Icicle Creek (Mullan *et al.* 1992). The pool frequency and quality in the upper Icicle does not meet Forest Plan standards (USFS 1994). Additionally, a review of the 1994 stream survey data shows that all reaches of the upper Icicle do not meet the matrix criteria for pool frequency. Portions of the upper Icicle lack in woody debris which promotes pool creation and maintenance. Pool water temperatures are not known, but low and high temperatures have been recorded in the watershed.

Pools play an important role in dissipating stream energy in addition to providing habitat for stream organisms. The limited number of pools may be a problem for stream inhabitants, especially young fish, during the winter. However, adult fish could be affected all year long by the lack of pools because of their size. Suitable habitat such as low velocity areas with adequate in-stream cover is the main factor regulating fish populations in the winter. Fish select over-wintering habitat based on minimizing energy expenditure and avoiding adverse physicochemical conditions such as ice, mid-winter flood events, and low dissolved oxygen (Cunjak 1996). Juvenile fish can utilize a wide range of in-stream cover such as woody debris, substrate, vegetation, undercut banks, and depth to avoid adverse conditions. For example juvenile cottids, cyprinids, centrarchids, and several salmonids including Chinook salmon and rainbow trout utilize cobble/boulder in-stream cover for shelter where substrate diameter is directly proportional to fish size (Rimmer *et al.* 1984, Cunjak 1988). Adult fish, because of their larger body size, are limited to using depth for in-stream cover. Thus, deep pools are important over-wintering habitats for adult fish. The amount and complexity of winter habitat in a stream determines its carrying capacity for resident fish populations. Consequently, Icicle Creek's fish production may be limited by the number of available over-wintering habitats.

This criteria is rated, from the available data, as **Not Properly Functioning**.

4. Pool Quality

Even though Icicle Creek does not meet pool frequency standards (see above), the available data shows that all reaches of Icicle Creek contain a few large pools with residual depths greater than 1 meter deep.

Icicle Creek is **Functioning at Risk** for this indicator.

5. Off-channel Habitat

In lower Icicle Creek there are few backwater areas and low energy off-channel areas. Off-channel habitat in the lower Icicle is limited mainly by residential development and road building. For example, there are several off-channel areas along East Leavenworth Road that are no longer connected to the stream. USFS stream survey data (1994) shows that 72% of upper Icicle Creek contains an adequate and diverse amount of off-channel habitat. Many side-channels, backwater areas, ponds, wetlands, and oxbows occur.

Overall, this criteria is rated as **Properly Functioning**. However, in lower Icicle Creek, below rm 2.8, this criteria is Not Properly Functioning.

6. Refugia

This criteria is directly related to the off-channel habitat indicator above. This criteria also considers human impacts and habitat connectivity within the watershed. In the lower Icicle off-channel habitat is limited in quantity and connectivity and there is a high rate and potential of human impacts. In the upper Icicle there is an adequate and diverse quantity of off-channel habitat. Distribution and connectivity of high quality habitat is moderate and the level of human activity, mainly recreation, is high.

Overall, this criteria is rated as **Functioning at Risk**. However, in lower Icicle Creek, below rm 2.8, this criteria is Not Properly Functioning.

D. Channel Condition and Dynamics

1. Width/Depth Ratio

Data on width/depth ratios has not been fully documented in Icicle Creek. Related information is presented below.

Rivers and streams act as indicators of environmental stress when sediment supply and channel adjustments occur due to deforestation, changes in vegetation composition, urbanization, road building, and other watershed activities that create their cumulative impacts on river and stream systems. For example, in the lower reach of Icicle Creek, channel features are not being maintained over time and deposition and erosion are occurring causing it to be in a state of flux. This instability is a result of Icicle Creek adjusting to natural and human impacts to achieve a stable dimension, pattern, and profile that are in equilibrium with its gradient, sediment supply, and discharge. Channel width/depth ratios in lower Icicle Creek are increasing and entrenchment ratios are decreasing in response to increases in sediment supply and bank instability, decreases in riparian vegetation structure and function, and changes in flow regime. Consequently, the creek is becoming shallower and wider. Reaches in upper Icicle Creek are functioning adequately except in areas where roads and bridges confine the stream channel and where riprap has been placed. Five site specific areas, at road mile 4.6-5.1, 9.9-10.1, 10.7-10.8, 13.6-14.1, and Ida Campground, exist where the road system has confined the stream channel and has cut off the floodplain.

From the data available and professional judgment, this criteria is rated as **Functioning at Risk**.

2. Stream Bank Condition

Urbanization, livestock grazing, and road building in the lower part of Icicle Creek has reduced the riparian zone in structure and function. Eleven percent of the riparian vegetation along the lower portion of Icicle Creek, below LNFH, has been removed for housing developments (WRWSC 1998). Many large areas of the stream's banks were eroded during the 1995/96 winter floods (WRWSC 1998). In upper Icicle Creek, bank erosion ranges from minimal in most reaches to 11% in one reach (USFS 1994a).

From the available qualitative and quantitative data, this criteria is rated, overall, as **Properly Functioning**. However, in lower Icicle Creek, below rm 2.8, this criteria is Not Properly Functioning.

3. Floodplain Connectivity

This criteria is strongly related to the off-channel and refugia indicators.

Off-channel habitat in the lower Icicle is limited mainly by residential development and road building. For example, there are several off-channel areas along East Leavenworth Road that are no longer connected to the stream. In several areas of the lower reach, riprap has been placed on stream banks and berms have been built to confine the stream and limit flood damage. Additionally, in several areas of the lower reach, wetlands have been reduced either through draining and/or filling them. Floodplain connectivity is limited in upper Icicle Creek in areas where roads and bridges confine the stream channel and where riprap has been placed. Five site specific areas, at road mile 4.6-5.1, 9.9-10.1, 10.7-10.8, 13.6-14.1, and Ida Campground, exist where the road system has confined the stream channel and has cut off the floodplain.

Overall, this criteria is rated as **Functioning at Risk**.

E. Flow/Hydrology

1. Change in Peak/Base Flows

Icicle Creek is listed under the Washington state 303(d) Clean Water Act for not meeting in-stream flow standards (WRWSC 1996). In-stream flow standards for Icicle Creek, a Class AA stream, are listed in Table 5. Information in the Watershed Ranking Project shows that measured flows did not meet surface water quality standards contained in Chapter 173-201A of the Washington Administrative Code (WAC) almost 45% of the time. The assessment found that WAC in-stream flow levels are not met for 66 days on average from August to October. However, these flow standards were set in 1983 and priority water right holders, which includes LNFH, Cascade, City of Leavenworth, and the District, are not constrained by these requirements. The WAC in-stream flow standards were established as the basis from which future (post-1983) water acquisition request would be evaluated.

Surface flows of Icicle Creek are continuously measured at a USGS gauge station (# 12458000) located at rm 5.8. This gauging station is located above all water withdrawal operations in the watershed. This is the only consistently monitored flow data available for Icicle Creek. Daily mean flow data for water years 1936 to 1971 and from 1993 to present are available from the USGS office in Spokane. Real-time data are currently not available. There is no gauging station data available for the 1971 - 1992 water years. The available data from water years 1937-1999 show the annual mean flow of Icicle Creek, at the gauging station, to be 630 cfs. The lowest daily mean flow at this location was 44 cfs, recorded on November 30, 1936, and the highest daily mean was 14,100 cfs, recorded on November 29, 1995. In general, lowest daily flows are experienced during September and October although daily mean flows of less than 100 cfs have occurred September through February. Most high flow events occur in May-June (95%) with 5% in late fall (USFS 1995). For the monthly maximum and minimum flows in Icicle Creek based on the average water year see Figure 6.

The discharge of Icicle Creek is altered by water diversions, which can reduce the flow in the lower reaches to very low levels during the summer and early fall (WRWSC 1998). The City of Leavenworth and the Icicle-Peshastin Irrigation District divert water above the Snow Lakes trailhead (rm 5.7) and LNFH and Cascade Irrigation Company divert water below the trailhead (rm 4.5). Irrigation diversions can remove 48% and 79% of the mean August and September flows, respectively (Mullan *et al.* 1992). To assure cold water for LNFH in dry summers, a supplementary water supply (16,000 acre feet) was developed in Upper Snow Lake, about seven miles from LNFH and one mile above it in elevation. Without the water release of approximately 25 to 30 cfs from Upper Snow and Nada Lakes, the downstream reaches of Icicle Creek may go dry in some years. The District may also supplement Icicle Creek flows from other storage lakes in the watershed (see Appendix A). A key point to remember is that discharge data from the USGS station represents flow in Icicle Creek before any substantial consumptive use occurs and in fact, during some summer months, may reflect some level of water supplementation from storage lakes. In addition, the USGS gage data does not reflect natural and supplementation flows from Snow and Nada Lakes which enter Icicle Creek through Snow Creek at rm 5.4, downstream of the gauging station. All water diversions and supplementations in Icicle Creek have occurred since 1942 (Cascade Orchards 1905, District 1910, City of Leavenworth 1912, LNFH 1942).

In Icicle Creek there is a potential change in peak/base flows due to increases in surface runoff from residential development, roads and trails, logging, landslides, and fires. Some change in flow is likely to have occurred due to recent forest fires (44,500 acres burned in the Icicle Creek watershed during July, 1994), but flow data from the USGS gauging station shows no greater variation in flow during the two years following the fires than has occurred since 1936.

Overall, this criteria is rated as **Not Properly Functioning** in Icicle Creek.

2. Increase in Drainage Network

No data is available describing increases in the drainage network of Icicle Creek. Related information is presented below.

There is a strong correlation between increases in roads and other hard surfaces (i.e. buildings, parking lots, roof tops etc.) and increases in drainage network (Leopold pers. comm. 1997). In Icicle Creek commercial and residential development and road and trail building has likely increased the drainage network.

This criteria is rated as **Functioning at Risk**.

F. Watershed Conditions

1. Road Density and Location

Currently, the open road density in the Icicle Creek watershed averages 0.4 road miles per square mile (Driscoll pers. comm. 2001), which is better than the desired condition of 1 mile per square mile. However, in the lower Icicle the road density is much higher than the watershed average. There are many valley bottom roads in all reaches of Icicle Creek.

From the available data and professional judgment, this indicator, at a watershed scale, is rated as **Properly Functioning**.

2. Disturbance History

The Icicle Creek watershed has a long history of human impacts beginning with sheep herding and mining in the late 1800's. Recent uses include timber harvest, road building, fire suppression, campground development, private residences, commercial development, and recreation. Five percent of Icicle Creek's watershed, outside of the Wilderness boundary, has been directly impacted by logging (USFS 1994). Road building has occurred for development, recreation, and timber harvest. Over 11% of the vegetation along lower Icicle Creek has been removed from private property (WRWSC 1998). The Icicle Creek watershed is a popular recreation area for hikers, rock climbers, fishermen, and many others. Natural disturbances such as fires and landslides are prevalent in the watershed. Recently, the 1994 forest fires burned 12% of the watershed (USFS 1994). In 1999, a landslide introduced a large quantity of sediment into the Icicle just above Snow Creek. In the Icicle Creek watershed, land development, road and trail building, natural disturbances, and the majority of recreation occurs within riparian reserves and along side Icicle Creek and its tributaries.

Overall, this criteria is rated as **Functioning at Risk**.

3. Riparian Conservation Areas

This criteria is related to several habitat elements already discussed such as large woody debris, refugia, road density and location, and habitat connectivity. These elements are functioning between appropriately and at risk within the watershed.

The structure and function of the riparian zone has been reduced throughout the watershed. Riparian vegetation has been reduced and removed from urbanization, commercial development, roads and trails,

timber harvest, campground development, and other human impacts. Natural disturbances such as fires and landslides have also impacted the riparian zone. In impacted areas, cover from shade and large woody debris recruitment as been reduced (USFS 1994). In many impacted areas, especially along roads, invasive weeds (ex. knapweed) have been established.

At a watershed scale, this criteria is rated as **Functioning at Risk**.

4. Disturbance Regime

In the Icicle Creek watershed natural disturbances are prevalent. In 1994, forest fires burned 12% of the watershed (USFS 1994). From 1996 to 1999, five landslides/avalanches occurred in the watershed. The flow regime of Icicle Creek is variable and flashy. Floods and droughts occur frequently. The measured flow in Icicle Creek ranges from a minimum of 44 cfs to a maximum of 14,100 cfs according to readings taken from the USGS gauging station located above all the major water diversions. Pool habitat is limited in Icicle Creek and off-channel habitat is limited except in the upper reaches. Natural processes are unstable in the lower reaches and in several areas of the upper Icicle. Icicle Creek has a long and continuing history of human impacts in the watershed.

At a watershed level, this criteria is rated as **Functioning at Risk**.

## XI. ANALYSIS OF POTENTIAL EFFECTS

### A. Steelhead trout (*Oncorhynchus mykiss*), Upper Columbia River ESU

Potential effects, positive and negative, to steelhead may occur during the rehabilitation and operation of the LNFH's surface water supply system. During the use of the temporary water supply, steelhead encountering the pump screens may be injured or entrained in the system. This possibility is unlikely as the pumps will be properly screened according to current federal and state regulations and will be kept free of debris. During in water work at the intake area, steelhead may be affected by the placement of cofferdams and removal of water from the work areas. These potential effects will be minimized or eliminated in many ways. The area of impact will be snorkeled for steelhead presence before cofferdams are placed. Cofferdams made of clean fill material will isolate work areas but will not span the entire channel width allowing for flows and fish to bypass them (Figure 18). Water trapped within the dammed work areas will be pumped back (properly screened) into the main channel. If any fish are inadvertently trapped within the sectioned off work areas, they will be removed by dip-netting or through electrofishing and placed in the main creek channel prior to water removal. As water is drained from the work areas, the areas will be monitored to ensure that no fish are left stranded. All in-stream work, except for the placement of cofferdams, will be conducted in the dry, sectioned off stream areas. Additionally, all in-stream work will occur within the window of time determined by WDFW. Construction activities below ordinary high water may increase turbidity and may affect steelhead in the immediate vicinity of those activities. Effects due to an increase in turbidity are unlikely as in-stream work will be conducted in the dry and sediment controls such as silt fencing will be used as necessary. Rehabilitation of the point of diversion and updating fish screens will significantly minimize fish entrapment in the system and virtually eliminate fish entrapment in the main surface water supply to the hatchery from current conditions. The Coanda screens will prevent fish from entering the hatchery's pipeline and guide them efficiently and safely back to Icicle Creek. A fish bypass pipe will lead from the screen structure to an outlet channel located at a point on the creek downstream of the sediment sluice (Figures 18 & 38). The maximum estimated time of potential fish entrapment from the point of diversion at the intake to the outlet channel, assuming a free floating body, is 70 seconds over a distance of approximately 160 feet. Steelhead migrating downstream that do enter the surface water supply system at the point of diversion will encounter the Coanda screens. If water elevation levels at the

Coanda screens are not met, steelhead may be harmed (descaled, injured) on dry sections of the screen. It is highly unlikely that this will occur. The proposed Coanda screens have been designed to meet current fish screening criteria and water levels at the screens will be monitored through sensors. Construction of the new fishway will be conducted in the dry as mentioned above. The new fishway will provide low flow passage which currently may be unavailable. Thus, efficient upstream and downstream fish passage will be possible year-round by the headworks of the hatchery's surface water supply. Additionally, water piped during low flow times (August and September) of low water years to the head of the new fishway through the proposed pump-back system will provide fish passage and increase habitat in the stream reach affected by all water diversions. The quality of habitat in this reach may be improved through the combination of cooler water being supplied from Snow Lake and the pump-back system.

In previous consultations with the NOAA Fisheries (NMFS: Upper Columbia River steelhead and spring Chinook ESU's) and USFWS (bull trout) on hatchery operations, both agencies concluded that LNFH's current operations, including its water intake system, are not likely to jeopardize the continued existence of ESA listed steelhead, spring Chinook salmon, or bull trout. In the Upper Columbia River draft Biological Opinion issued by the NMFS on October 27, 2000, it was the opinion of NMFS that the LNFH current fish screening system functions adequately to reduce the risk of injury and mortality, or other harm to anadromous fish that may be entrained, and that the risk of significant adverse effects to listed Wenatchee Basin salmon and steelhead is minimal. The NMFS judged that the current LNFH water intake system at the diversion dam may adversely affect listed steelhead. However, the current water intake system is not likely to jeopardize the continued existence of listed Upper Columbia spring Chinook or Upper Columbia steelhead ESUs. In a memorandum dated March 31, 1999, the USFWS concurred that the continuation of current operations at LNFH may effect, but is not likely to adversely affect the bull trout subpopulation in Icicle Creek. The proposed project will improve current conditions by providing year-round fish passage past the intake's low head dam, updating fish screen's at the point of diversion, supplementing flows through the pump-back system, and replacing structural components of the gravity intake facility and water delivery system that are degraded and failing.

Proposed construction activities may effect steelhead in the short-term. However, these potential effects will be minimized through best management practices. In the long-term steelhead will benefit from implementation of the proposed project through the rehabilitation of the point of diversion, updated fish screens, new fishway, and operation of the pump-back system. Therefore LNFH's Hatchery Water Supply System Rehabilitation "**may effect, is likely to adversely affect**" steelhead.

B. Spring Chinook Salmon (*Oncorhynchus tshawytscha*), Upper Columbia River ESU

The spring Chinook salmon brood stock returning to LNFH is not listed. Additionally, Icicle Creek does not support listed UCR spring Chinook salmon and no adverse impacts are expected to result from the operation of the hatchery facilities on UCR spring Chinook salmon (NOAA Fisheries 2003). Therefore, LNFH's proposed Hatchery Water Supply System Rehabilitation project will have "**no effect**" on UCR spring Chinook salmon.

## XII. ANALYSIS OF POTENTIAL EFFECTS TO THE CURRENT CONDITION OF HABITAT

### A. Water Quality

#### 1. Temperature

Icicle Creek water temperatures have not been fully documented. However, since 1999, the USFWS has collected hourly temperature readings from spring through fall at four locations in Icicle Creek. The four locations are: (1) below LNFH's final outflow (rm 2.7); (2) middle of historic channel (rm 3.4); (3) at the intake (rm 4.5); and (4) near Chatter Creek campground (approx. rm 16). This data has not yet been fully analyzed, however, information collected during 2001 (a low flow year) is displayed in Figures 7, 8, and 9. The mean daily temperature difference between water entering the intake and water below the outflow (rm 2.8) ranged from 0 to 1.9 degrees. Additionally, the mean daily temperature difference between water at the Chatter Creek location and water below the outflow ranged from only 0.2 to 6.2 degrees with an average difference of 3.2 degrees. Operation of the LNFH intake system has no net effect on water temperatures below rm 2.8. The effect of water diversions on water temperatures in the reach between rm 2.8 and 4.5 is unknown. However, it is possible that a reduction of flow in this reach causes water temperatures to be higher in the summer months and lower in the winter months as compared to unaffected reaches.

Water temperatures in Icicle Creek naturally fall well below 50-57 $^{0}$F during steelhead spawning and fall within 57-64 $^{0}$F and sometimes reaching higher temperatures during rearing times, as seen at the Chatter Creek temperature station. Also, temperatures at this site do not consistently meet requirements for bull trout incubation, rearing, spawning, or migration and may limit bull trout production. The Chatter Creek temperature station is located more than 10 miles upstream of all water diversions. Thus, Icicle Creek naturally Functions at Unacceptable Risk in regards to the temperature criteria. In the past, operation of LNFH’s water delivery system potentially aided to maintain and may have exacerbated this indicator in the stream reach between rm 2.8 and 4.5 during low flows periods. However, with the use of the proposed new pump-back system during August and September, this indicator would be **Restored** in the stream reach between rm 2.8 to 4.5. Operations have no net effect on water temperatures below rm 2.8. Overall, this indicator would be **Maintained** in Icicle Creek.

#### 2. Sediment/Turbidity

The LNFH intake system and withdrawal of 42 cfs year-round does not increase the sediment input into Icicle Creek or affect factors which contribute to sedimentation. Reducing flows may increase the amount of sediment settling out in these areas, however, this is unlikely as sediment moves through this system at high flows. However, operation of LNFH's intake system does decrease the amount of sediment entering areas below rm 4.5 as the water entering the intake flows through a sediment settling basin and potentially a pollution abatement pond before re-entering Icicle Creek. Proposed construction activities may temporarily increase sediment entering Icicle Creek, however measures such as the use of cofferdams and working in the dry and revegetating all disturbed areas will reduce this potential. Implementation of the proposed project, especially the operation of the intake system, will **Restore** this indicator in Icicle Creek below rm 4.5. The project will have no effect on areas in Icicle Creek above the intake. Overall, this indicator would be **Maintained** in Icicle Creek.

#### 3. Chemical Contamination/Nutrients

Proposed construction activities and the operation of the LNFH intake system will have no effect on the occurrence of chemical contamination or nutrient loading in Icicle Creek. Activities will not change the

creeks Clean Water Act 303(d) water quality designations. Therefore, this indicator would be **Maintained**.

B. Habitat Access

1. Physical Barriers

Currently, upstream and downstream fish passage at all flows does not occur through the main hatchery complex beginning at rm 2.8. If fish passage is provided through the main LNFH property, migration under current conditions may be blocked during low flows at the LNFH intake's low head dam. However, implementation of the proposed project will provide year-round fish passage past the intake's low dam. Thus, the proposed project will Restore this indicator at the intake. However, until fish passage is provided through the main hatchery grounds (see Foreseeable Future Actions above) this indicator will be **Maintained**.

C. Habitat Elements

1. Substrate

Proposed construction activities and operation of the intake system have no effect on this indicator. Therefore, this indicator would be **Maintained**.

2. Large Woody Debris (LWD)

LWD recruitment may be reduced in the lower Icicle by being caught behind the intake's low head dam and then being removed from the creek. This is unlikely as LWD movement would occur at high flows. Construction activities and operation of the intake system would not likely have an effect on LWD recruitment or abundance in Icicle Creek. Therefore, this indicator would be **Maintained**.

3. Pool Frequency

Currently, the removal of 42 cfs by LNFH during low flow times of the year may be, in addition to many other factors, reducing the number of and quality (depth, temperature, size) of pools in the stream reach from rm 2.8 to 4.5. However, with the new proposed pump-back system this potential effect will no longer be likely. Thus, the proposed project may Restore this indicator in the project area. Overall, this indicator would be **Maintained** in Icicle Creek.

4. Pool Quality

The proposed project may Restore this indicator in the project area (see above). Overall, this indicator would be **Maintained** in Icicle Creek.

5. Off-channel Habitat

The proposed project will have no effect on this criteria. Thus, this indicator is **Maintained**.

6. Refugia

The proposed project will have no effect on this criteria. Thus, this indicator is **Maintained**.

D. Channel Condition and Dynamics

1. Width/Depth Ratio

The bankfull discharge does the work (formation and maintenance) that results in the average morphological characteristics (dimension, pattern, and profile) of channels under the modern climatic regime and its importance should not be underestimated (Dunne and Leopold 1978; Rosgen 1996). The bankfull stage corresponds to the discharge at which channel maintenance is most effective. The proposed project will not affect bankfull flow in Icicle Creek. Therefore, this indicator will be **Maintained** in these reaches.

2. Stream Bank Condition

Implementation of the proposed project may Degrade the stream bank within the vicinity of the intake through the removal of vegetation within the pipeline corridor. Overall, this indicator would be **Maintained** in Icicle Creek.

3. Floodplain Connectivity

The proposed project will have no impact on floodplain connectivity or other factors influencing floodplain connectivity in Icicle Creek. Therefore, this indicator would be **Maintained**.

E. Flow/Hydrology

1. Change in Peak/Base Flows

Operation of LNFH's intake system has a direct and cumulative effect on base flows in Icicle Creek from rm 2.8 to 4.5 (Table 4). From January through April and from October through November, LNFH (42 cfs) along with the City of Leavenworth (City) (3 cfs) removes on average 13.8% (range: 6.7-18.4%) of the mean monthly flows for water years 1937 through 2000 (USGS). From May through September a total of 174.4 cfs (LNFH - 42, City - 3, Cascade - 12.4, District - 117) is removed from these sections of Icicle Creek. However, from mid-July through the beginning of October, LNFH supplements Icicle Creek flows with 25-30 cfs from Snow Creek. The District may also supplement flows from other high elevation lakes (see Appendix A). Without supplemental flows (worst case scenario), the cumulative effect of water withdrawal reduces the mean monthly flows in May through July 10, 8.9, and 19 percent, respectively. The most effect to stream flow occurs in August and September. During August 63.3% of the mean and potentially 144% of the minimum monthly flow and in September potentially 107% of the mean and 196% of the minimum monthly flow is cumulatively removed from Icicle Creek. The proposed project will **Restore** this indicator between rm 2.8 and 4.5 through the construction and operation (August and September) of the pump-back system. Overall, this indicator will be **Maintained**.

2. Increase in Drainage Network

The proposed project will have no effect on this criteria. Therefore this indicator would be **Maintained**.

F. Watershed Conditions

The proposed project will have no affect on overall watershed conditions. Therefore, the indicators Road Density and Location, Disturbance History, Riparian Conservation Areas, and Disturbance Regime would all be **Maintained**.

XIII. EFFECT DETERMINATIONS AND RESPONSE REQUESTED

Steelhead trout (*Oncorhynchus mykiss*)

| Determination: | Response Requested: |
|---|---|
| ____No Effect | ____ *Concurrence |
| ____Is Not Likely to Adversely Affect | _____Concurrence |
| | ____*Formal Consultation |
| __X__Is Likely to Adversely Affect | _____Formal Consultation |

Spring Chinook Salmon (*Oncorhynchus tshawytscha*)

| Determination: | Response Requested: |
|---|---|
| __X__No Effect | ____ *Concurrence |
| _____Is Not Likely to Adversely Affect | _____Concurrence |
| | ____*Formal Consultation |
| ____Is Likely to Adversely Affect | _____Formal Consultation |

XIV. RELEVANT REPORTS, STUDIES, OR MEETINGS

Sverdrup Civil, Inc. 2000. Icicle Creek Fish Passage Restoration and Intake Alternatives Study at the Leavenworth National Fish Hatchery.

Jacobs Civil, Inc. September 2003. Final Environment Assessment for LNFH's Water Supply System Rehabilitation Project.

Montgomery Water Group, Inc. 2004. Draft Icicle Creek Target Flow Report for USFWS Leavenworth National Fish Hatchery.

Additionally, several related meetings have been held including: December 14, 2000, between USFWS and NMFS; February 1, 2001, between USFWS and USFS; February 12, 2001, between USFWS , USFS, and NMFS; March 7 , 2001, between USFWS, NMFS, Icicle-Peshastin Irrigation District, Cascade Orchards Irrigation Company, and the City of Leavenworth; on April 4, 2001 with technical representative's from USFWS, NMFS, USFS, WDFW, and WDOE; and on August 31, 2004 between USFWS, Montgomery Water Group, WDOE, and NOAA Fisheries.

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## XVI. TABLES AND FIGURES

### A. Tables

Table 1: Leavenworth National Fish Hatchery's Water Rights

| CERTIFICATE # | PRIORITY DATE | SOURCE | AMOUNT |
|---|---|---|---|
| 1824 | 03/26/1942 | Icicle Creek | 42 cfs (18,851 gpm) |
| 1825 | 03/26/1942 | Snow & Nada Lakes | 16,000 acre feet |
| | | | |
| 016378 | 08/01/1939 | Groundwater (1 Wells) | 1.56 cfs (700 gpm) |
| 016379 | 06/01/1940 | Groundwater (1 Wells) | 2.01 cfs (900 gpm) |
| 3103-A | 10/16/1957 | Groundwater (1 Wells) | 2.67 cfs (1200 gpm) |
| G4-27115C | 10/20/1980 | Groundwater (4 Wells) | 8.69 cfs (3900 gpm) |

Table 2: Checklist For Documenting Environmental Baseline And Effects Of Proposed Action(s) On Relevant Indicators.

| Diagnostics/ Pathways: | Population & | Environmental | Baseline | Effects | Of The | Action(s) |
|---|---|---|---|---|---|---|
| Indicators | Properly Functioning | Functioning at Risk | Not Properly Functioning | Restore | Maintain | Degrade |
| Subpopulation Characteristics: Population Size | | | X | | X | |
| Growth and Survival | | | X | | X | |
| Life History Diversity and Isolation | | | X | | X | |
| Persistence and Genetic Integrity | | | X | | X | |
| Water Quality: Temperature | | | X | | X | |
| Sediment | | X | | | X | |
| Chem. Contam./Nutrients | | X | | | X | |
| Habitat Access: Physical Barriers | | | X | | X | |
| Habitat Elements: Substrate Embeddedness | | | X | | X | |
| Large Woody Debris | | X | | | X | |
| Pool Frequency | | | X | | X | |
| Pool Quality | | X | | | X | |
| Off-channel Habitat | X | | | | X | |
| Refugia | | X | | | X | |
| Channel Cond. & Dynamics: Wetted Width/Max. Depth Ratio | | X | | | X | |
| Streambank Condition | X | | | | X | |
| Floodplain Connectivity | | X | | | X | |
| Flow/Hydrology: Change in Peak/Base Flows | | | X | | X | |
| Drainage Network Increase | | X | | | X | |
| Watershed Condition: Road Density & Location | X | | | | X | |
| Disturbance History | | X | | | X | |
| Riparian Conservation Areas | | X | | | X | |
| Disturbance Regime | | X | | | X | |
| Integration of Species and Habitat Conditions | | | X | | X | |

Table 4: % of Stream Flow Withdrawn from the USGS Monthly Mean Data for Water Years 1937-2000 (not including supplemental flows)

| MONTH | FLOW TYPE | CFS | % LNFH | % CUMULATIVE |
|---|---|---|---|---|
| January | Mean | 277 | 15 | 16 |
| January | Maximum | 813 | 5.2 | 5.5 |
| January | Minimum | 72.4 | 58 | 62 |
| February | Mean | 297 | 14 | 15 |
| February | Maximum | 994 | 4.2 | 4.5 |
| February | Minimum | 72.5 | 58 | 62 |
| March | Mean | 284 | 15 | 15.8 |
| March | Maximum | 669 | 6.3 | 6.7 |
| March | Minimum | 112 | 37.5 | 40 |
| April | Mean | 668 | 6.3 | 6.7 |
| April | Maximum | 1099 | 3.8 | 4.1 |
| April | Minimum | 275 | 15.3 | 16.4 |
| May | Mean | 1728 | 2.4 | 10 |
| May | Maximum | 2798 | 1.5 | 6.2 |
| May | Minimum | 984 | 4.3 | 17.7 |
| June | Mean | 1953 | 2.2 | 8.9 |
| June | Maximum | 3429 | 1.2 | 5.1 |
| June | Minimum | 779 | 16.9 | 22.3 |
| July | Mean | 915 | 4.6 | 19 |
| July | Maximum | 2292 | 1.8 | 7.6 |
| July | Minimum | 269 | 15.6 | 65 |
| August | Mean | 275 | 15.3 | 63.3 |
| August | Maximum | 764 | 5.5 | 22.8 |
| August | Minimum | 121 | 35 | 144* |
| September | Mean | 162 | 26 | 107* |
| September | Maximum | 380 | 11 | 45.8 |
| September | Minimum | 89 | 47 | 196* |
| October | Mean | 245 | 17.1 | 18.4 |
| October | Maximum | 703 | 6 | 6.4 |
| October | Minimum | 74.5 | 56.4 | 60.4 |
| November | Mean | 382 | 11 | 11.8 |
| November | Maximum | 1992 | 2.1 | 2.3 |
| November | Minimum | 66.2 | 63.4 | 68 |
| December | Mean | 350 | 12 | 13 |
| December | Maximum | 1062 | 4 | 4.2 |
| December | Minimum | 72.9 | 57.6 | 61.7 |

*Although the numbers show that Icicle Creek surface water is over allocated, the creek may only go dry on extremely low water years as not all diverters use their entire water right at all times.

Table 5: Washington State's Surface Water Quality Standards and Established In-stream Flow Standards for Icicle Creek, Washington

| Water quality parameters |
|---|
| **Temperature** shall not exceed 16.0 °C due to human activities. When natural conditions exceed 16.0 °C, no temperature increases will be allowed which will raise receiving water temperature by greater than 0.3 °C. |
| **Dissolved Oxygen** shall exceed 9.5 mg/L. |
| **pH** shall be within the range of 6.5 to 8.5 with a human caused variation within the range of less than 0.2 units. |
| **Turbidity** shall not exceed 5 NTU over background turbidity when background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU. |

| Instream flows[1] | | | | | |
|---|---|---|---|---|---|
| Month | Day | flow (cfs) | Month | Day | flow (cfs) |
| Jan | 1 | 120 | Jul | 1 | 450 |
| | 15 | 120 | | 15 | 300 |
| Feb | 1 | 120 | Aug | 1 | 200 |
| | 15 | 120 | | 15 | 170 |
| Mar | 1 | 150 | Sep | 1 | 130 |
| | 15 | 170 | | 15 | 130 |
| Apr | 1 | 200 | Oct | 1 | 130 |
| | 15 | 300 | | 15 | 130 |
| May | 1 | 450 | Nov | 1 | 150 |
| | 15 | 660 | | 15 | 150 |
| Jun | 1 | 1000 | Dec | 1 | 150 |
| | 15 | 660 | | 15 | 150 |

Instream flows[1] : WAC 173-545-030 stream management unit and control station for Icicle Creek are established at river mile 1.5 (approximately where the East Leavenworth bridge crosses over Icicle Creek). A second control station on Icicle Creek for water quality criteria is located at the confluence of Bridge Creek (approximately RM 9.3). Table data from Chapter 173-545 WAC, Instream Resources Protection Program - Wenatchee River Basin, Water Resource Inventory Area 45. Information accessed via Washington State website: http://www.ecy.wa.gov/pubs/wac173545.pdf

Table 6: LNFH's Use of Water for Hatchery Operations

## WATER REQUIREMENTS FOR CURRENT FACILITY OPERATIONS

(Based on Hatchery Records from October 1998 - September 1999)

| Period | Leavenworth National Fish Hatchery Facility Water Demand (Max. Demand for Period) | | | | | | | | | Hatchery Water Supply (Max. Output for Period) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A Hatchery Building | B1 8 x 80 Raceways (Upper) | B2 8 x 80 Raceways (Mid) | B3 8 x 80 Raceways (Lower) | C1 Covered Raceways (Upper) | C2 Covered Raceways (Lower) | D1 Adult Hold Pond (Reuse Water) | D2 Adult Hold Pond (River Water) | Total | Icicle Creek | Wells | Re-Use |
| | (gpm) | (gpm) | (gpm) | (gpm) | (gpm) | (gpm) | (gpm) | (gpm) | (gpm) | (gpm) | (gpm) | (gpm) |
| 1/1 to 1/16 | 1,935 | | | 7,545 | 7,658 | 7,189 (1) | 3,400 (1) | 1,400 | 29,127 | 17,398 | 4,170 | 10,589 |
| 1/17 to 1/31 | 1,960 | | | 7,545 | 7,659 | 7,189 (1) | 3,400 (1) | 1,400 | 29,153 | 16,918 | 3,500 | 10,589 |
| 2/1 to 2/14 | 1,960 | | | 7,545 | 7,660 | 7,189 (1) | 1,800 (1) | 3,000 | 29,154 | 18,843 | 3,500 | 8,989 |
| 2/15 to 2/28 | 850 | 3,840 | 3,225 (1) | 7,545 | 7,661 | 7,189 (1) | 1,800 (1) | 3,000 | 35,110 | 18,053 | 5,050 | 12,214 |
| 3/1 to 3/15 | | 3,690 | 3,690 (1) | 8,220 | 7,378 | 7,300 (1) | 2,800 (1) | 3,000 | 36,078 | 18,768 | 3,750 | 13,790 |
| 3/16 to 3/31 | | 3,690 | 3,690 (1) | 8,220 | 7,378 | 7,300 (1) | 2,800 (1) | 3,000 | 36,078 | 18,538 | 4,130 | 13,790 |
| 4/1 to 4/15 | | 3,690 | 3,690 (1) | 8,220 | 7,378 | 7,300 (1) | 2,400 (1) | 3,400 | 36,078 | 18,938 | 4,220 | 13,390 |
| 4/16 to 4/30 | | 3,690 | 3,690 (1) | | | | | | 7,380 | 18,558 | 3,160 | 3,690 |
| 5/1 to 5/15 | 80 | 3,000 | 1,875 | 1,500 | 2,800 | 2,240 (1) | | | 11,495 | 9,255 | 3,740 | 2,240 |
| 5/16 to 5/31 | 80 | 3,000 | 1,875 | 1,500 | 2,800 | 2,240 (1) | | | 11,495 | 9,255 | 4,220 | 2,240 |
| 6/1 to 6/15 | | 4,140 | 2,370 | 2,370 | 4,060 | 2,905 | 1,500 (1) | | 17,345 | 9,255 | 6,590 | 1,500 |
| 6/16 to 6/30 | | 4,140 | 2,370 | 2,370 | 4,060 | 2,905 | 1,500 (1) | | 17,345 | 14,785 | 6,590 | 1,500 |
| 7/1 to 7/15 | | 3,750 | 2,250 | 2,250 | 4,200 | 2,870 | 1,500 (1) | | 16,820 | 15,320 | 1,150 | 1,500 |
| 7/16 to 7/31 | | 2,895 | 2,925 | 4,770 | 4,200 | 2,870 | 1,600 (3) | | 19,260 | 15,290 | 1,630 | |
| 8/1 to 8/15 | 60 | 2,895 | 2,925 | 4,770 | 5,537 | 3,829 | 1,000 (4) | | 21,016 | 18,386 | 1,630 | 1,000 |
| 8/16 to 8/31 | 195 | 2,895 | 2,925 | 4,770 | 5,537 | 3,829 | 1,000 (4) | | 21,151 | 18,091 | 2,540 | 1,000 |
| 9/1 to 9/15 | 390 | 2,895 | 2,925 | 4,770 | 5,537 | 3,829 | 1,000 (1) | | 21,346 | 18,226 | 2,210 | 1,000 |
| 9/16 to 9/30 | 390 | 2,895 | 2,925 | 4,770 | 5,537 | 3,829 | | | 20,346 | 18,226 | 2,120 | |
| 10/1 to 10/15 | 330 | 6,330 | 5,505 (1) | 6,000 | | 6,440 (2) | | | 24,605 | 17,950 | 2,620 | 5,505 |
| 10/16 to 10/31 | 330 | | | 7,965 | | 6,440 (2) | 1,000 (1) | 3,576 | 19,311 | 16,006 | 2,620 | 1,000 |
| 11/1 to 11/15 | 330 | | | 7,485 | 7,658 | 7,189 (1) | 1,400 (1) | 3,400 | 27,462 | 17,983 | 1,060 | 8,589 |
| 11/16 to 11/30 | 330 | | | 7,485 | 7,658 | 7,189 (1) | 1,400 (1) | 3,400 | 27,462 | 17,813 | 1,470 | 8,589 |
| 12/1 to 12/15 | 1,470 | | | 7,485 | 7,658 | 7,189 (1) | 1,400 (1) | 3,400 | 28,602 | 18,473 | 1,540 | 8,589 |
| 12/16 to 12/31 | 1,470 | | | 7,485 | 7,658 | 7,189 (1) | 1,400 (1) | 3,400 | 28,602 | 17,803 | 6,110 | 8,589 |

**Notes:**

(1) Reuse water

(2) Foster-Lucas ponds (last month of operation before switch to new covered raceways)

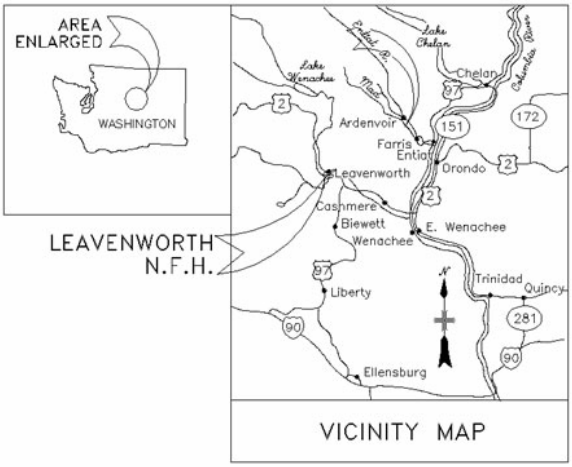
(3) Well water

(4) Reuse and well water

Sverdrup, Inc.

B. Figures

Figure 1: LNFH Location



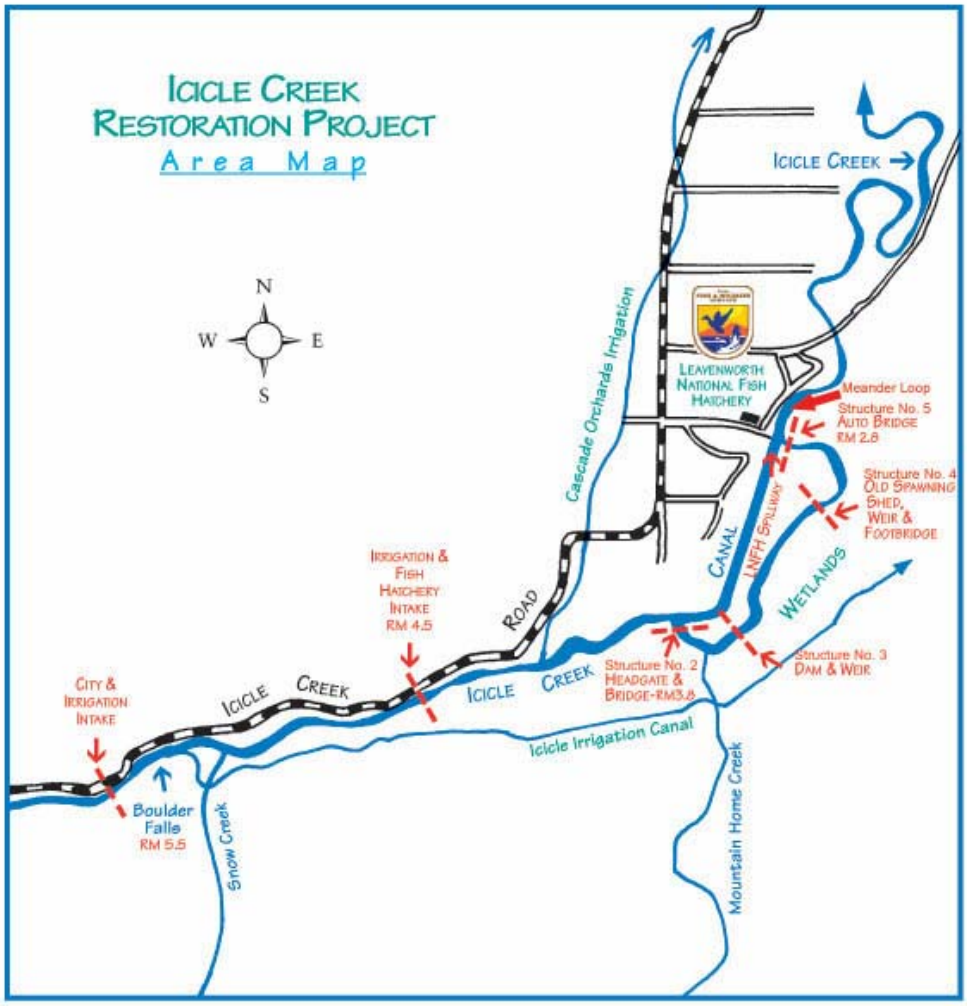



Figure 2: Overview of LNFH Design (Plate 1.1)

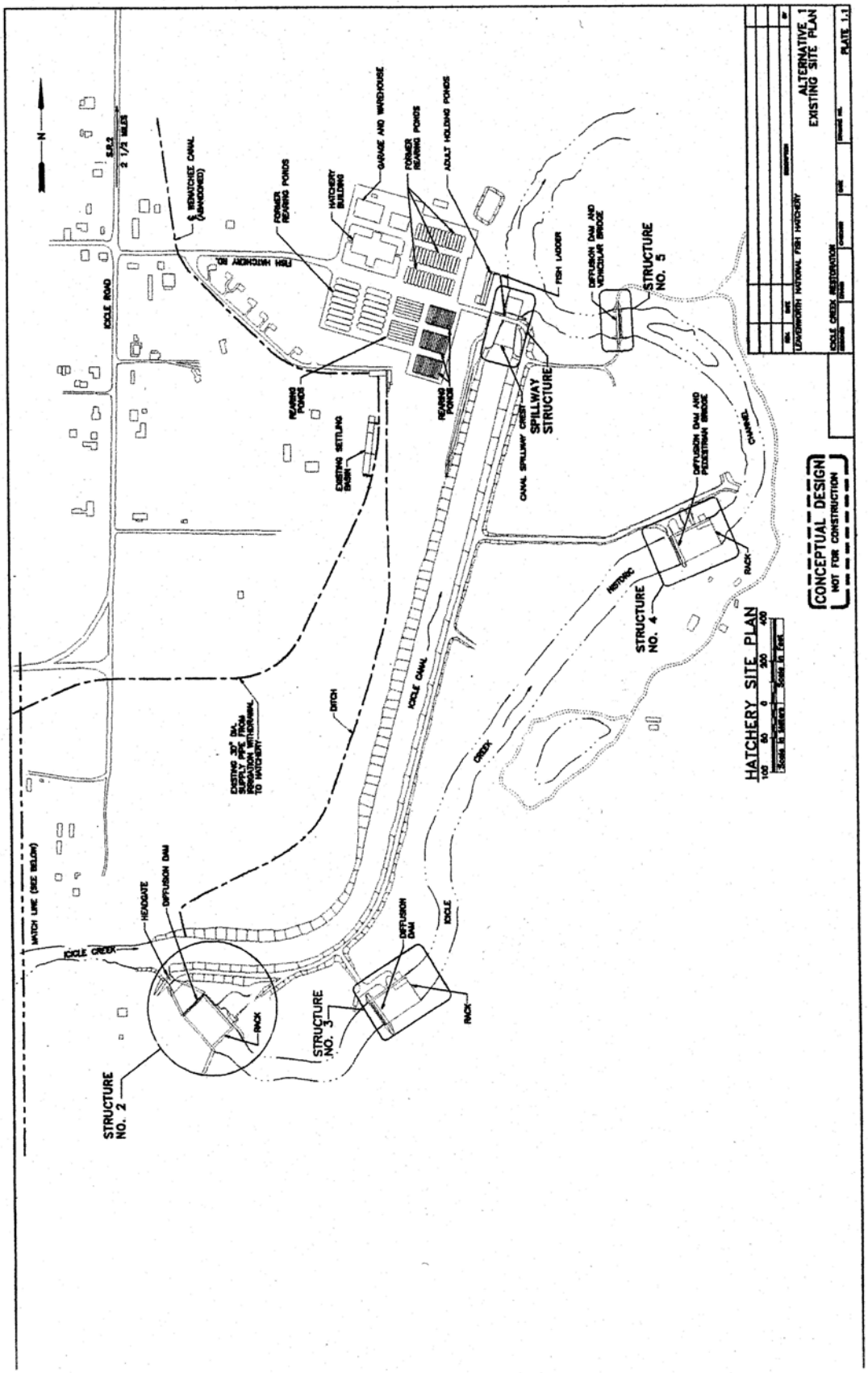
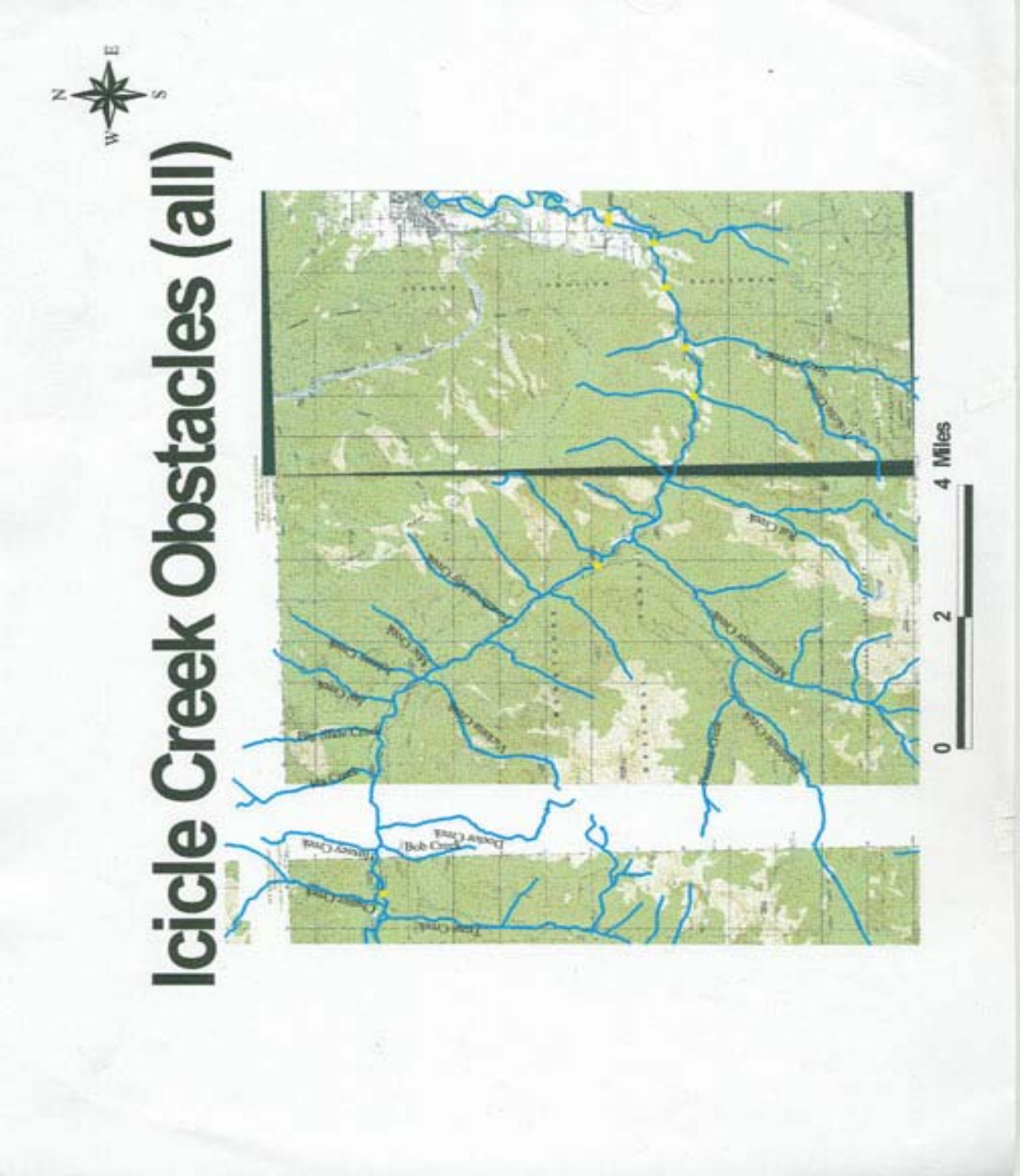
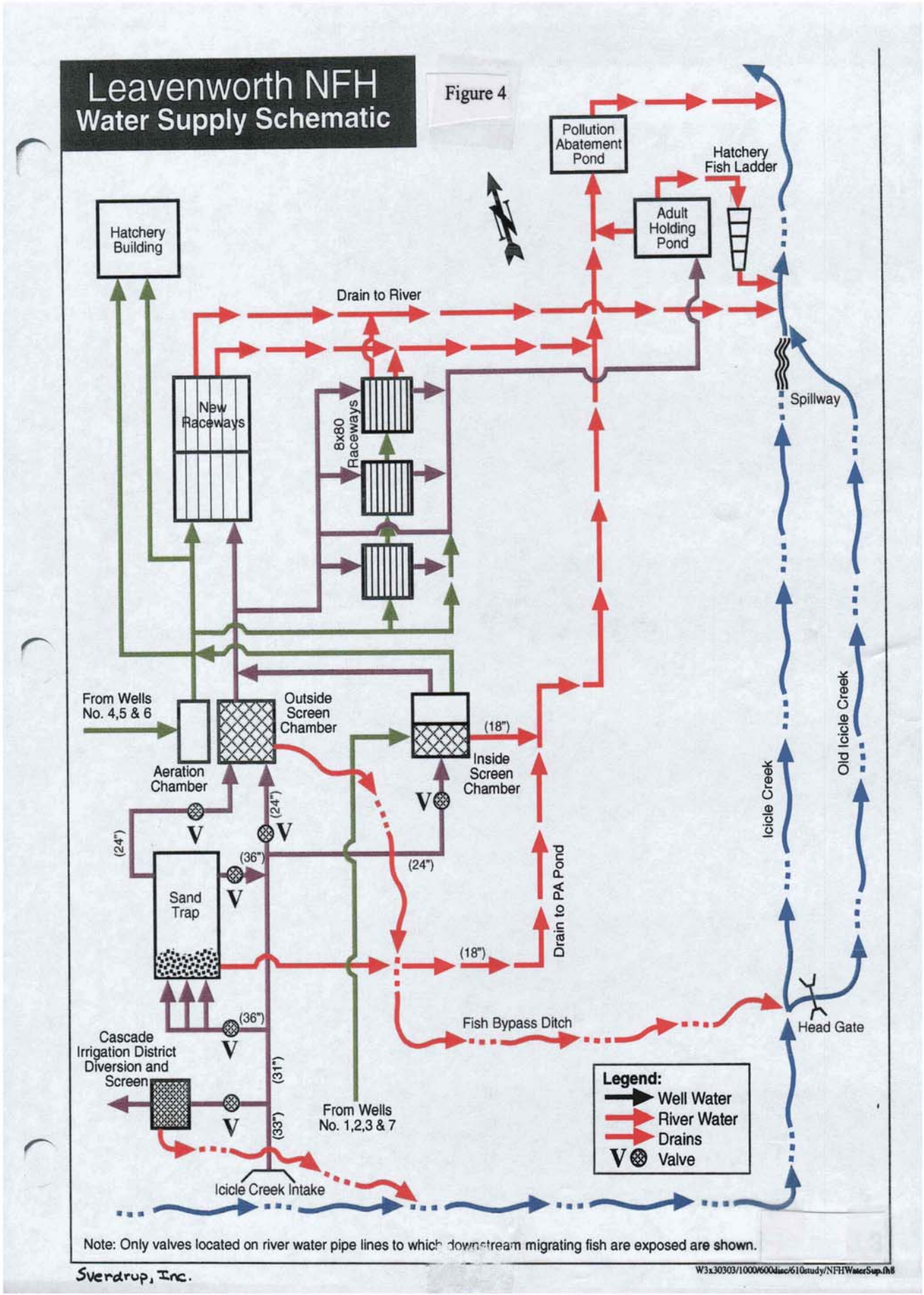
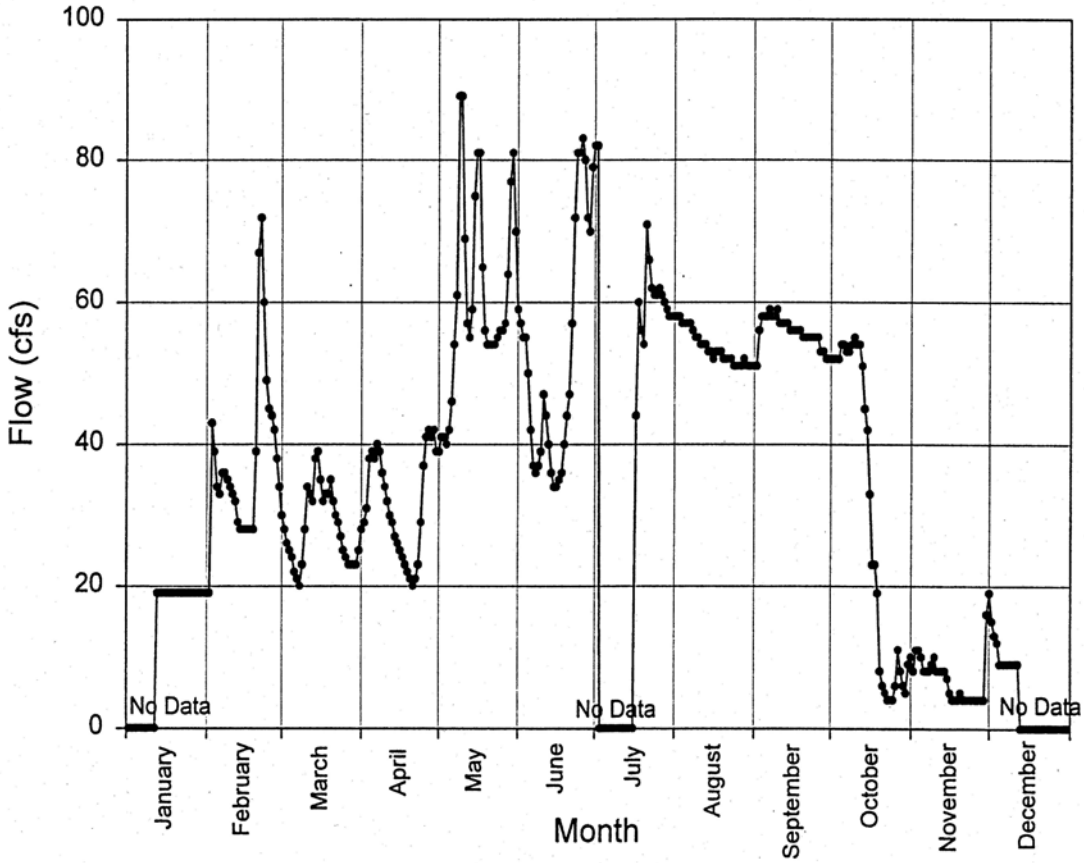


Figure 3: Icicle Creek Obstacles (all)




Leavenworth NFH
Water Supply Schematic
Figure 4
Pollution Abatement Pond
Hatchery Fish Ladder
Adult Holding Pond
Hatchery Building
Drain to River
New Raceways
8x80 Raceways
Spillway
From Wells No. 4,5 & 6
Outside Screen Chamber
Aeration Chamber
Inside Screen Chamber
(18")
(24")
(36")
Sand Trap
Drain to PA Pond
Icicle Creek
Old Icicle Creek
Fish Bypass Ditch
Head Gate
Cascade Irrigation District Diversion and Screen
(31")
(33")
From Wells No. 1,2,3 & 7
Icicle Creek Intake
Legend:
Well Water
River Water
Drains
Valve
Note: Only valves located on river water pipe lines to which downstream migrating fish are exposed are shown.
Sverdrup, Inc.
W3x30303/1000/600disc/610study/NFHWaterSup.fh8

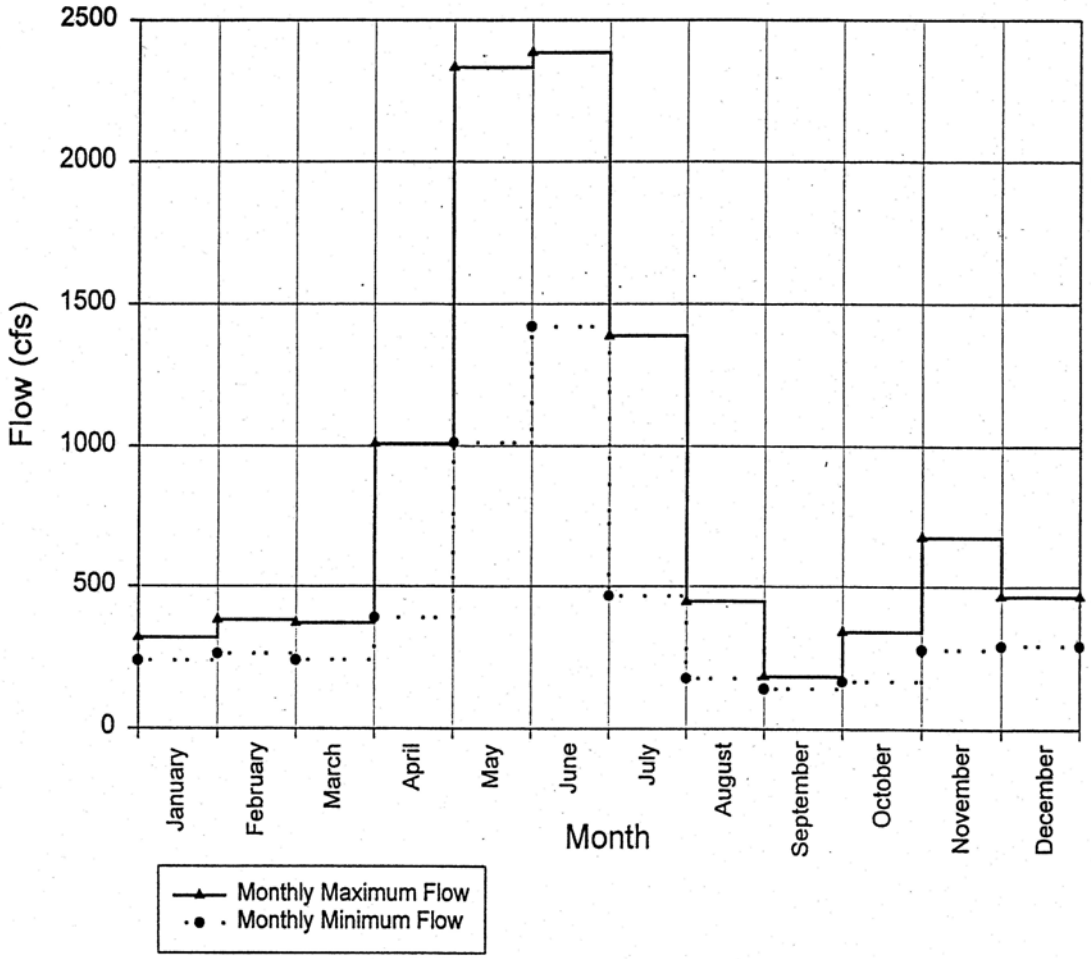



| | |
|---|---|
| ENSR Consulting • Engineering • Remediation | DRAWN: C. Long |
| | CHECKED: M. Rashid |
| | DATE: November 15, 1999 |
| PROJECT NO: 6455-022 | FILENAME: Icicle.jnb |

Figure 5:

Average Year Hydrograph
Snow Creek at Icicle Creek

Leavenworth National Fish Hatchery
Leavenworth, Washington

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|---|---|
| ENSR<br>Consulting • Engineering • Remediation | DRAWN: C. Long |
| | CHECKED: M. Rashid |
| | DATE: November 15, 1999 |
| PROJECT NO: 6455-022 | FILENAME: Icicle.jnb |

Figure 6:
Monthly Maximum / Minimum Flow
based on Average Water Year
Icicle Creek - Gauge #12458000
Leavenworth National Fish Hatchery
Leavenworth, Washington

Figure 7: Icicle Creek Minimum Daily Temperatures 2001

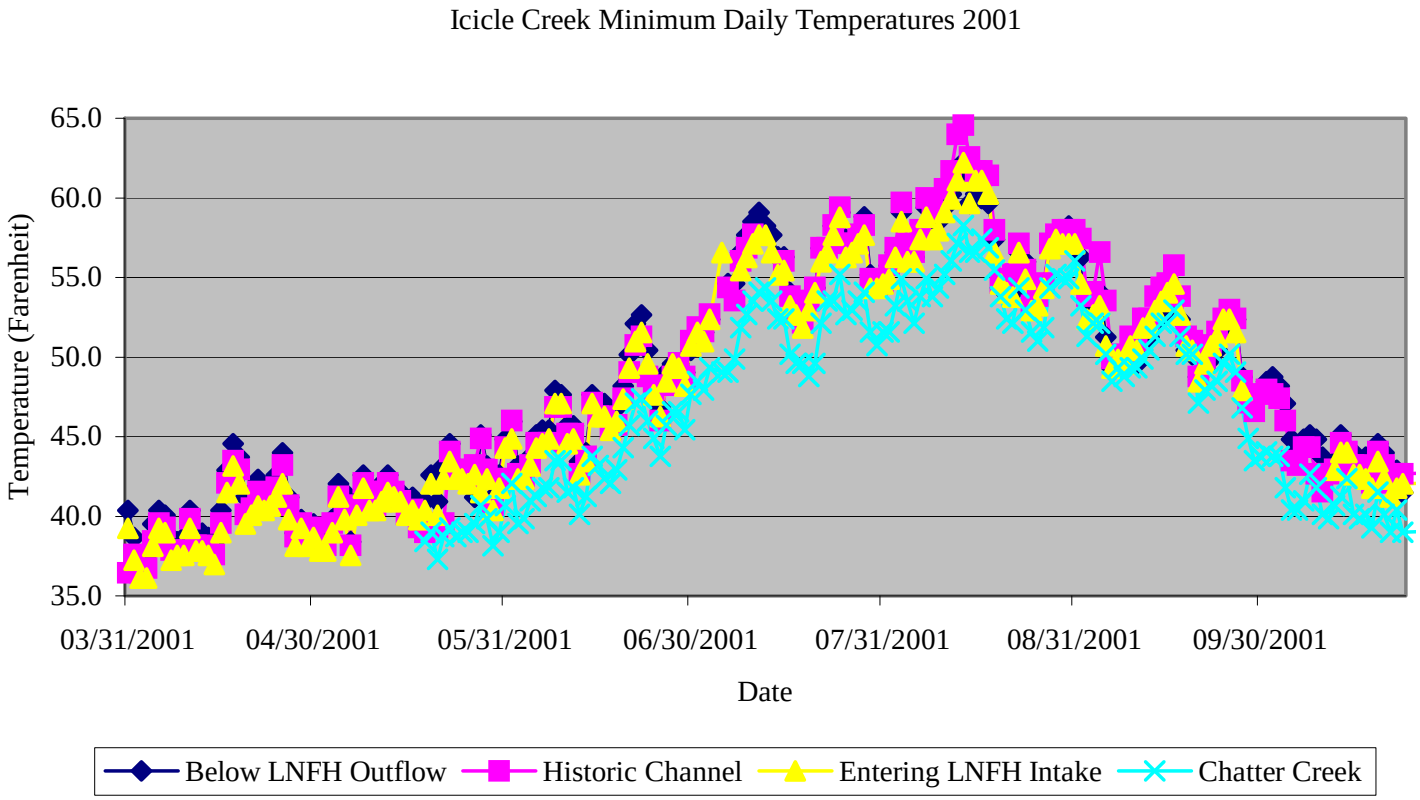


Figure 8: Icicle Creek Maximum Daily Temperatures 2001

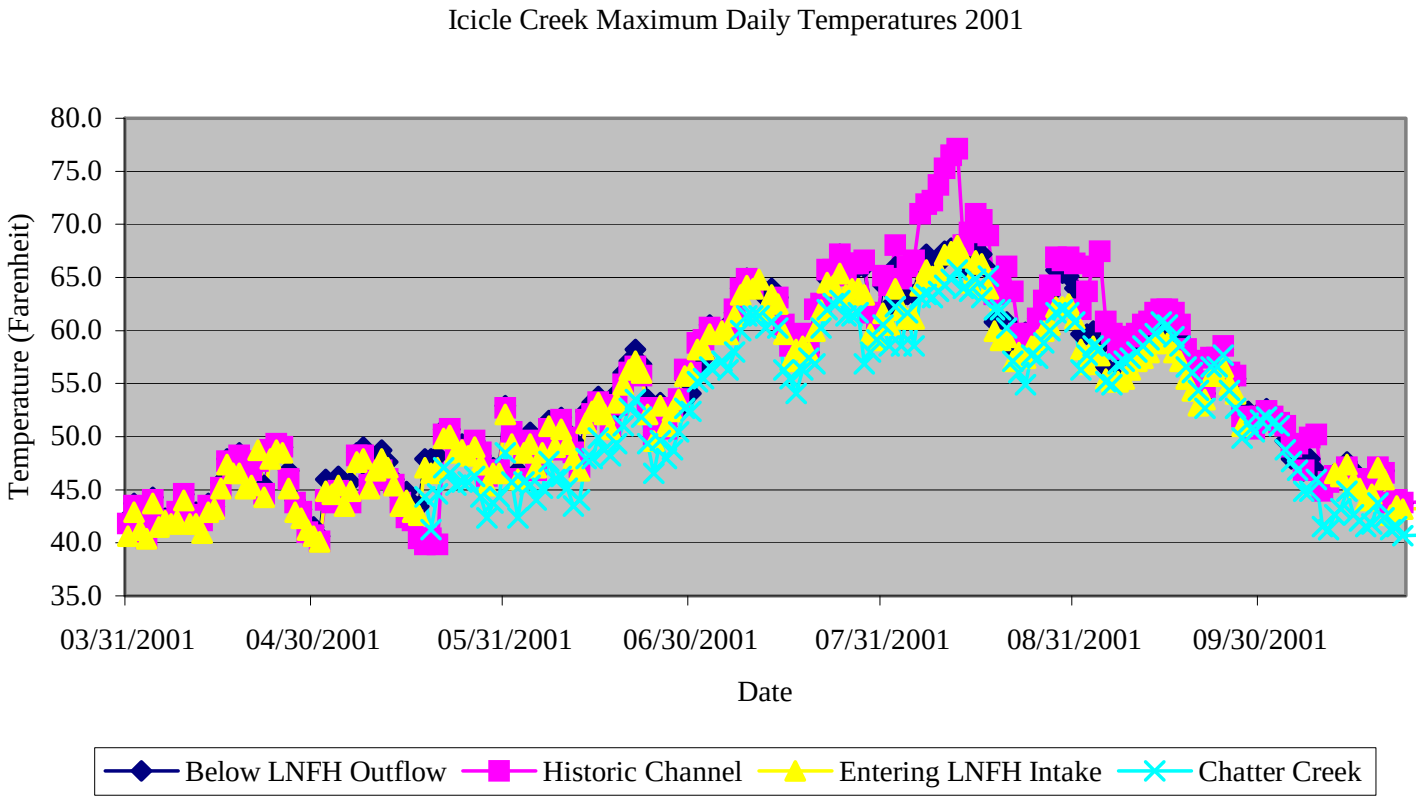
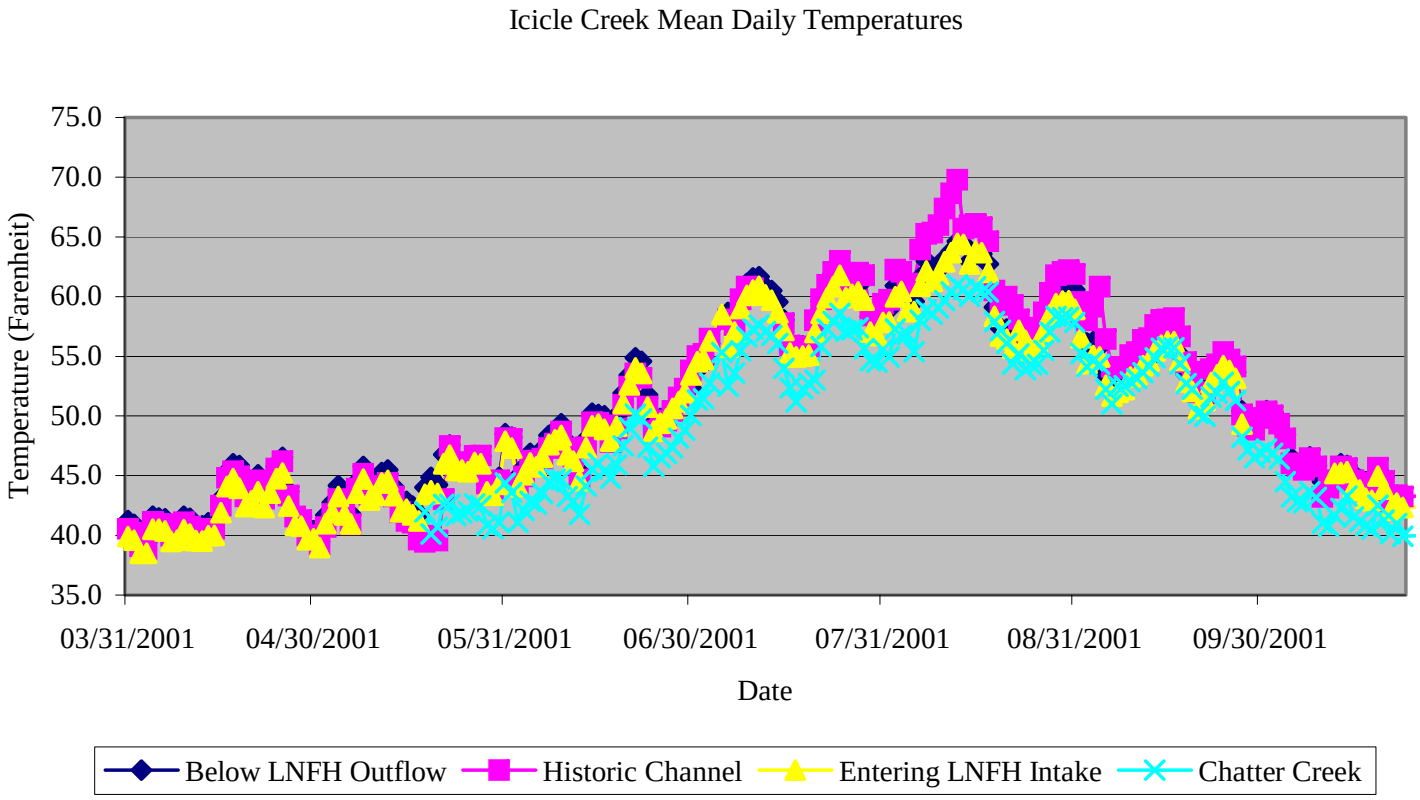


Figure 9: Icicle Creek Mean Daily Temperatures



# LEAVENWORTH
## NATIONAL FISH HATCHERY
## INTAKE SYSTEM REHABILITATION

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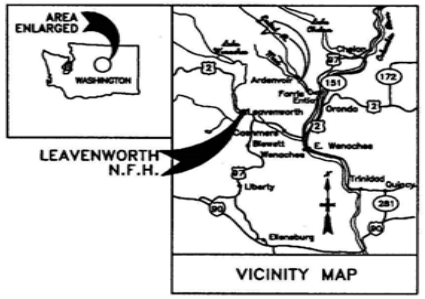
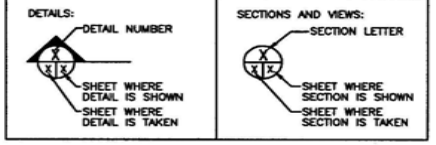



### DETAILING CONVENTIONS

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0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

JACOBS

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|

FISH AND WILDLIFE SERVICE
REGION 1, OFFICE OF ENGINEERING

LEAVENWORTH
NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
DRAWING INDEX
AND LOCATION MAP
CHELAN COUNTY WASHINGTON

| SURVEYED | DESIGNED | DRAWN | CHECKED |
|---|---|---|---|
| | DLA | DLA | RGW |

DATE 08/04
DRAWING NO. 1F-WA-257A-140-01.0

SHEET G1 OF 63

P:\WX303\12000\700CADD\740WORK\LEWG0001.DWG 08-21-04

## LEGEND

- U/G ELECTRICAL LOCATE
- OVERHEAD ELECTRICAL
- DOMESTIC WATER LOCATE
- U/G TELEPHONE LOCATE
- SANITARY SEWER LOCATE
- FENCE
- U/G NATURAL GAS LOCATE
- STORM SEWER LOCATE
- CULVERT
- IRRIGATION PIPE CENTERLINE
- EDGE OF WATER (NOV. 5 & 6, 2003)
- TOP OF SLOPE
- TOE OF SLOPE
- RIGHT OF WAY CENTERLINE
- GUARD RAIL
- CONTIGUOUS OWNERSHIP
- GATE POST
- BALLARD
- BOULDER OVER 24" DIAMETER
- X 600.0 SPOT ELEVATION
- ASPHALT PAVEMENT
- CONCRETE
- CALC POINT
- FOUND MONUMENT
- FOUND REBAR AND CAP
- SET CHISLED X IN CONCRETE
- POWER MANHOLE
- ELECTRICAL POLE
- POLE ANCHOR
- ELECTRIC VAULT
- ELECTRIC TRANSFORMER
- ELECTRIC OUTLET PLUG
- ELECTRIC HAND HOLD
- ELECTRIC HEAT PUMP
- TELEPHONE MANHOLE
- TELEPHONE HAND HOLD
- FIBER OPTIC VAULT
- TV CABLE PLUG
- SANITARY SEWER MANHOLE
- SANITARY SEWER CLEANOUT
- UNKNOWN UTILITY MANHOLE
- TRAFFIC CONTROL VAULT
- STREET / BUSINESS SIGN
- LUMINAIRE
- MAILBOX
- LANDSCAPED LUMINAIRE
- FLAG POLE
- STORM SEWER MANHOLE
- CATCH BASIN (RND.)
- CATCH BASIN (SQR.)
- WATER MANHOLE
- FIRE HYDRANT
- DOMESTIC WATER VALVE
- WATER METER
- WATER BLOW OFF VALVE
- IRRIGATION RISER
- IRRIGATION CONTROL BOX
- IRRIGATIONVALVE
- DECIDUOUS TREE
- CONIFEROUS TREE

## ABBREVIATIONS & CONVENTIONS

| | | |
|---|---|---|
| & | AND | |
| L | ANGLE | |
| @ | AT | |
| ± | DIAMETER, PHASE | |
| # | NUMBER, POUND | |
| **A** | | |
| ABV | ABOVE | |
| AC | ALTERNATING CURRENT | |
| ACP | ASBESTOS CEMENT PIPE | |
| ACP | ASPHALT CONCRETE PAVEMENT | |
| AF | AMPERE FRAME | |
| AHU | AIR HANDLER UNIT | |
| ALT | ALTERNATE | |
| APPRX | APPROXIMATE | |
| AT | AMPERE TRIP | |
| ATS | AUTOMATIC TRANSFER SWITCH | |
| ATU | AIR TERMINAL UNIT | |
| AUX | AUXILIARY | |
| AWG | AMERICAN WIRE GAGE | |
| **B** | | |
| B | BUS | |
| BKBD | BACKBOARD | |
| BKR | BREAKER | |
| BL | BASE LINE | |
| BLDG | BUILDING | |
| BM | BENCH MARK | |
| BRG | BEARING | |
| BTFL | BUTTERFLY | |
| **C** | | |
| C | CONDUIT | |
| C.C. | CENTER TO CENTER | |
| C.I. | CAST IRON | |
| CB | CATCH BASIN, CIRCUIT BREAKER | |
| CCP | CONCRETE CYLINDER PIPE | |
| CDF | CONTROLLED DENSITY FILL | |
| CH | CHILLER | |
| CHWP | CHILLER WATER PUMP | |
| CID | CHANGE IN DESIGN | |
| CKT | CIRCUIT | |
| CL | CENTERLINE | |
| CLR | CLEAR | |
| CMP | CORRUGATED METAL PIPE | |
| CMU | CONCRETE MASONRY UNIT | |
| CONC | CONCRETE | |
| CONST. JT. | CONSTRUCTION JOINT | |
| CONT | CONTROL, CONTINUED, CONTINUOUS | |
| CP | CONTROL POINT | |
| CS | CARBON STEEL | |
| CS | CONTROL SWITCH | |
| CT | CABLE TRAY, CURRENT TRANSFORMER | |
| CTBX | CONTROL TERMINAL BOX | |
| CTR | CENTER | |
| CU | COPPER | |
| CULV | CULVERT | |
| CV | CHECK VALUE | |
| CWP | CONDENSER WATER PUMP | |
| **D** | | |
| D.I. | DUCTILE IRON DIP | |
| DAS | DATA ACQUISITION SYSTEM | |
| DIA | DIAMETER | |
| DIL | DRAIN INTERCEPT LINE | |
| DS | DISCONNECT SWITCH | |
| DWG | DRAWING | |
| **E** | | |
| E | EAST, EASTING | |
| EA | EACH | |
| EHH | ELECTRIC HANDHOLE | |
| EL | ELEVATION | |
| ELB | ELBOW | |
| ELEC | ELECTRIC | |
| ELECT | ELECTRICAL | |
| EOP | END OF PIPE | |
| EXF | EXHAUST FAN | |
| EXIST | EXISTING | |
| EXP | EXPANSION | |
| EXPJT | EXPANSION JOINT | |
| EXT | EXTERIOR | |
| **F** | | |
| F.F. | FINISH FLOOR | |
| FD | FLOOR DRAIN | |
| FLR | FLOOR | |
| FNSH | FINISH | |
| FT | FOOT | |
| FTG | FOOTING | |
| FVNR | FULL VOLTAGE NON-REVERSING | |
| FVR | FULL VOLTAGE REVERSING | |
| **G** | | |
| G.E. | GRADE ELEVATION | |
| G.V. | GATE VALVE | |
| GALV. | GALVANIZED | |
| GEN | GENERATOR | |
| GFI | GROUND FAULT INTERRUPTER | |
| GND | GROUND | |
| GPM | GALLONS PER MINUTE | |
| GRTG | GRATING | |
| **H** | | |
| H | HIGH | |
| HDPE | HIGH DENSITY POLYETHYLENE | |
| HORIZ. | HORIZONTAL | |
| HP | HORSEPOWER | |
| HTR | HEATER | |
| HWL | HIGH-WATER LEVEL | |
| **I** | | |
| I.E. | INVERT ELEVATION | |
| ID | INSIDE DIAMETER | |
| IN | INCH | |
| INCL | INCLUDE | |
| IPS | IRON PIPE SIZE | |
| IRR. | IRRIGATION | |
| ITBX | INSTRUMENT TERMINAL BOX | |
| **L** | | |
| L.F. | LINEAL FEET | |
| LB(S) | POUND(S) | |
| LOC'D | LOCATED | |
| LT | LIGHT | |
| LTG | LIGHTING | |
| **M** | | |
| MB | MAIN BREAKER | |
| MC | MANHOLE COVER | |
| MCC | MOTOR CONTROL CENTER | |
| MCP | MOTOR CIRCUIT PROTECTOR | |
| MECH | MECHANICAL | |
| MED. | MEDIUM | |
| MFG | MANUFACTURER | |
| MH | MANHOLE | |
| MHHW | MEAN HIGHER HIGH WATER | |
| MHW | MEAN HIGH WATER | |
| MIN | MINIMUM | |
| MISC | MISCELLANEOUS | |
| MJ | MECHANICAL JOINT | |
| MLLW | MEAN LOWER LOW WATER | |
| MLW | MEAN LOW WATER | |
| MSL | MEAN SEA LEVEL | |
| MTD | MOUNTED | |
| MTG | MOUNTING | |
| MTZ | MOTORIZED | |
| **N** | | |
| N | NORTH, NORTHING | |
| N/A | NOT APPLICABLE | |
| NEC | NATIONAL ELECTRICAL CODE | |
| NFH | NATIONAL FISH HATCHERY | |
| NMC | NON-METALLIC CONDUIT | |
| NO. | NUMBER | |
| NOM | NOMINAL | |
| NP | NAME PLATE | |
| NTS | NOT TO SCALE | |
| **O** | | |
| O.C. | ON CENTER | |
| O.D. | OUTSIDE DIAMETER | |
| O.H. | OVERHEAD | |
| OBJ | OBJECT | |
| OF | OUTSIDE FACE | |
| OPP. | OPPOSITE | |
| **P** | | |
| P | POLE | |
| P.A. | POLLUTION ABATEMENT | |
| PB | PUSH BUTTON, PULL BOX | |
| PBT | PUMPBACK TRENCH | |
| PC | POINT OF CURVATURE | |
| PCC | POINT OF COMPOUND CURVE | |
| PE | PHOTOELECTRIC SENSOR (PHOTOCELL) | |
| PH | PHASE | |
| PI | POINT OF INTERSECTION | |
| PL | PLATE | |
| PNL | PANEL | |
| PRCST | PRECAST | |
| PT | POINT, POINT OF TANGENCY | |
| PTBX | POWER TERMINAL BOX | |
| PVC | POLYVINYL CHLORIDE | |
| PVI | POINT OF VERTICAL INTERCEPT | |
| **R** | | |
| R | RADIUS | |
| RCP | REINFORCED CONCRETE PIPE | |
| RD. | ROAD | |
| REC | RECEPTACLE | |
| RECPT | RECEPTACLE | |
| REF | REFERENCE | |
| REINF. | REINFORCED | |
| REQD | REQUIRED | |
| REV | REVISION | |
| RGS | RIGID GALVANIZED STEEL | |
| RR | RAILROAD | |
| **S** | | |
| S.S. | STAINLESS STEEL | |
| S.W. | SURFACE WATER | |
| SCH. | SCHEDULE | |
| SCKT | SHORT CIRCUIT | |
| SD | STORM DRAIN | |
| SECT | SECTION | |
| SF | SUPPLY FAN | |
| SHT. | SHEET | |
| SLT | SUPPLY LINE TRENCH | |
| SPH | SINGLE-PHASE | |
| SPLY | SUPPLY | |
| SQ | SQUARE | |
| SQFT | SQUARE FOOT | |
| SQIN | SQUARE INCH | |
| ST | STREET | |
| STA | STATION | |
| STD | STANDARD | |
| STGR | STRINGER | |
| STL | STEEL | |
| STRL | STRUCTURAL | |
| STRUCT | STRUCTURE | |
| STWY | STAIRWAY | |
| SURF | SURFACE | |
| SURV | SURVEY | |
| SW | SWITCH | |
| SWGR | SWITCHGEAR | |
| SYMM | SYMMETRICAL | |
| **T** | | |
| T.O.C. | TOP OF CONCRETE | |
| T.S. | TOE OF SLOPE | |
| TBM | TEMPORARY BENCH MARK | |
| TEMP | TEMPORARY | |
| THK | THICK | |
| TLD | TOTAL LOAD | |
| TSL | TEMPERING SUPPLY LINE | |
| TSP | TWISTED, SHIELDED PAIR | |
| TYP | TYPICAL | |
| XFMR | TRANSFORMER | |
| **U** | | |
| UG | UNDERGROUND | |
| UH | UNIT HEATER | |
| UHMWPE | ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE | |
| UL | UNDERWRITER'S LABORATORIES INC. | |
| UNK | UNKNOWN | |
| USFWS | UNITED STATES FISH AND WILDLIFE SERVICE | |
| UTIL | UTILITY | |
| **V** | | |
| V | VOLT | |
| VAC | VACUUM | |
| VAR | VARIABLE | |
| VEL | VELOCITY | |
| VERIF | VERIFY | |
| VERT | VERTICAL | |
| VFD | VARIABLE FREQUENCY DRIVE | |
| VLV | VALVE | |
| VOL | VOLUME | |
| **W** | | |
| W | WEST, WESTING, WIRE, WITH, WIDE | |
| W/ | WITH | |
| W/O | WITHOUT | |
| WD | WIDE | |
| WG | WIRE GAGE | |
| WL | WATERLINE | |
| WP | WEATHERPROOF | |
| WS | WELDED STEEL, WATER SURFACE | |
| WSHR | WASHER | |
| WT | WEIGHT | |
| WTR | WATER | |
| WTRPRF | WATERPROOF | |
| **X** | | |
| XBRA | CROSS BRACING | |
| XSECT | CROSS SECTION | |

VERIFY SCALE

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0"——1"

ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

| REV. | DATE | DESCRIPTION | BY |
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| | | | |

LEAVENWORTH NATIONAL FISH HATCHERY

INTAKE SYSTEM REHABILITATION
GENERAL

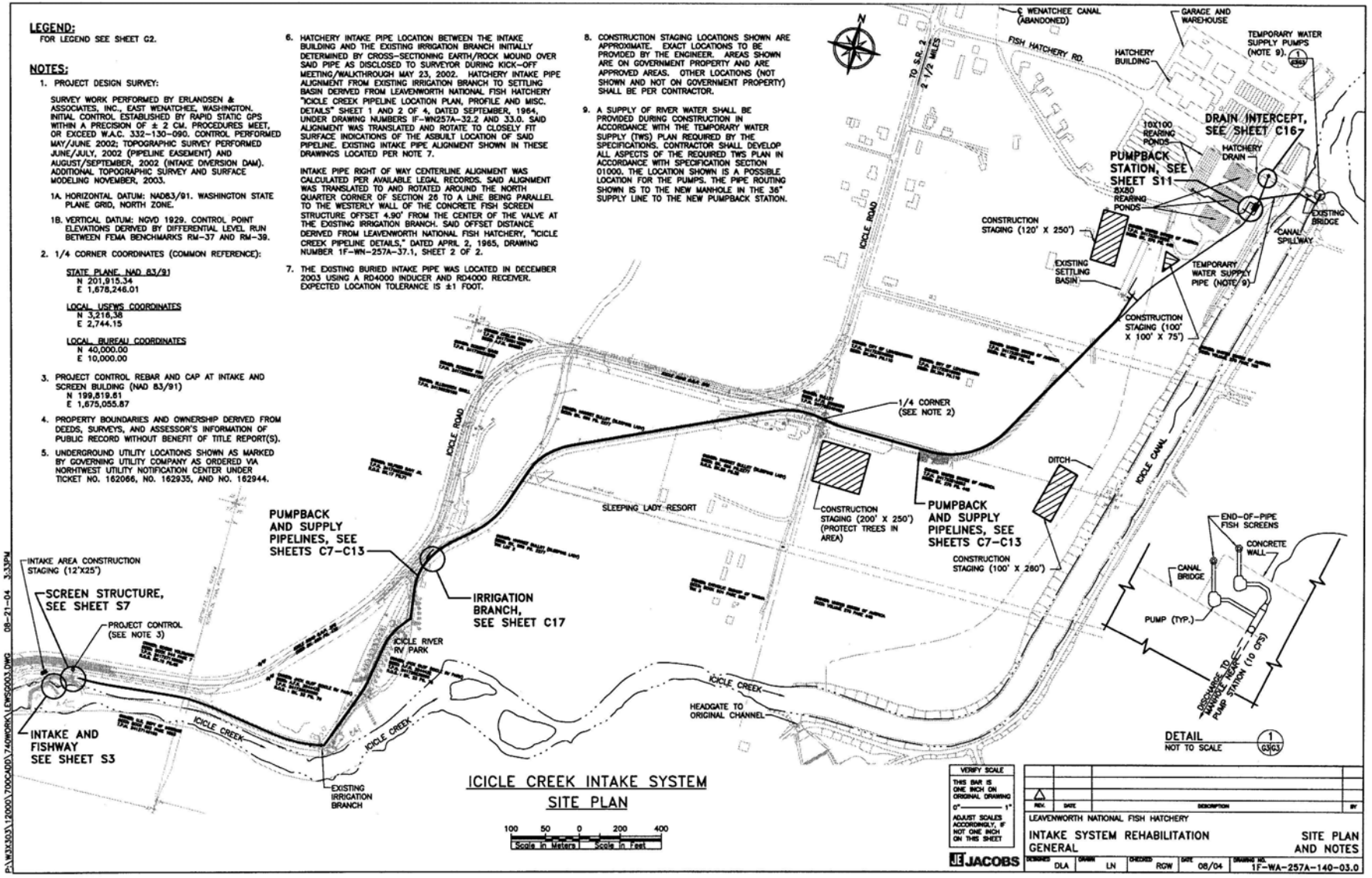
LEGEND AND ABBREVIATIONS

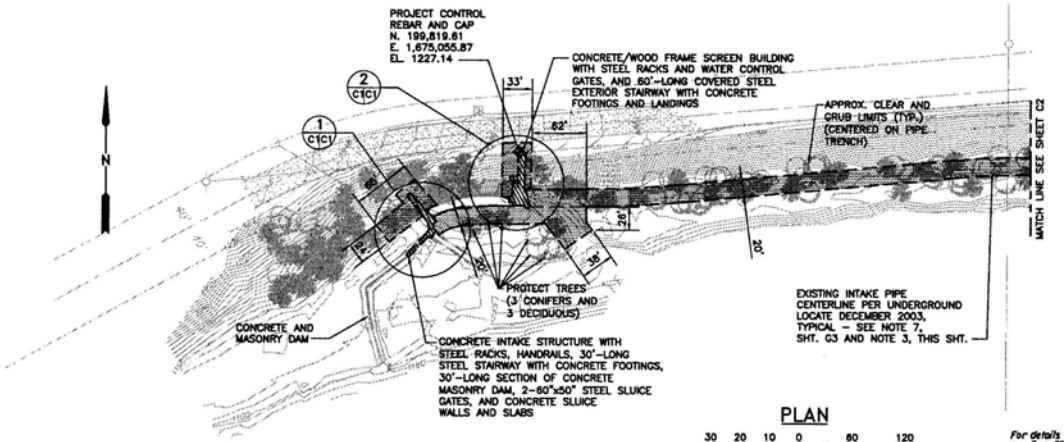
JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| DLA | LN | RGW | 08/04 | 1F-WA-257A-140-02.0 |

SHEET 02 OF 63

P:\W03\303\120000\700CADD\740WORK\LEWS0002.DWG 08-21-04 3:26PM


LEGEND:
FOR LEGEND SEE SHEET G2.
NOTES:
1. PROJECT DESIGN SURVEY:
SURVEY WORK PERFORMED BY ERLANDSEN & ASSOCIATES, INC., EAST WENATCHEE, WASHINGTON. INITIAL CONTROL ESTABLISHED BY RAPID STATIC GPS WITHIN A PRECISION OF ± 2 CM. PROCEDURES MEET, OR EXCEED W.A.C. 332-130-090. CONTROL PERFORMED MAY/JUNE 2002; TOPOGRAPHIC SURVEY PERFORMED JUNE/JULY, 2002 (PIPELINE EASEMENT) AND AUGUST/SEPTEMBER, 2002 (INTAKE DIVERSION DAM). ADDITIONAL TOPOGRAPHIC SURVEY AND SURFACE MODELING NOVEMBER, 2003.
1A. HORIZONTAL DATUM: NAD83/91. WASHINGTON STATE PLANE GRID, NORTH ZONE.
1B. VERTICAL DATUM: NGVD 1929. CONTROL POINT ELEVATIONS DERIVED BY DIFFERENTIAL LEVEL RUN BETWEEN FEMA BENCHMARKS RM-37 AND RM-39.
2. 1/4 CORNER COORDINATES (COMMON REFERENCE):
STATE PLANE, NAD 83/91
N 201,915.34
E 1,678,246.01
LOCAL USEWS COORDINATES
N 3,216.38
E 2,744.15
LOCAL BUREAU COORDINATES
N 40,000.00
E 10,000.00
3. PROJECT CONTROL REBAR AND CAP AT INTAKE AND SCREEN BULDING (NAD 83/91)
N 199,819.61
E 1,675,055.87
4. PROPERTY BOUNDARIES AND OWNERSHIP DERIVED FROM DEEDS, SURVEYS, AND ASSESSOR'S INFORMATION OF PUBLIC RECORD WITHOUT BENEFIT OF TITLE REPORT(S).
5. UNDERGROUND UTILITY LOCATIONS SHOWN AS MARKED BY GOVERNING UTILITY COMPANY AS ORDERED VIA NORHTWEST UTILITY NOTIFICATION CENTER UNDER TICKET NO. 162066, NO. 162935, AND NO. 162944.
6. HATCHERY INTAKE PIPE LOCATION BETWEEN THE INTAKE BUILDING AND THE EXISTING IRRIGATION BRANCH INITIALLY DETERMINED BY CROSS-SECTIONING EARTH/ROCK MOUND OVER SAID PIPE AS DISCLOSED TO SURVEYOR DURING KICK-OFF MEETING/WALKTHROUGH MAY 23, 2002. HATCHERY INTAKE PIPE ALIGNMENT FROM EXISTING IRRIGATION BRANCH TO SETTLING BASIN DERIVED FROM LEAVENWORTH NATIONAL FISH HATCHERY "ICICLE CREEK PIPELINE LOCATION PLAN, PROFILE AND MISC. DETAILS" SHEET 1 AND 2 OF 4, DATED SEPTEMBER, 1964, UNDER DRAWING NUMBERS IF-WN257A-32.2 AND 33.0. SAID ALIGNMENT WAS TRANSLATED AND ROTATE TO CLOSELY FIT SURFACE INDICATIONS OF THE ASBUILT LOCATION OF SAID PIPELINE. EXISTING INTAKE PIPE ALIGNMENT SHOWN IN THESE DRAWINGS LOCATED PER NOTE 7.
INTAKE PIPE RIGHT OF WAY CENTERLINE ALIGNMENT WAS CALCULATED PER AVAILABLE LEGAL RECORDS. SAID ALIGNMENT WAS TRANSLATED TO AND ROTATED AROUND THE NORTH QUARTER CORNER OF SECTION 26 TO A LINE BEING PARALLEL TO THE WESTERLY WALL OF THE CONCRETE FISH SCREEN STRUCTURE OFFSET 4.90' FROM THE CENTER OF THE VALVE AT THE EXISTING IRRIGATION BRANCH. SAID OFFSET DISTANCE DERIVED FROM LEAVENWORTH NATIONAL FISH HATCHERY, "ICICLE CREEK PIPELINE DETAILS," DATED APRIL 2, 1965, DRAWING NUMBER 1F-WN-257A-37.1, SHEET 2 OF 2.
7. THE EXISTING BURIED INTAKE PIPE WAS LOCATED IN DECEMBER 2003 USING A RD4000 INDUCER AND RD4000 RECEIVER. EXPECTED LOCATION TOLERANCE IS ±1 FOOT.
8. CONSTRUCTION STAGING LOCATIONS SHOWN ARE APPROXIMATE. EXACT LOCATIONS TO BE PROVIDED BY THE ENGINEER. AREAS SHOWN ARE ON GOVERNMENT PROPERTY AND ARE APPROVED AREAS. OTHER LOCATIONS (NOT SHOWN AND NOT ON GOVERNMENT PROPERTY) SHALL BE PER CONTRACTOR.
9. A SUPPLY OF RIVER WATER SHALL BE PROVIDED DURING CONSTRUCTION IN ACCORDANCE WITH THE TEMPORARY WATER SUPPLY (TWS) PLAN REQUIRED BY THE SPECIFICATIONS. CONTRACTOR SHALL DEVELOP ALL ASPECTS OF THE REQUIRED TWS PLAN IN ACCORDANCE WITH SPECIFICATION SECTION 01000. THE LOCATION SHOWN IS A POSSIBLE LOCATION FOR THE PUMPS. THE PIPE ROUTING SHOWN IS TO THE NEW MANHOLE IN THE 36" SUPPLY LINE TO THE NEW PUMPBACK STATION.
N
TO S.R. 2
2 1/2 MILES
FISH HATCHERY RD.
℄ WENATCHEE CANAL (ABANDONED)
GARAGE AND WAREHOUSE
HATCHERY BUILDING
TEMPORARY WATER SUPPLY PUMPS (NOTE 9).
DRAIN INTERCEPT, SEE SHEET C16
10X100 REARING PONDS
HATCHERY DRAIN
PUMPBACK STATION, SEE SHEET S11
8X80 REARING PONDS
CONSTRUCTION STAGING (120' X 250')
EXISTING BRIDGE
CANAL SPILLWAY
EXISTING SETTLING BASIN
TEMPORARY WATER SUPPLY PIPE (NOTE 9)
CONSTRUCTION STAGING (100' X 100' X 75')
ICICLE ROAD
1/4 CORNER (SEE NOTE 2)
ICICLE CANAL
DITCH
SLEEPING LADY RESORT
CONSTRUCTION STAGING (200' X 250') (PROTECT TREES IN AREA)
PUMPBACK AND SUPPLY PIPELINES, SEE SHEETS C7-C13
CONSTRUCTION STAGING (100' X 280')
PUMPBACK AND SUPPLY PIPELINES, SEE SHEETS C7-C13
IRRIGATION BRANCH, SEE SHEET C17
INTAKE AREA CONSTRUCTION STAGING (12'X25')
SCREEN STRUCTURE, SEE SHEET S7
PROJECT CONTROL (SEE NOTE 3)
INTAKE AND FISHWAY SEE SHEET S3
ICICLE RIVER RV PARK
ICICLE CREEK
HEADGATE TO ORIGINAL CHANNEL
EXISTING IRRIGATION BRANCH
END-OF-PIPE FISH SCREENS
CONCRETE WALL
CANAL BRIDGE
PUMP (TYP.)
DISCHARGE TO MANHOLE NEAR PUMP STATION (10 CFS)
DETAIL 1 G3/C3
NOT TO SCALE
ICICLE CREEK INTAKE SYSTEM
SITE PLAN
100 50 0 200 400
Scale in Meters Scale in Feet
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
JE JACOBS
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
GENERAL
SITE PLAN AND NOTES
DESIGNED DLA
DRAWN LN
CHECKED RGW
DATE 08/04
DRAWING NO. 1F-WA-257A-140-03.0
SHEET G3 OF 63
P:\W3X3033\12000\700CADD\740WORK\LEWSG003.DWG 08-21-04 3:33PM




PLAN

30 20 10 0 60 120
Scale in Meters | Scale in Feet

CALL 48 HOURS BEFORE YOU DIG
UTILITY LOCATES SHOWN ARE APPROXIMATE
1-800-424-5555

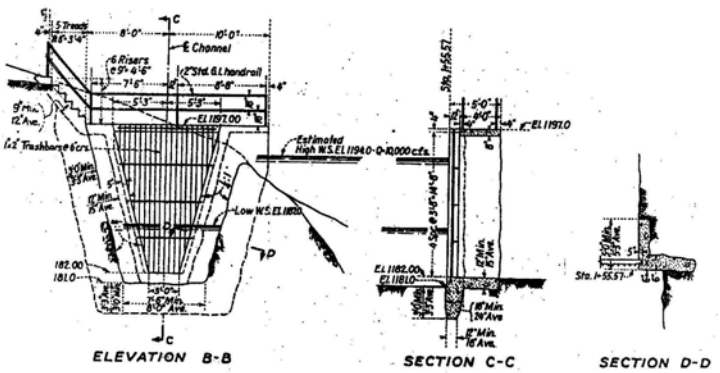
**LEGEND**

CLEAR AND GRUB FOR PIPE TRENCH.

ITEM TO BE DEMOLISHED.

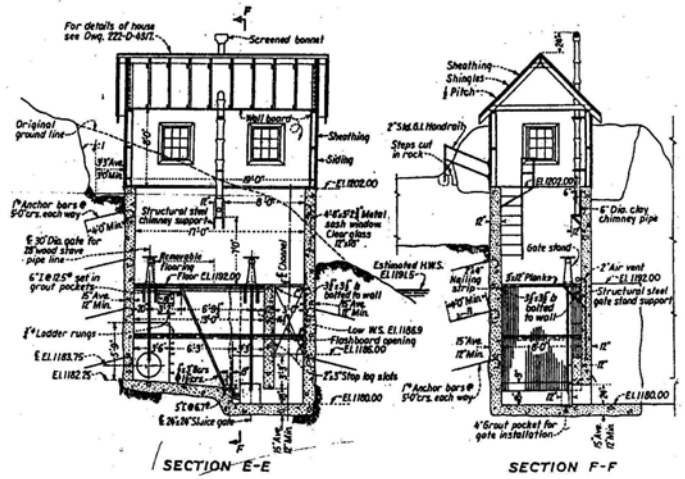
**NOTES:**

1. DEPICTIONS OF EXISTING STRUCTURES DO NOT NECESSARILY REFLECT AS-BUILT CONDITIONS. CONTRACTOR TO VERIFY ALL INSTALLATIONS PRIOR TO CONSTRUCTION.
2. CONTOURS WITHIN INTAKE INLET CHANNEL, DOWNSTREAM OF INTAKE CONTROL WEIR, WERE GENERATED FOLLOWING SEDIMENT REMOVAL IN SEPTEMBER, 2002
3. THE EXISTING BURIED 33" DIAMETER STEEL AND 30" DIAMETER CCP PIPELINE IS TO BE REMOVED WITHIN THE TRENCH BOUNDARIES FOR THE NEW PIPELINES. EXISTING PIPELINE NOT LOCATED WITHIN THE TRENCH BOUNDARIES AND NOT INTERFERING WITH CONSTRUCTION OF THE NEW PIPELINES IS TO BE ABANDONED IN PLACE. PLUG ENDS OF PIPE WITH CONCRETE.




EXISTING INTAKE STRUCTURE REFERENCE FIGURES (SEE NOTE 1)

REFERENCE 1 C1C1
NOT TO SCALE




EXISTING SCREEN BUILDING REFERENCE FIGURES (SEE NOTE 1)

REFERENCE 2 C1C1
NOT TO SCALE

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

| NO. | DATE | DESCRIPTION | BY |
|---|---|---|---|

LEAVENWORTH NATIONAL FISH HATCHERY

INTAKE SYSTEM REHABILITATION — INTAKE AREA
DEMOLITION PLAN AND SECTIONS

JE JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| RGW | LN | DLA | 08/04 | 1F-WA-257A-140-04.0 |

SHEET C1 OF 63

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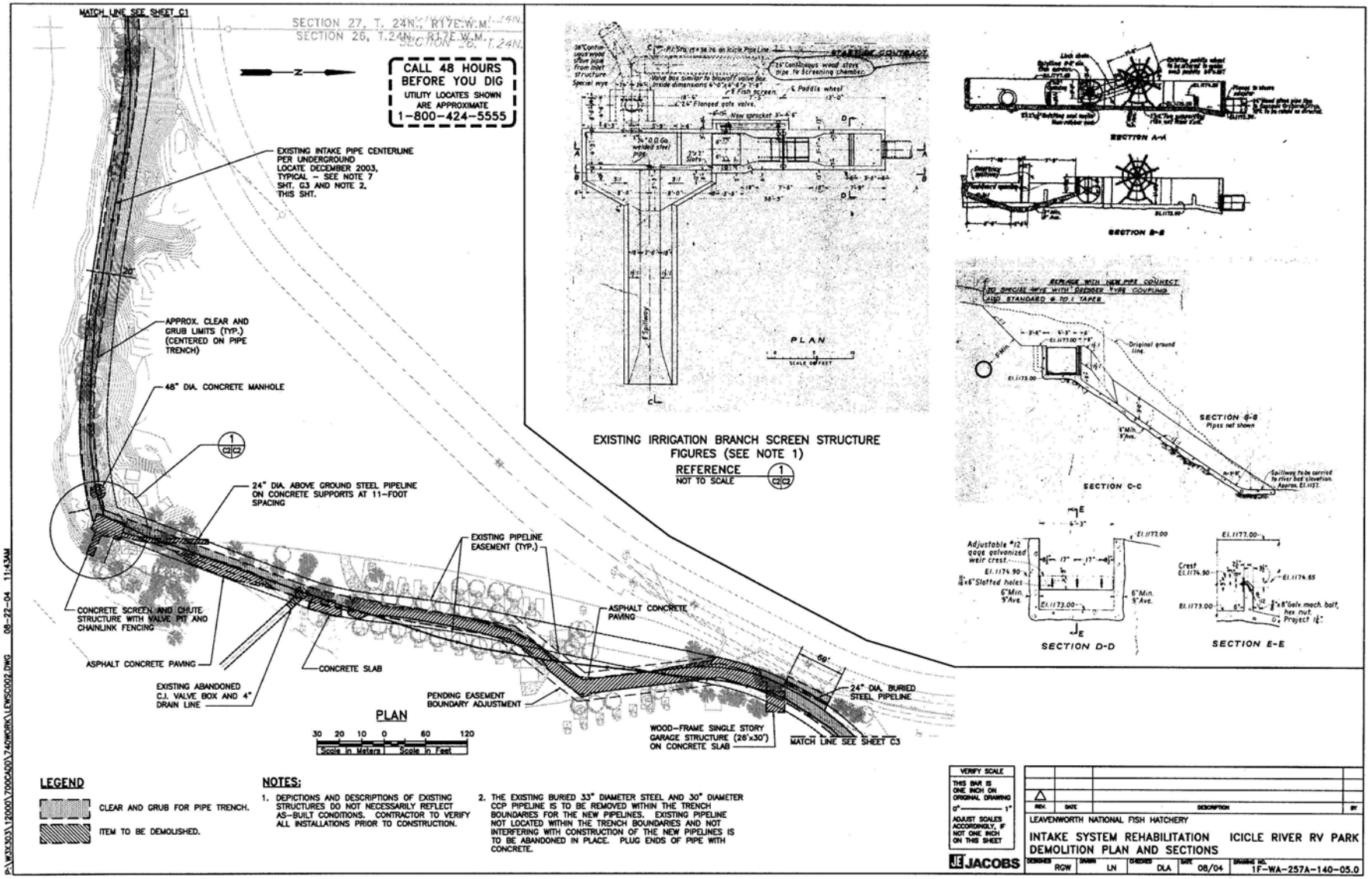
MATCH LINE SEE SHEET C1
SECTION 27, T. 24N., R17E.W.M.
SECTION 26, T.24N., R17E.W.M.
CALL 48 HOURS BEFORE YOU DIG
UTILITY LOCATES SHOWN ARE APPROXIMATE
1-800-424-5555
EXISTING INTAKE PIPE CENTERLINE PER UNDERGROUND LOCATE DECEMBER 2003, TYPICAL – SEE NOTE 7 SHT. G3 AND NOTE 2, THIS SHT.
APPROX. CLEAR AND GRUB LIMITS (TYP.) (CENTERED ON PIPE TRENCH)
48" DIA. CONCRETE MANHOLE
24" DIA. ABOVE GROUND STEEL PIPELINE ON CONCRETE SUPPORTS AT 11-FOOT SPACING
EXISTING PIPELINE EASEMENT (TYP.)
CONCRETE SCREEN AND CHUTE STRUCTURE WITH VALVE PIT AND CHAINLINK FENCING
ASPHALT CONCRETE PAVING
CONCRETE SLAB
EXISTING ABANDONED C.I. VALVE BOX AND 4" DRAIN LINE
PENDING EASEMENT BOUNDARY ADJUSTMENT
24" DIA. BURIED STEEL PIPELINE
WOOD-FRAME SINGLE STORY GARAGE STRUCTURE (26'x30') ON CONCRETE SLAB
MATCH LINE SEE SHEET C3
PLAN
Scale in Meters
Scale in Feet
EXISTING IRRIGATION BRANCH SCREEN STRUCTURE FIGURES (SEE NOTE 1)
REFERENCE 1 C2/C2
NOT TO SCALE
PLAN
SECTION A-A
SECTION B-B
SECTION C-C
SECTION D-D
SECTION E-E
LEGEND
CLEAR AND GRUB FOR PIPE TRENCH.
ITEM TO BE DEMOLISHED.
NOTES:
1. DEPICTIONS AND DESCRIPTIONS OF EXISTING STRUCTURES DO NOT NECESSARILY REFLECT AS-BUILT CONDITIONS. CONTRACTOR TO VERIFY ALL INSTALLATIONS PRIOR TO CONSTRUCTION.
2. THE EXISTING BURIED 33" DIAMETER STEEL AND 30" DIAMETER CCP PIPELINE IS TO BE REMOVED WITHIN THE TRENCH BOUNDARIES FOR THE NEW PIPELINES. EXISTING PIPELINE NOT LOCATED WITHIN THE TRENCH BOUNDARIES AND NOT INTERFERING WITH CONSTRUCTION OF THE NEW PIPELINES IS TO BE ABANDONED IN PLACE. PLUG ENDS OF PIPE WITH CONCRETE.
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
JACOBS
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION ICICLE RIVER RV PARK
DEMOLITION PLAN AND SECTIONS
DESIGNED RGW
DRAWN LN
CHECKED DLA
DATE 08/04
DRAWING NO. 1F-WA-257A-140-05.0
SHEET C2 OF 63
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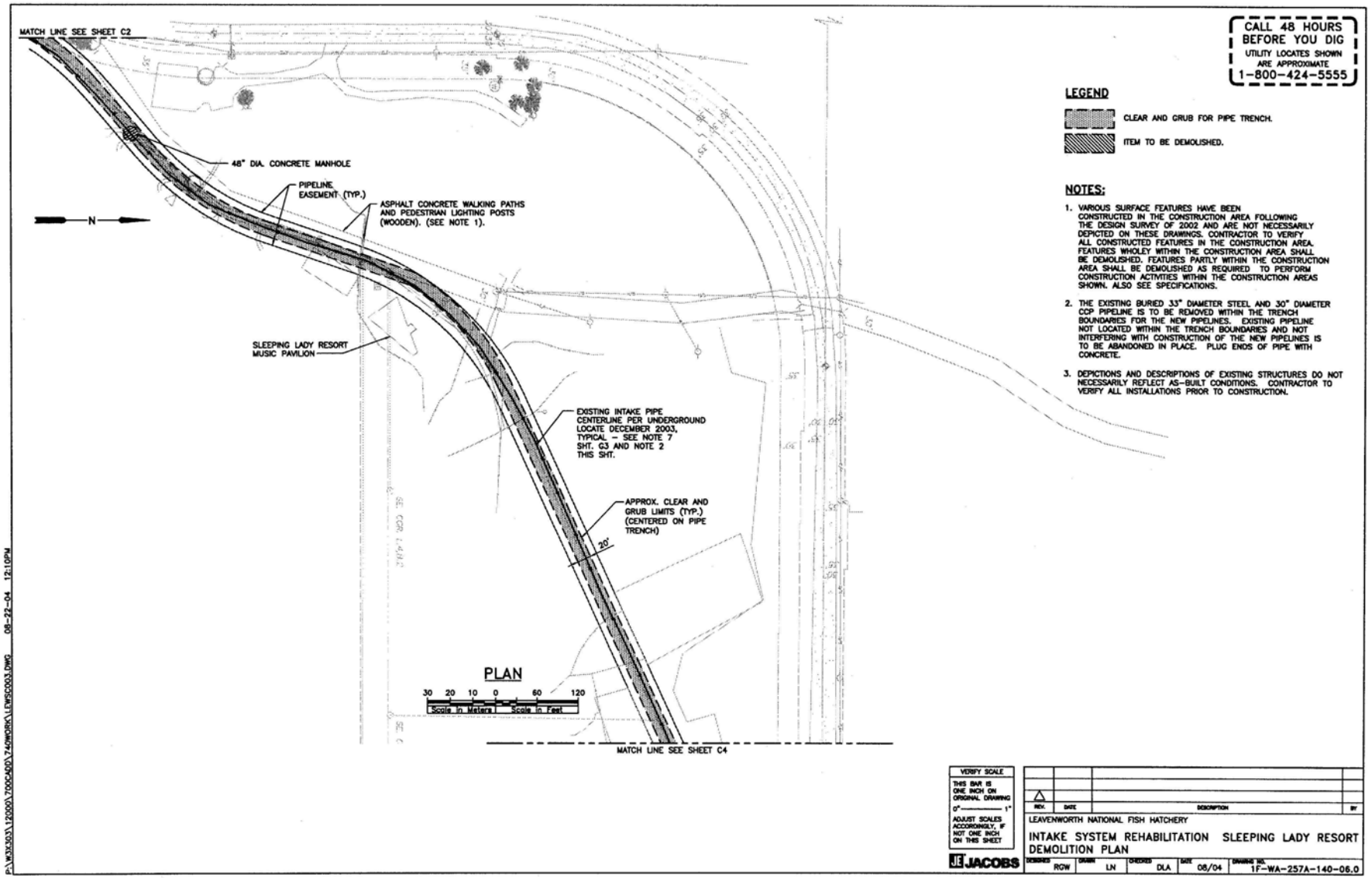


CALL 48 HOURS BEFORE YOU DIG
UTILITY LOCATES SHOWN ARE APPROXIMATE
1-800-424-5555

**LEGEND**

CLEAR AND GRUB FOR PIPE TRENCH.

ITEM TO BE DEMOLISHED.

**NOTES:**

1. VARIOUS SURFACE FEATURES HAVE BEEN CONSTRUCTED IN THE CONSTRUCTION AREA FOLLOWING THE DESIGN SURVEY OF 2002 AND ARE NOT NECESSARILY DEPICTED ON THESE DRAWINGS. CONTRACTOR TO VERIFY ALL CONSTRUCTED FEATURES IN THE CONSTRUCTION AREA. FEATURES WHOLEY WITHIN THE CONSTRUCTION AREA SHALL BE DEMOLISHED. FEATURES PARTLY WITHIN THE CONSTRUCTION AREA SHALL BE DEMOLISHED AS REQUIRED TO PERFORM CONSTRUCTION ACTIVITIES WITHIN THE CONSTRUCTION AREAS SHOWN. ALSO SEE SPECIFICATIONS.
2. THE EXISTING BURIED 33" DIAMETER STEEL AND 30" DIAMETER CCP PIPELINE IS TO BE REMOVED WITHIN THE TRENCH BOUNDARIES FOR THE NEW PIPELINES. EXISTING PIPELINE NOT LOCATED WITHIN THE TRENCH BOUNDARIES AND NOT INTERFERING WITH CONSTRUCTION OF THE NEW PIPELINES IS TO BE ABANDONED IN PLACE. PLUG ENDS OF PIPE WITH CONCRETE.
3. DEPICTIONS AND DESCRIPTIONS OF EXISTING STRUCTURES DO NOT NECESSARILY REFLECT AS-BUILT CONDITIONS. CONTRACTOR TO VERIFY ALL INSTALLATIONS PRIOR TO CONSTRUCTION.

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| △ | | | |

LEAVENWORTH NATIONAL FISH HATCHERY

INTAKE SYSTEM REHABILITATION SLEEPING LADY RESORT
DEMOLITION PLAN

JE JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| RGW | LN | DLA | 08/04 | 1F-WA-257A-140-06.0 |

SHEET C3 OF 63

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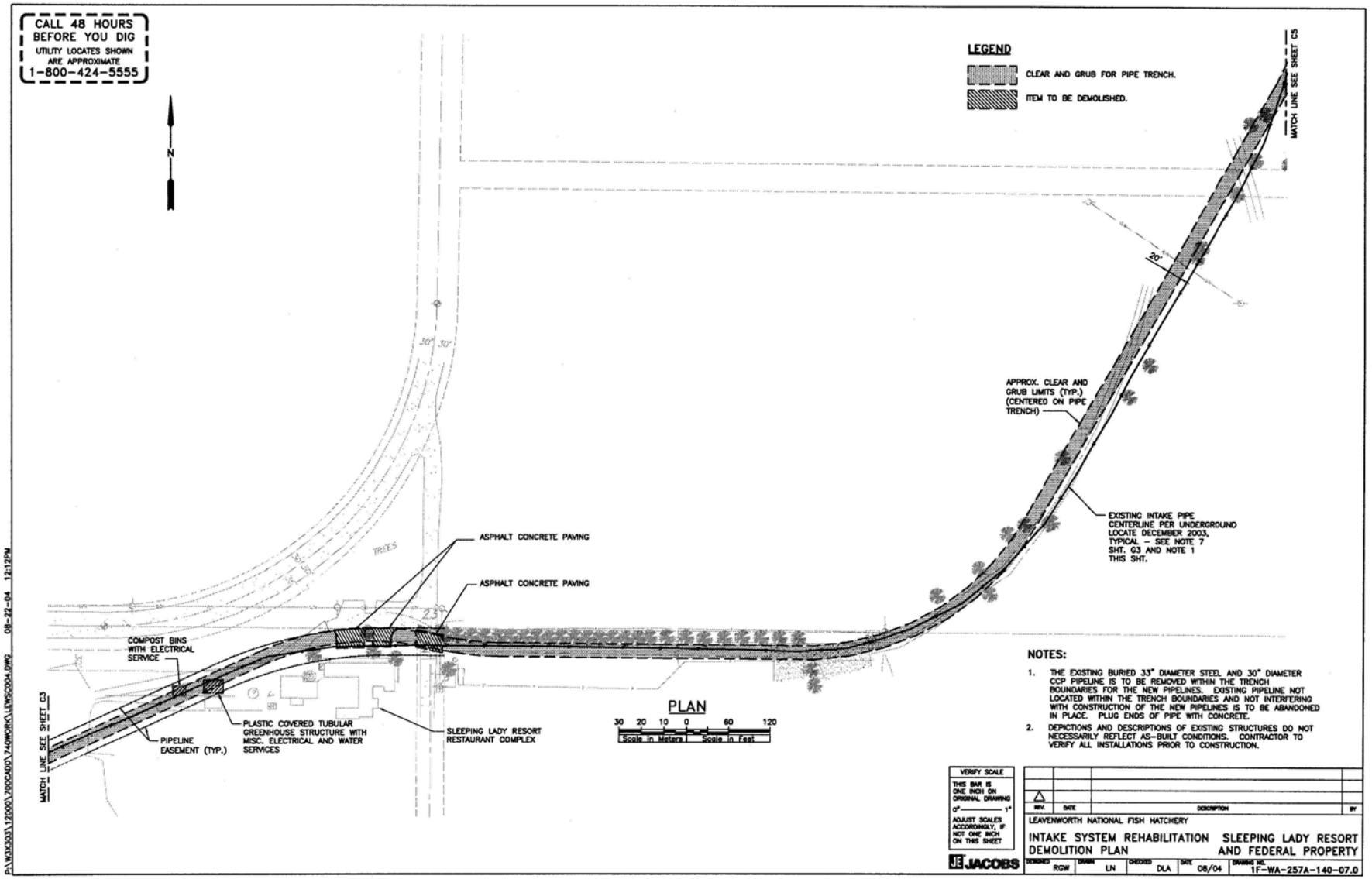
CALL 48 HOURS BEFORE YOU DIG
UTILITY LOCATES SHOWN ARE APPROXIMATE
1-800-424-5555
N
LEGEND
CLEAR AND GRUB FOR PIPE TRENCH.
ITEM TO BE DEMOLISHED.
MATCH LINE SEE SHEET C3
20'
APPROX. CLEAR AND GRUB LIMITS (TYP.) (CENTERED ON PIPE TRENCH)
EXISTING INTAKE PIPE CENTERLINE PER UNDERGROUND LOCATE DECEMBER 2003, TYPICAL – SEE NOTE 7 SHT. G3 AND NOTE 1 THIS SHT.
ASPHALT CONCRETE PAVING
ASPHALT CONCRETE PAVING
TREES
30'
30'
COMPOST BINS WITH ELECTRICAL SERVICE
PIPELINE EASEMENT (TYP.)
PLASTIC COVERED TUBULAR GREENHOUSE STRUCTURE WITH MISC. ELECTRICAL AND WATER SERVICES
SLEEPING LADY RESORT RESTAURANT COMPLEX
MATCH LINE SEE SHEET C3
PLAN
30 20 10 0 60 120
Scale in Meters Scale in Feet
NOTES:
1. THE EXISTING BURIED 33" DIAMETER STEEL AND 30" DIAMETER CCP PIPELINE IS TO BE REMOVED WITHIN THE TRENCH BOUNDARIES FOR THE NEW PIPELINES. EXISTING PIPELINE NOT LOCATED WITHIN THE TRENCH BOUNDARIES AND NOT INTERFERING WITH CONSTRUCTION OF THE NEW PIPELINES IS TO BE ABANDONED IN PLACE. PLUG ENDS OF PIPE WITH CONCRETE.
2. DEPICTIONS AND DESCRIPTIONS OF EXISTING STRUCTURES DO NOT NECESSARILY REFLECT AS-BUILT CONDITIONS. CONTRACTOR TO VERIFY ALL INSTALLATIONS PRIOR TO CONSTRUCTION.
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
REV. DATE DESCRIPTION BY
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION SLEEPING LADY RESORT AND FEDERAL PROPERTY
DEMOLITION PLAN
JE JACOBS
DESIGNED RGW DRAWN LN CHECKED DLA DATE 08/04 DRAWING NO. 1F-WA-257A-140-07.0
SHEET C4 OF 63
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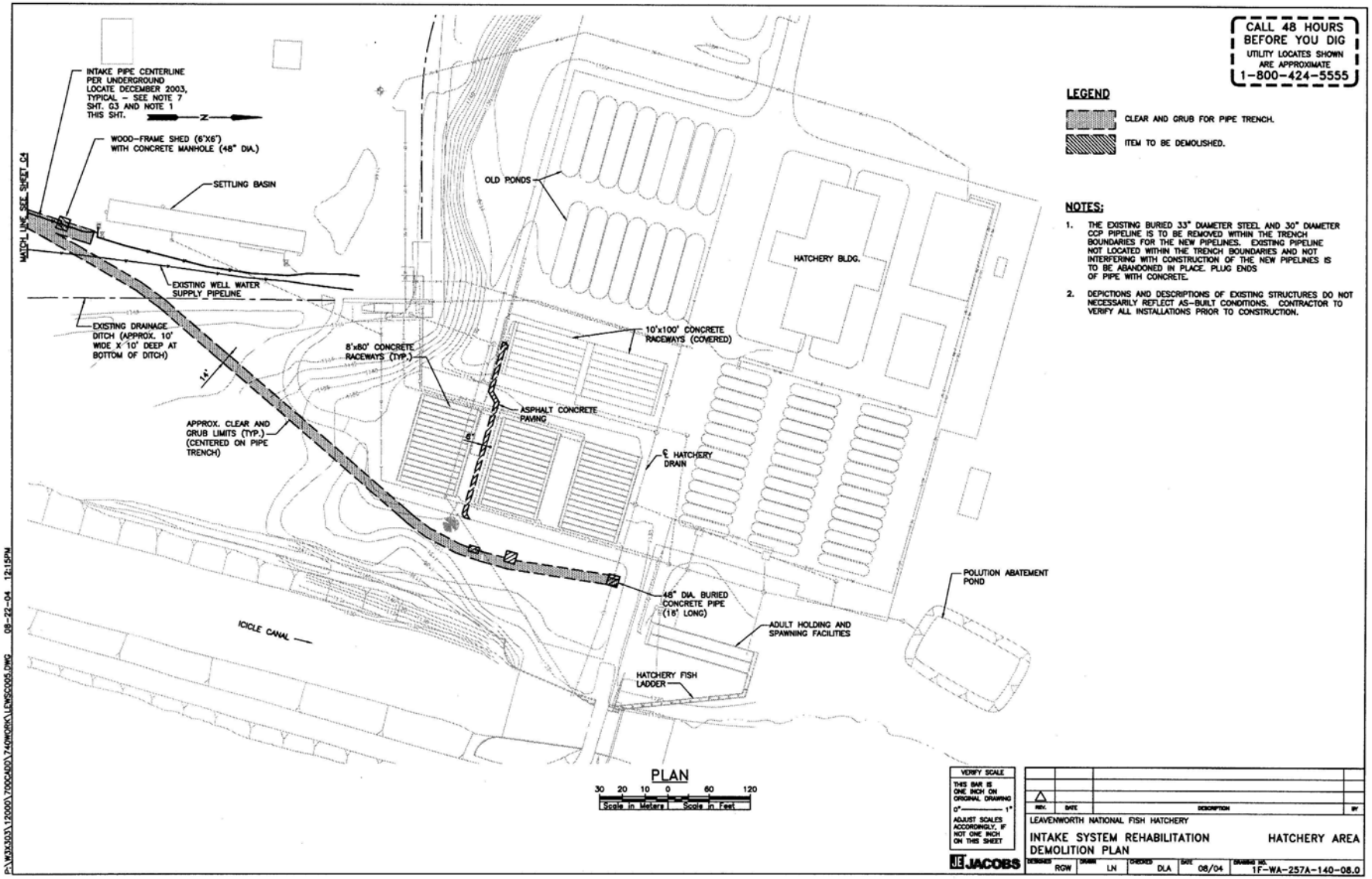
CALL 48 HOURS BEFORE YOU DIG
UTILITY LOCATES SHOWN ARE APPROXIMATE
1-800-424-5555
LEGEND
CLEAR AND GRUB FOR PIPE TRENCH.
ITEM TO BE DEMOLISHED.
NOTES:
1. THE EXISTING BURIED 33" DIAMETER STEEL AND 30" DIAMETER CCP PIPELINE IS TO BE REMOVED WITHIN THE TRENCH BOUNDARIES FOR THE NEW PIPELINES. EXISTING PIPELINE NOT LOCATED WITHIN THE TRENCH BOUNDARIES AND NOT INTERFERING WITH CONSTRUCTION OF THE NEW PIPELINES IS TO BE ABANDONED IN PLACE. PLUG ENDS OF PIPE WITH CONCRETE.
2. DEPICTIONS AND DESCRIPTIONS OF EXISTING STRUCTURES DO NOT NECESSARILY REFLECT AS-BUILT CONDITIONS. CONTRACTOR TO VERIFY ALL INSTALLATIONS PRIOR TO CONSTRUCTION.
INTAKE PIPE CENTERLINE PER UNDERGROUND LOCATE DECEMBER 2003, TYPICAL - SEE NOTE 7 SHT. G3 AND NOTE 1 THIS SHT.
WOOD-FRAME SHED (6'X6') WITH CONCRETE MANHOLE (48" DIA.)
SETTLING BASIN
MATCH LINE SEE SHEET C4
EXISTING WELL WATER SUPPLY PIPELINE
EXISTING DRAINAGE DITCH (APPROX. 10' WIDE X 10' DEEP AT BOTTOM OF DITCH)
APPROX. CLEAR AND GRUB LIMITS (TYP.) (CENTERED ON PIPE TRENCH)
OLD PONDS
HATCHERY BLDG.
10'x100' CONCRETE RACEWAYS (COVERED)
8'x80' CONCRETE RACEWAYS (TYP.)
ASPHALT CONCRETE PAVING
℄ HATCHERY DRAIN
48" DIA. BURIED CONCRETE PIPE (16' LONG)
POLLUTION ABATEMENT POND
ADULT HOLDING AND SPAWNING FACILITIES
HATCHERY FISH LADDER
ICICLE CANAL
PLAN
30 20 10 0 60 120
Scale in Meters Scale in Feet
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
JE JACOBS
REV. DATE DESCRIPTION BY
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION HATCHERY AREA
DEMOLITION PLAN
DESIGNED RGW DRAWN LN CHECKED DLA DATE 08/04
DRAWING NO. 1F-WA-257A-140-08.0
SHEET C5 OF 63
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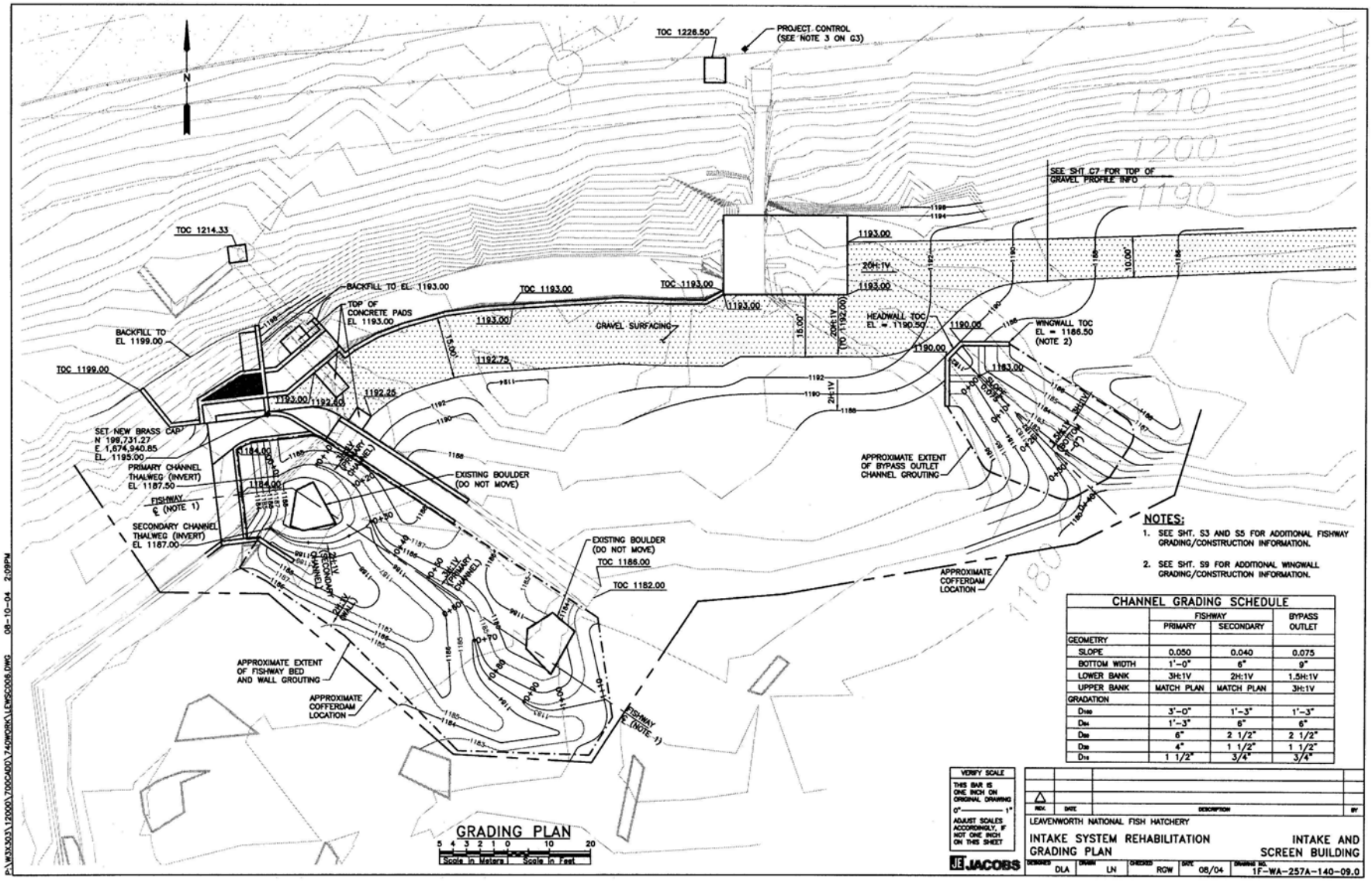


**NOTES:**

1. SEE SHT. S3 AND S5 FOR ADDITIONAL FISHWAY GRADING/CONSTRUCTION INFORMATION.
2. SEE SHT. S9 FOR ADDITIONAL WINGWALL GRADING/CONSTRUCTION INFORMATION.

**CHANNEL GRADING SCHEDULE**

| | FISHWAY | | BYPASS |
|---|---|---|---|
| | PRIMARY | SECONDARY | OUTLET |
| GEOMETRY | | | |
| SLOPE | 0.050 | 0.040 | 0.075 |
| BOTTOM WIDTH | 1'-0" | 6" | 9" |
| LOWER BANK | 3H:1V | 2H:1V | 1.5H:1V |
| UPPER BANK | MATCH PLAN | MATCH PLAN | 3H:1V |
| GRADATION | | | |
| $D_{100}$ | 3'-0" | 1'-3" | 1'-3" |
| $D_{84}$ | 1'-3" | 6" | 6" |
| $D_{50}$ | 6" | 2 1/2" | 2 1/2" |
| $D_{30}$ | 4" | 1 1/2" | 1 1/2" |
| $D_{16}$ | 1 1/2" | 3/4" | 3/4" |

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

| NO. | DATE | DESCRIPTION | BY |
|---|---|---|---|

LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
GRADING PLAN
INTAKE AND SCREEN BUILDING

JE JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| DLA | LN | RGW | 08/04 | 1F-WA-257A-140-09.0 |

SHEET C9 OF 63

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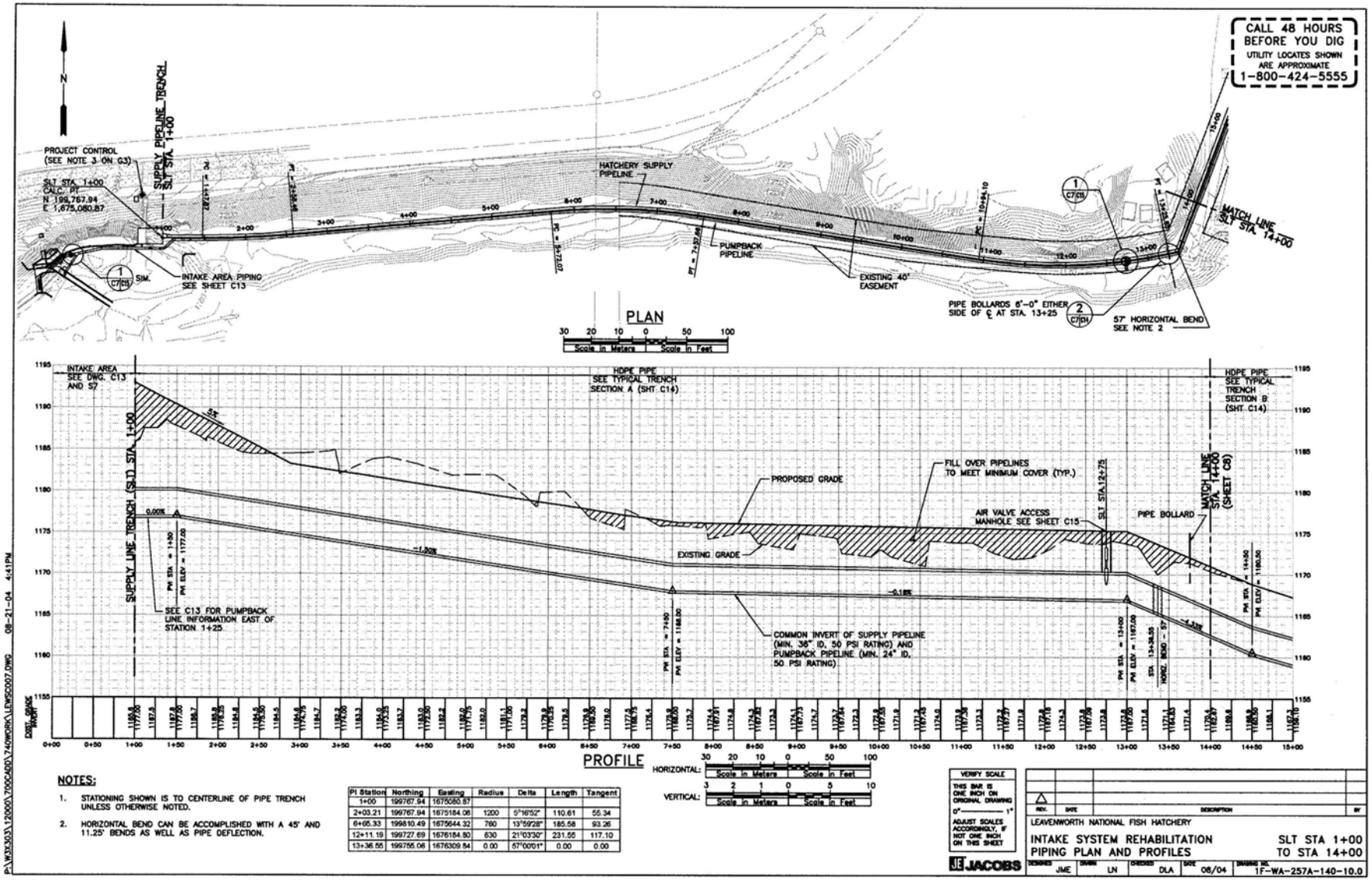


**NOTES:**

1. STATIONING SHOWN IS TO CENTERLINE OF PIPE TRENCH UNLESS OTHERWISE NOTED.
2. HORIZONTAL BEND CAN BE ACCOMPLISHED WITH A 45° AND 11.25° BENDS AS WELL AS PIPE DEFLECTION.

| PI Station | Northing | Easting | Radius | Delta | Length | Tangent |
|---|---|---|---|---|---|---|
| 1+00 | 199767.94 | 1675080.87 | | | | |
| 2+03.21 | 199767.94 | 1675184.06 | 1200 | 5°16'52" | 110.61 | 55.34 |
| 6+65.33 | 199610.49 | 1675644.32 | 760 | 13°59'28" | 185.58 | 93.26 |
| 12+11.19 | 199727.69 | 1676184.80 | 630 | 21°03'30" | 231.55 | 117.10 |
| 13+36.55 | 199755.06 | 1676309.84 | 0.00 | 57°00'01" | 0.00 | 0.00 |

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" ——— 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

JACOBS

LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION — SLT STA 1+00
PIPING PLAN AND PROFILES — TO STA 14+00

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| JME | LN | DLA | 08/04 | 1F-WA-257A-140-10.0 |

SHEET C7 OF 63

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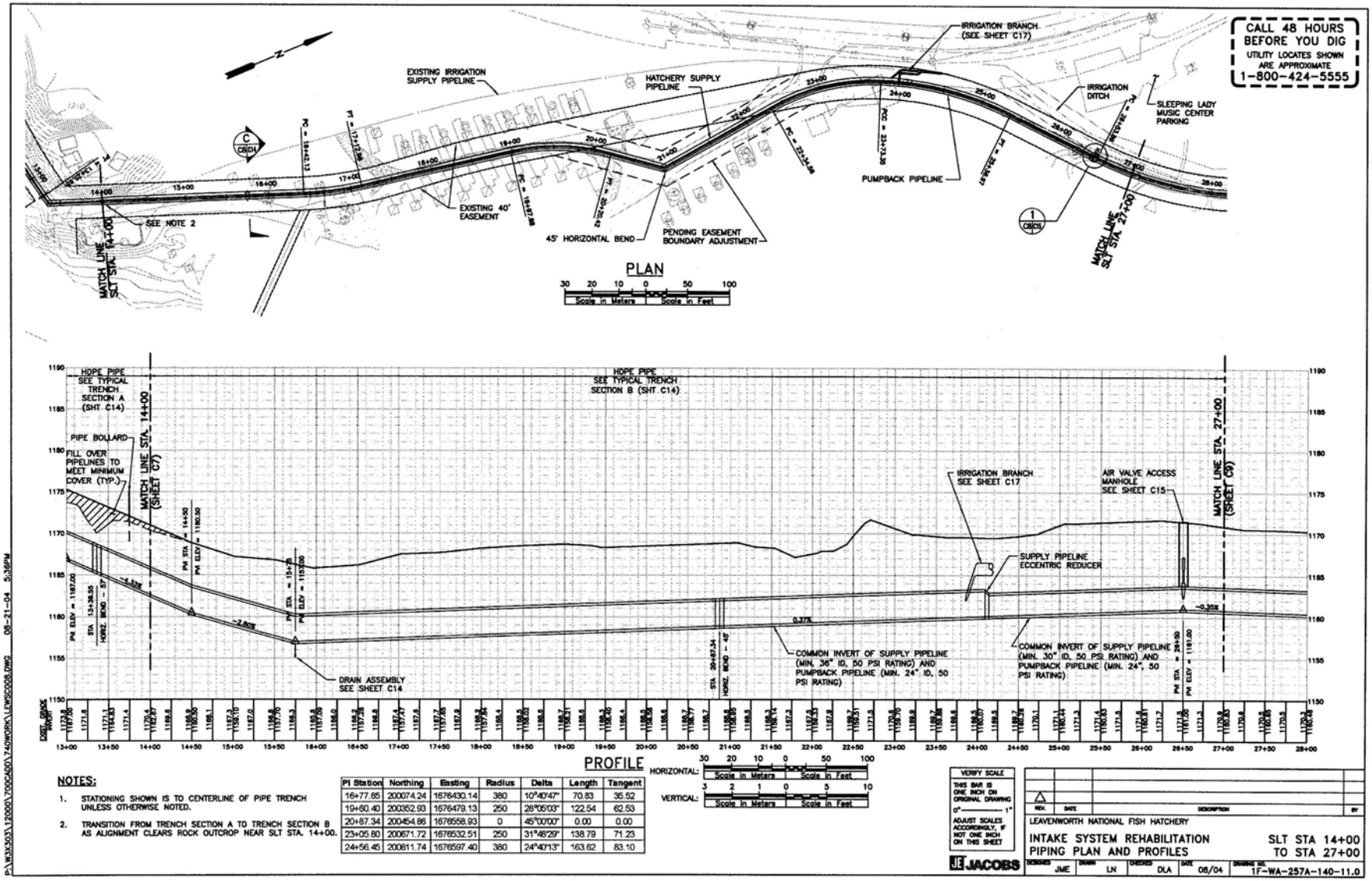


**NOTES:**

1. STATIONING SHOWN IS TO CENTERLINE OF PIPE TRENCH UNLESS OTHERWISE NOTED.
2. TRANSITION FROM TRENCH SECTION A TO TRENCH SECTION B AS ALIGNMENT CLEARS ROCK OUTCROP NEAR SLT STA. 14+00.

| PI Station | Northing | Easting | Radius | Delta | Length | Tangent |
|---|---|---|---|---|---|---|
| 16+77.65 | 200074.24 | 1676430.14 | 380 | 10°40'47" | 70.83 | 35.52 |
| 19+60.40 | 200352.93 | 1676479.13 | 250 | 28°05'03" | 122.54 | 62.53 |
| 20+87.34 | 200454.86 | 1676558.93 | 0 | 45°00'00" | 0.00 | 0.00 |
| 23+05.80 | 200671.72 | 1676532.51 | 250 | 31°48'29" | 138.79 | 71.23 |
| 24+56.45 | 200811.74 | 1676597.40 | 380 | 24°40'13" | 163.62 | 83.10 |

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

JE JACOBS

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | | |

LEAVENWORTH NATIONAL FISH HATCHERY

INTAKE SYSTEM REHABILITATION
PIPING PLAN AND PROFILES

SLT STA 14+00
TO STA 27+00

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| JME | LN | DLA | 08/04 | 1F-WA-257A-140-11.0 |

SHEET C8 OF 63

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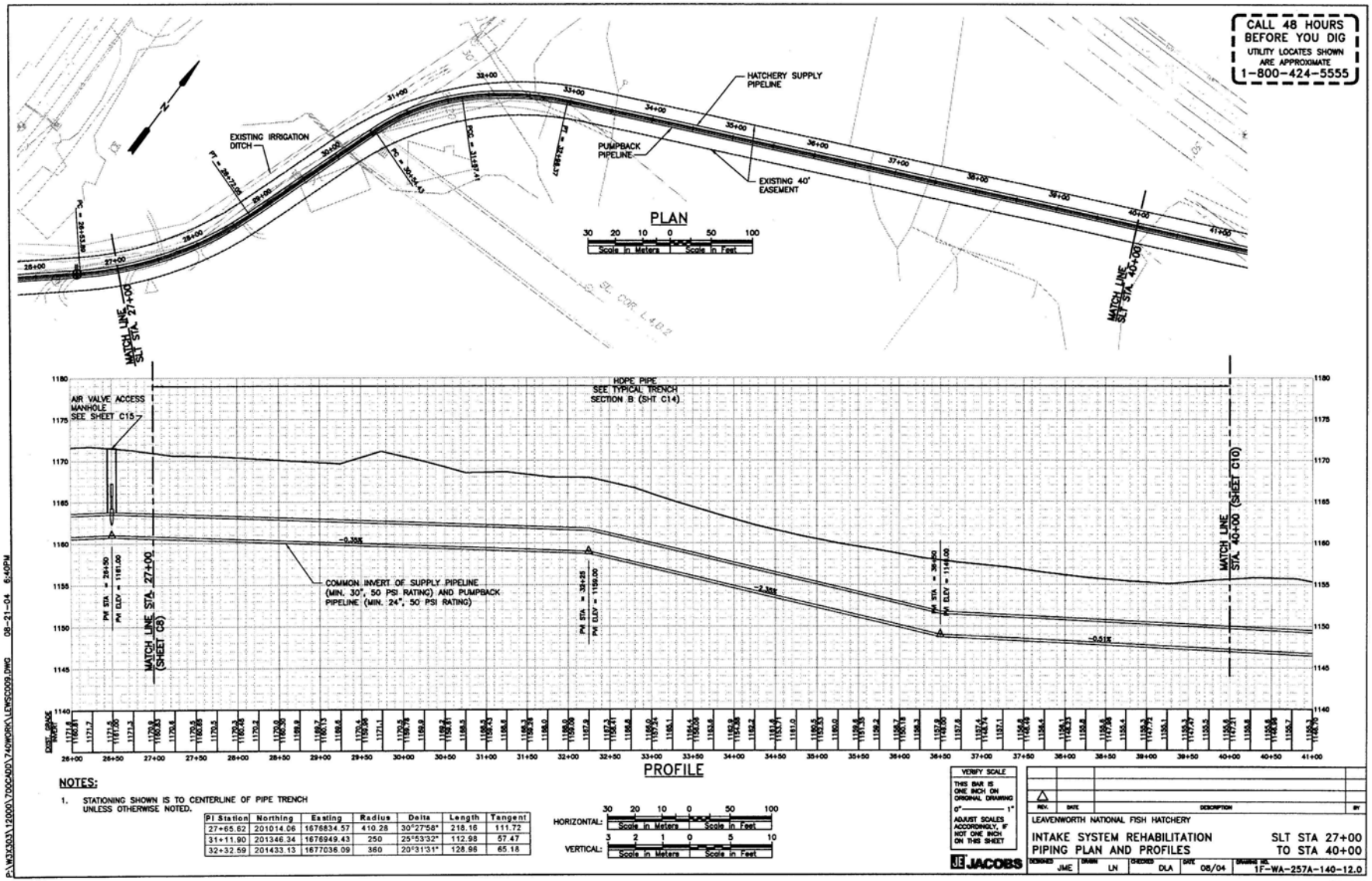
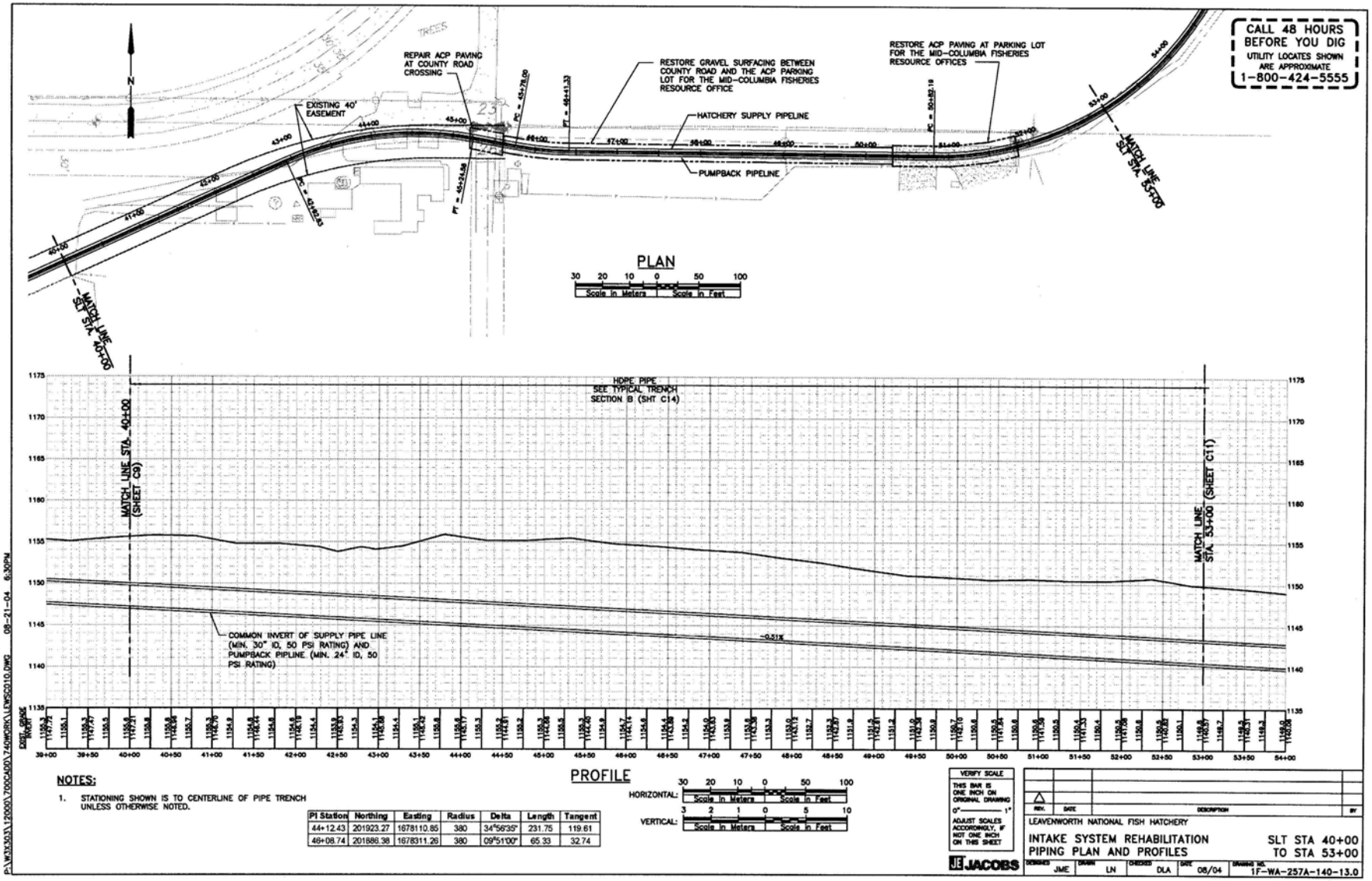
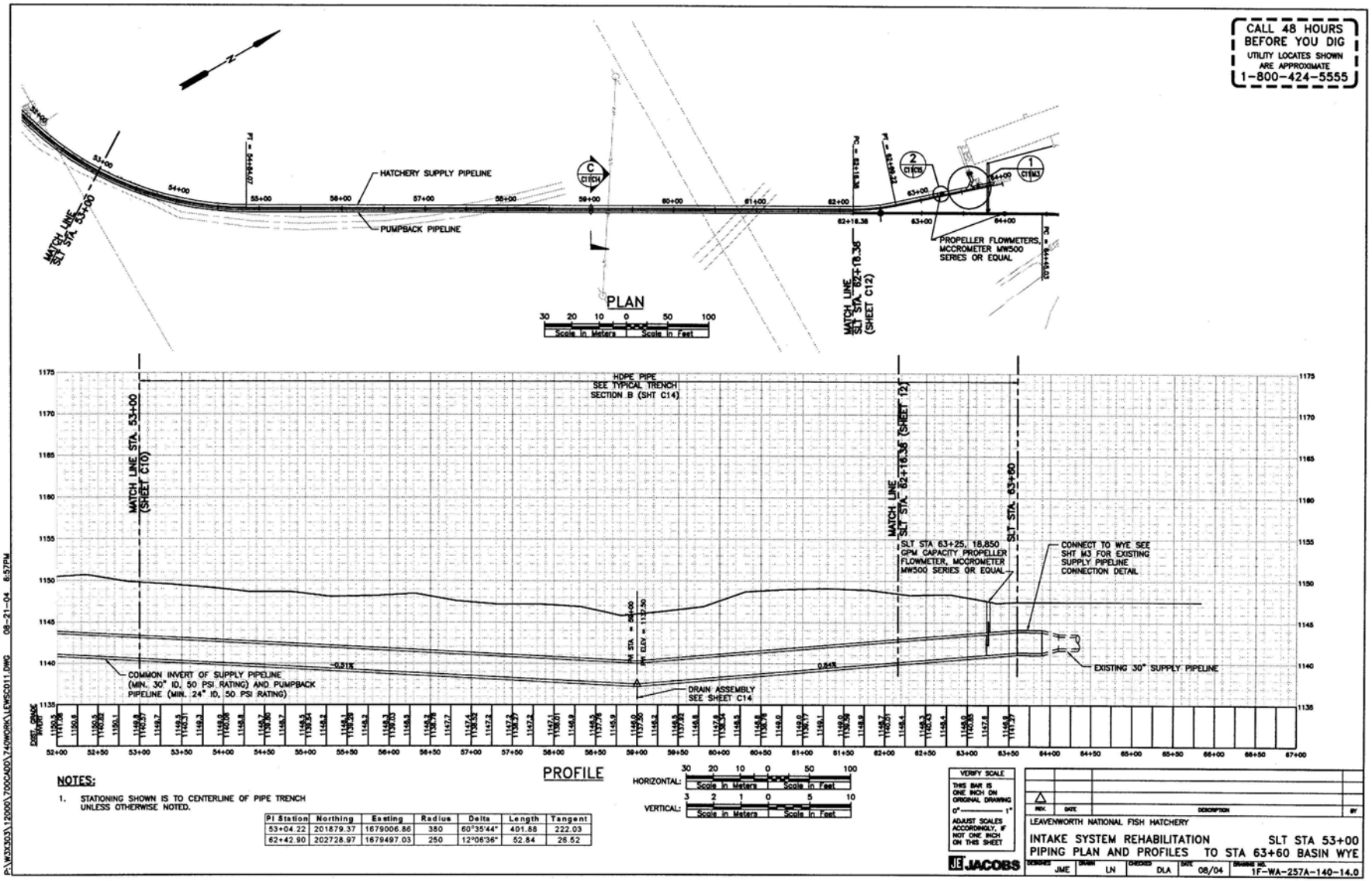
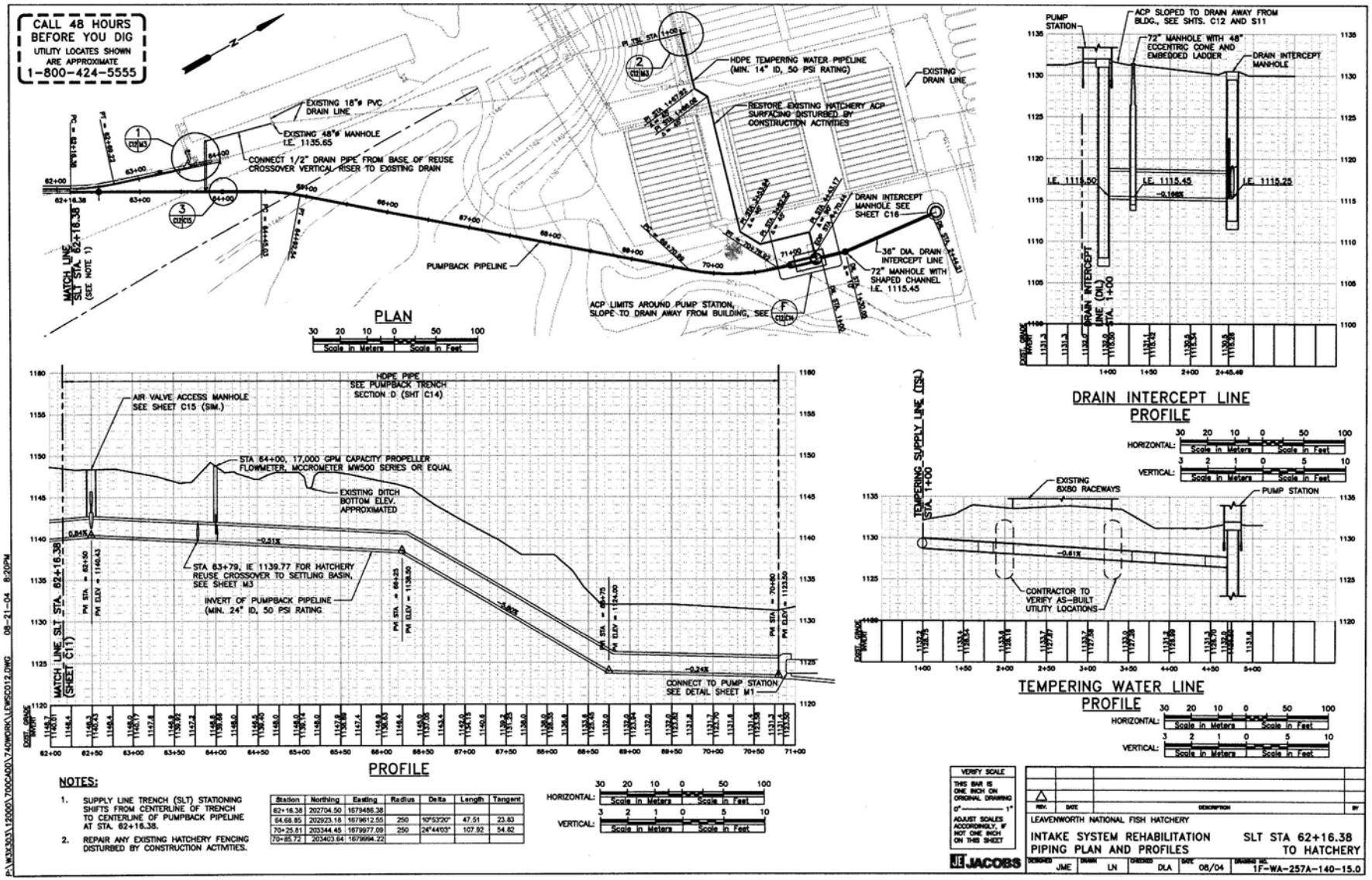



| PI Station | Northing | Easting | Radius | Delta | Length | Tangent |
|---|---|---|---|---|---|---|
| 27+65.62 | 201014.06 | 1676834.57 | 410.28 | 30°27'58" | 218.16 | 111.72 |
| 31+11.90 | 201346.34 | 1676949.43 | 250 | 25°53'32" | 112.98 | 57.47 |
| 32+32.59 | 201433.13 | 1677036.09 | 360 | 20°31'31" | 128.96 | 65.18 |


CALL 48 HOURS BEFORE YOU DIG
UTILITY LOCATES SHOWN ARE APPROXIMATE
1-800-424-5555
REPAIR ACP PAVING AT COUNTY ROAD CROSSING
EXISTING 40' EASEMENT
RESTORE GRAVEL SURFACING BETWEEN COUNTY ROAD AND THE ACP PARKING LOT FOR THE MID-COLUMBIA FISHERIES RESOURCE OFFICE
RESTORE ACP PAVING AT PARKING LOT FOR THE MID-COLUMBIA FISHERIES RESOURCE OFFICES
HATCHERY SUPPLY PIPELINE
PUMPBACK PIPELINE
MATCH LINE SLT STA. 40+00
MATCH LINE SLT STA. 53+00
PLAN
Scale in Meters
Scale in Feet
HDPE PIPE SEE TYPICAL TRENCH SECTION B (SHT C14)
MATCH LINE STA. 40+00 (SHEET C9)
MATCH LINE STA. 53+00 (SHEET C11)
COMMON INVERT OF SUPPLY PIPE LINE (MIN. 30" ID, 50 PSI RATING) AND PUMPBACK PIPLINE (MIN. 24" ID, 50 PSI RATING)
-0.51%
EXIST. GRADE
INVERT
PROFILE
HORIZONTAL:
VERTICAL:
NOTES:
1. STATIONING SHOWN IS TO CENTERLINE OF PIPE TRENCH UNLESS OTHERWISE NOTED.
PI Station | Northing | Easting | Radius | Delta | Length | Tangent
44+12.43 | 201923.27 | 1678110.85 | 380 | 34°56'35" | 231.75 | 119.61
46+08.74 | 201886.38 | 1678311.26 | 380 | 09°51'00" | 65.33 | 32.74
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
JE JACOBS
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
PIPING PLAN AND PROFILES
SLT STA 40+00 TO STA 53+00
DESIGNED JME
DRAWN LN
CHECKED DLA
DATE 08/04
DRAWING NO. 1F-WA-257A-140-13.0
SHEET C10 OF 63
P:\W33\03\12000\7000\400\740WORK\LNPSC010.DWG 08-21-04 6:30PM




| PI Station | Northing | Easting | Radius | Delta | Length | Tangent |
|---|---|---|---|---|---|---|
| 53+04.22 | 201879.37 | 1679006.86 | 380 | 60°35'44" | 401.88 | 222.03 |
| 62+42.90 | 202728.97 | 1679497.03 | 250 | 12°06'36" | 52.84 | 26.52 |


CALL 48 HOURS BEFORE YOU DIG
UTILITY LOCATES SHOWN ARE APPROXIMATE
1-800-424-5555
EXISTING 18"ø PVC DRAIN LINE
EXISTING 48"ø MANHOLE I.E. 1135.65
CONNECT 1/2" DRAIN PIPE FROM BASE OF REUSE CROSSOVER VERTICAL RISER TO EXISTING DRAIN
HDPE TEMPERING WATER PIPELINE (MIN. 14" ID, 50 PSI RATING)
RESTORE EXISTING HATCHERY ACP SURFACING DISTURBED BY CONSTRUCTION ACTIVITIES
EXISTING DRAIN LINE
DRAIN INTERCEPT MANHOLE SEE SHEET C16
36" DIA. DRAIN INTERCEPT LINE
72" MANHOLE WITH SHAPED CHANNEL I.E. 1115.45
PUMPBACK PIPELINE
ACP LIMITS AROUND PUMP STATION, SLOPE TO DRAIN AWAY FROM BUILDING, SEE
MATCH LINE SLT STA. 62+16.38 (SEE NOTE 1)
PLAN
Scale in Meters
Scale in Feet
PUMP STATION
ACP SLOPED TO DRAIN AWAY FROM BLDG., SEE SHTS. C12 AND S11
72" MANHOLE WITH 48" ECCENTRIC CONE AND EMBEDDED LADDER
DRAIN INTERCEPT MANHOLE
I.E. 1115.50
I.E. 1115.45
I.E. 1115.25
DRAIN INTERCEPT LINE (DIL) STA. 1+00
DRAIN INTERCEPT LINE PROFILE
HORIZONTAL:
VERTICAL:
HDPE PIPE SEE PUMPBACK TRENCH SECTION D (SHT C14)
AIR VALVE ACCESS MANHOLE SEE SHEET C15 (SIM.)
STA 64+00, 17,000 GPM CAPACITY PROPELLER FLOWMETER, MCCROMETER MW500 SERIES OR EQUAL
EXISTING DITCH BOTTOM ELEV. APPROXIMATED
STA 83+79, IE 1139.77 FOR HATCHERY REUSE CROSSOVER TO SETTLING BASIN, SEE SHEET M3
INVERT OF PUMPBACK PIPELINE (MIN. 24" ID, 50 PSI RATING
CONNECT TO PUMP STATION SEE DETAIL SHEET M1
MATCH LINE SLT STA. 62+16.38 (SHEET C11)
PROFILE
TEMPERING SUPPLY LINE (TSL) STA. 1+00
EXISTING 8X80 RACEWAYS
PUMP STATION
CONTRACTOR TO VERIFY AS-BUILT UTILITY LOCATIONS
TEMPERING WATER LINE PROFILE
NOTES:
1. SUPPLY LINE TRENCH (SLT) STATIONING SHIFTS FROM CENTERLINE OF TRENCH TO CENTERLINE OF PUMPBACK PIPELINE AT STA. 62+16.38.
2. REPAIR ANY EXISTING HATCHERY FENCING DISTURBED BY CONSTRUCTION ACTIVITIES.
Station | Northing | Easting | Radius | Delta | Length | Tangent
62+16.38 | 202704.50 | 1679486.38
64.68.85 | 202923.16 | 1679612.55 | 250 | 10°53'20" | 47.51 | 23.83
70+25.81 | 203344.45 | 1679977.09 | 250 | 24°44'05" | 107.92 | 54.82
70+85.72 | 203403.64 | 1679994.22
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
JACOBS
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
PIPING PLAN AND PROFILES
SLT STA 62+16.38 TO HATCHERY
JME | LN | DLA | 08/04
1F-WA-257A-140-15.0
SHEET C12 OF 63
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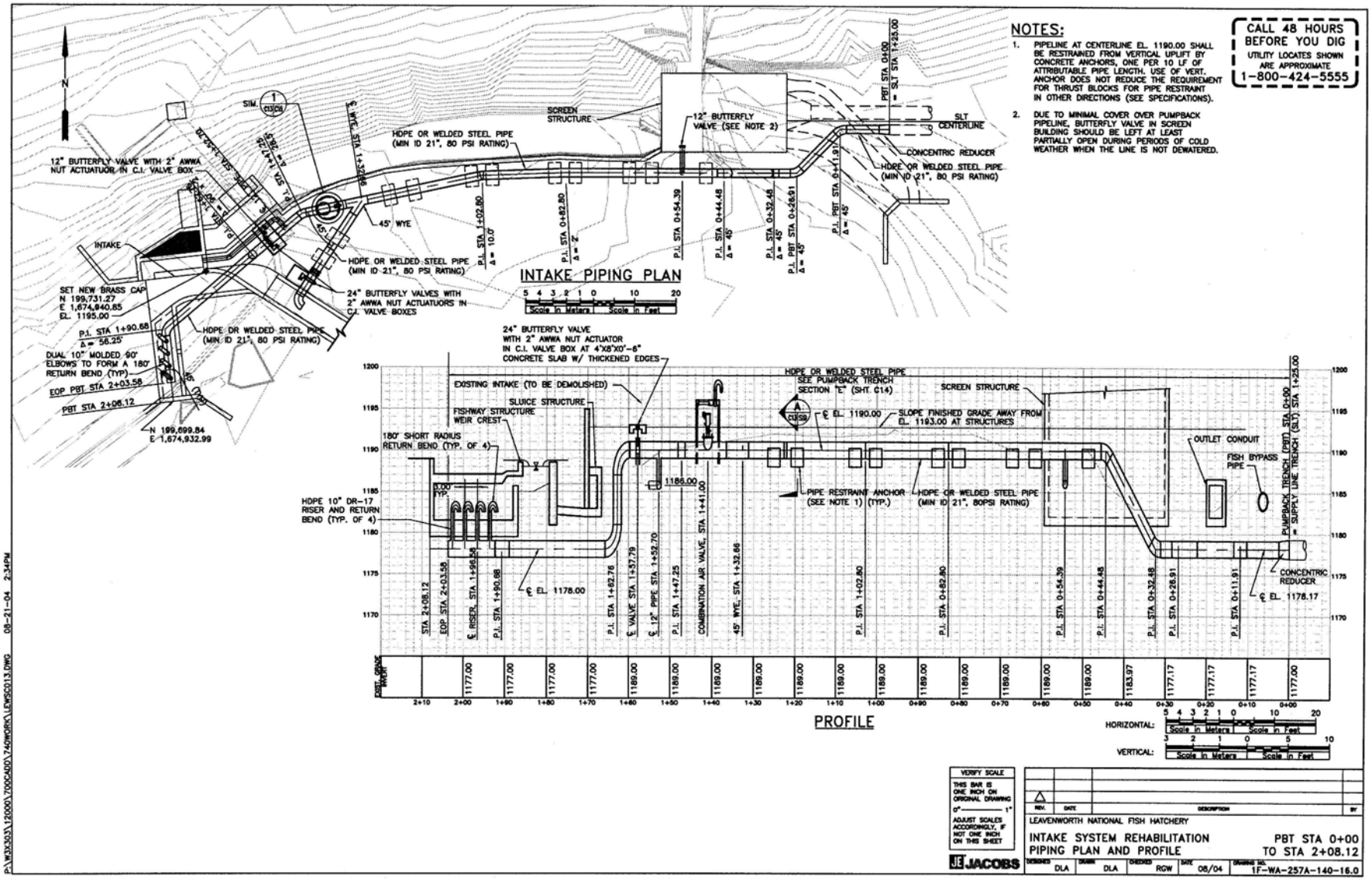
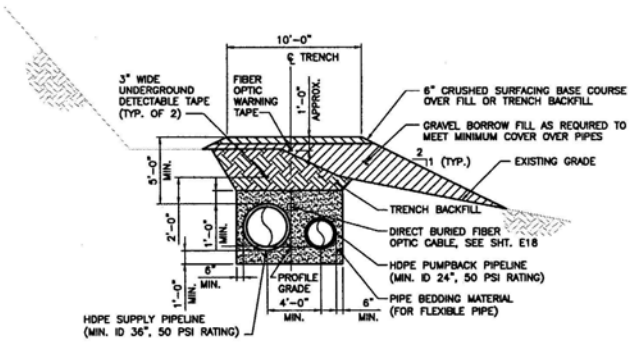

NOTES:
1. PIPELINE AT CENTERLINE EL. 1190.00 SHALL BE RESTRAINED FROM VERTICAL UPLIFT BY CONCRETE ANCHORS, ONE PER 10 LF OF ATTRIBUTABLE PIPE LENGTH. USE OF VERT. ANCHOR DOES NOT REDUCE THE REQUIREMENT FOR THRUST BLOCKS FOR PIPE RESTRAINT IN OTHER DIRECTIONS (SEE SPECIFICATIONS).
2. DUE TO MINIMAL COVER OVER PUMPBACK PIPELINE, BUTTERFLY VALVE IN SCREEN BUILDING SHOULD BE LEFT AT LEAST PARTIALLY OPEN DURING PERIODS OF COLD WEATHER WHEN THE LINE IS NOT DEWATERED.
CALL 48 HOURS BEFORE YOU DIG
UTILITY LOCATES SHOWN ARE APPROXIMATE
1-800-424-5555
INTAKE PIPING PLAN
PROFILE
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
PIPING PLAN AND PROFILE
PBT STA 0+00 TO STA 2+08.12
1F-WA-257A-140-16.0
JE JACOBS

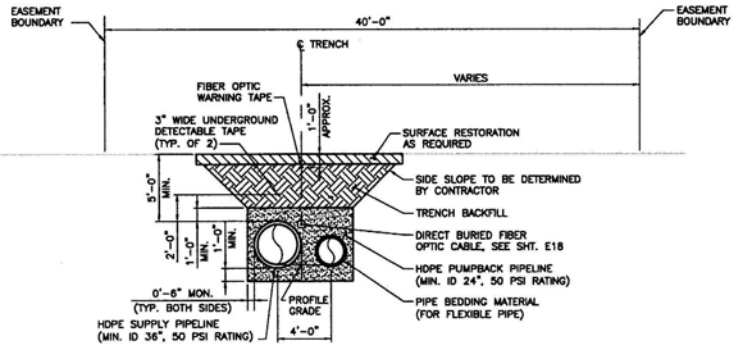



## TYPICAL DUAL PIPE, MIN. EXCAVATION TRENCH SECTION

(LOOKING TOWARD HATCHERY)
STA 1+00 TO 14+00

SECTION A (C7|CH) A (C8|CH)

2000 1000 0 5 10
Scale in mm | Scale in Feet

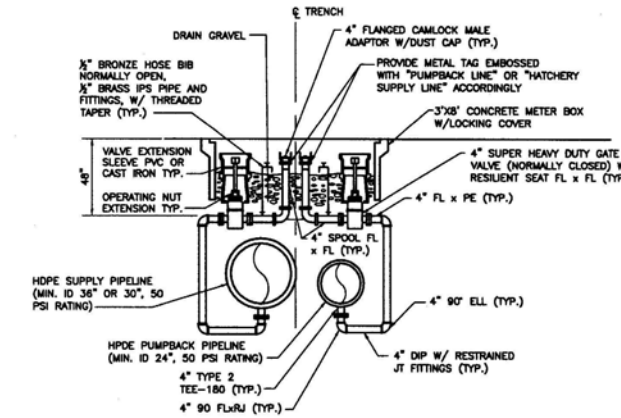



## TYPICAL DUAL PIPE, STD. EXCAVATION TRENCH SECTION

(LOOKING TOWARD HATCHERY)
STA 14+00 TO 62+13.38

SECTION B (C8|CH) B (C9|CH) B (C9|CH) B (C1|CH)

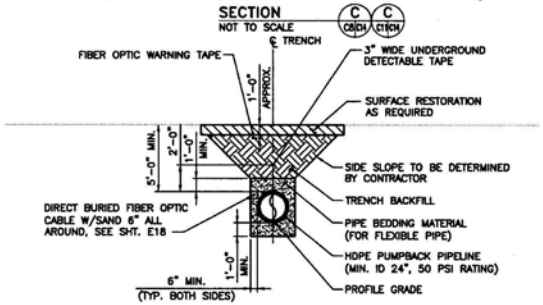
2000 1000 0 5 10
Scale in mm | Scale in Feet




## DRAIN ASSEMBLY

(FOR BOTH SUPPLY LINE AND PUMP BACK LINE)

SECTION C (C8|CH) C (C1|CH)
NOT TO SCALE

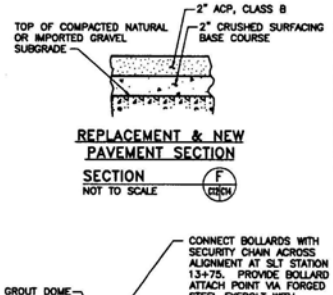



## TYPICAL SINGLE PIPE, STD. EXCAVATION TRENCH SECTION

(LOOKING TOWARD HATCHERY)
STA 62+13.38 TO 70+85.72

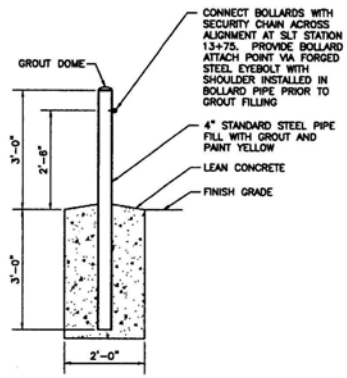
SECTION D (C1|CH)

2000 1000 0 5 10
Scale in mm | Scale in Feet




## REPLACEMENT & NEW PAVEMENT SECTION

SECTION F (C1|CH)
NOT TO SCALE




## TYPICAL PIPE BOLLARD

DETAIL 2 (C7|CH) 2 (M3|CH)
SCALE: NTS

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

JE JACOBS

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | | |

LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
PIPING SECTIONS AND DETAILS
TRENCH SECTIONS AND CLEANOUT DETAIL

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| JME | LN | DLA | 08/04 | 1F-WA-257A-140-17.0 |

SHEET C14 OF 63

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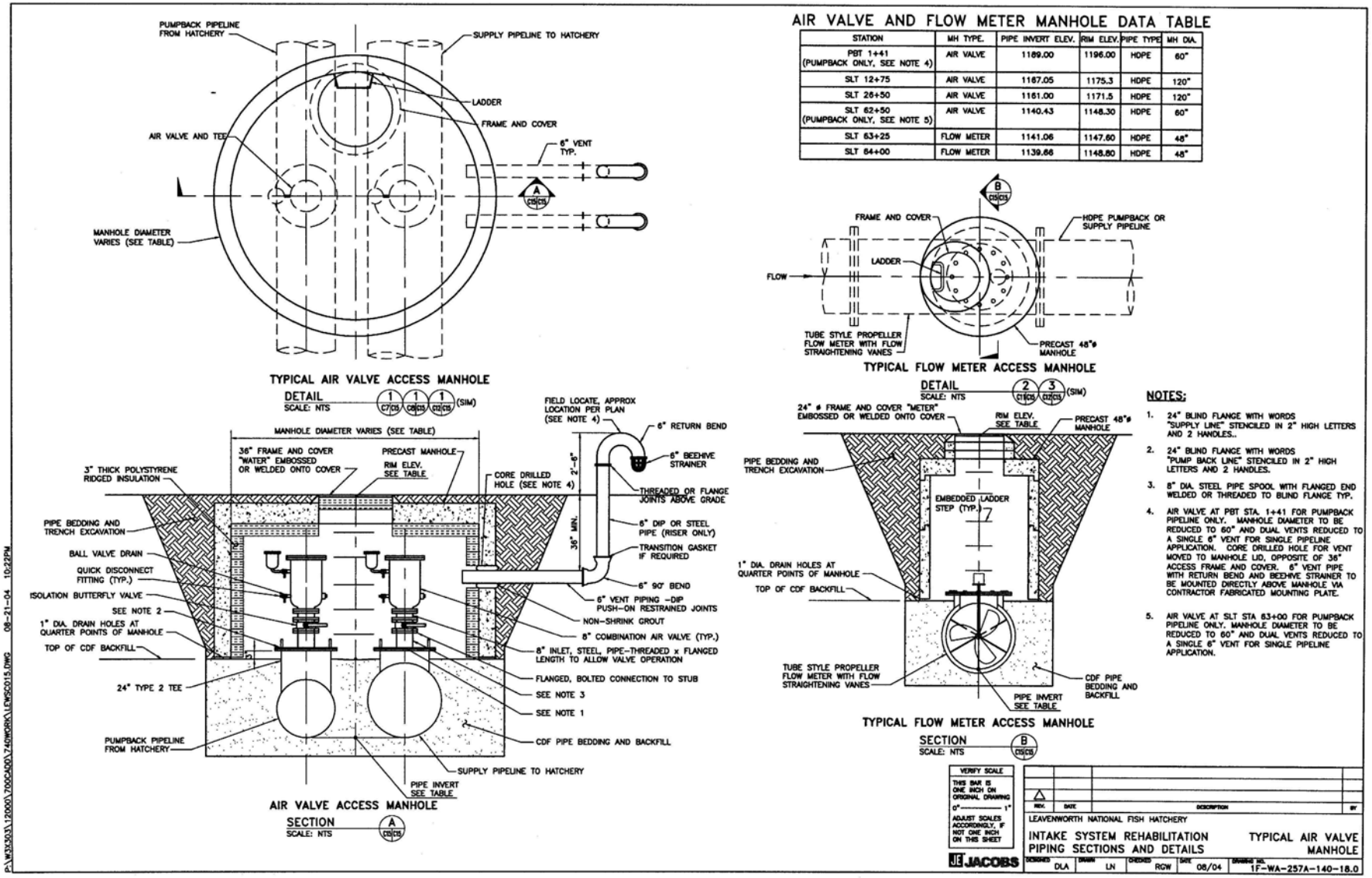
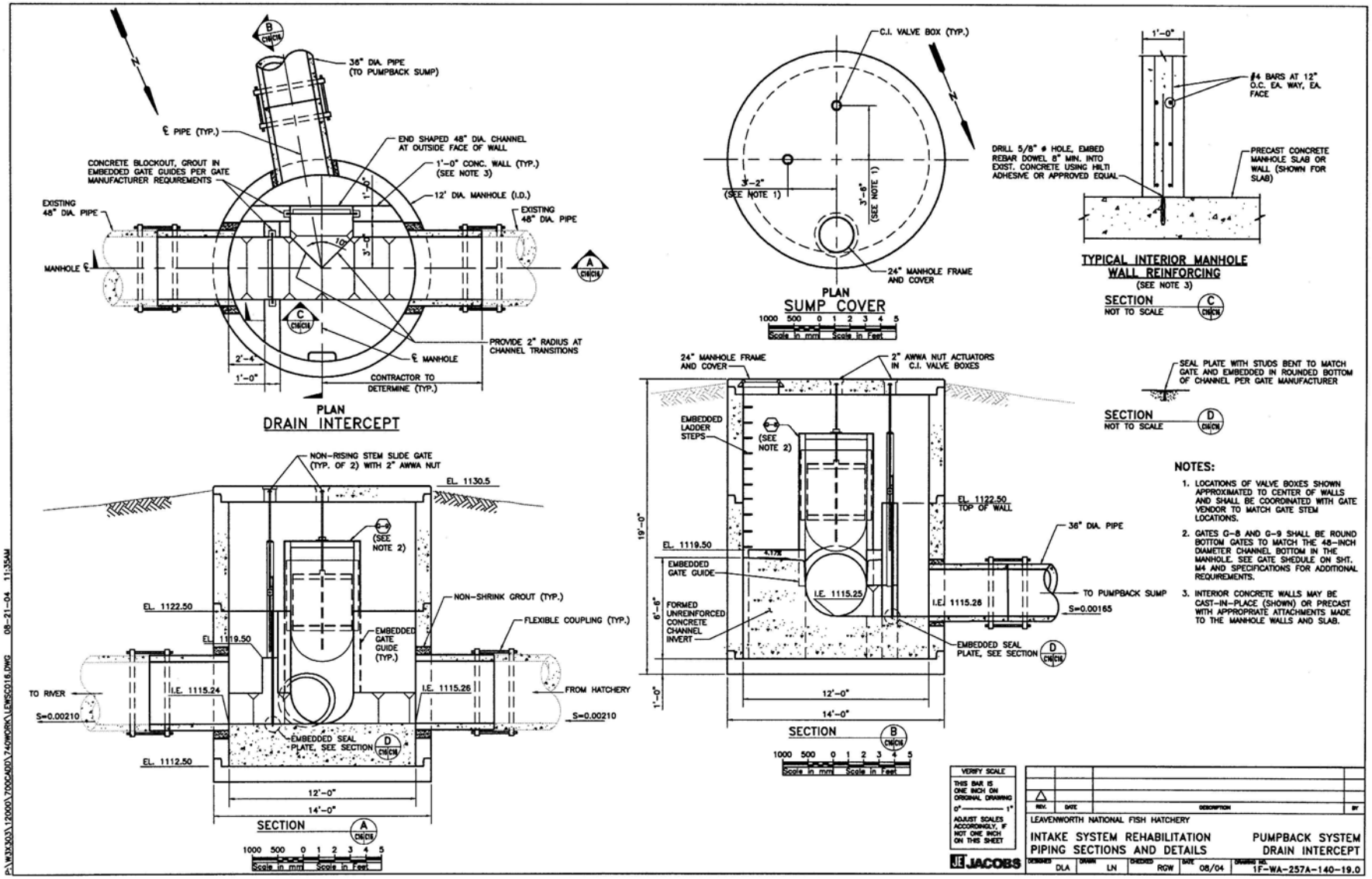

PUMPBACK PIPELINE FROM HATCHERY
SUPPLY PIPELINE TO HATCHERY
LADDER
FRAME AND COVER
AIR VALVE AND TEE
6" VENT TYP.
MANHOLE DIAMETER VARIES (SEE TABLE)
TYPICAL AIR VALVE ACCESS MANHOLE
DETAIL
SCALE: NTS
(SIM)
MANHOLE DIAMETER VARIES (SEE TABLE)
36" FRAME AND COVER "WATER" EMBOSSED OR WELDED ONTO COVER
PRECAST MANHOLE
RIM ELEV. SEE TABLE
3" THICK POLYSTYRENE RIDGED INSULATION
CORE DRILLED HOLE (SEE NOTE 4)
FIELD LOCATE, APPROX LOCATION PER PLAN (SEE NOTE 4)
6" RETURN BEND
6" BEEHIVE STRAINER
THREADED OR FLANGE JOINTS ABOVE GRADE
2'-6"
36" MIN.
PIPE BEDDING AND TRENCH EXCAVATION
6" DIP OR STEEL PIPE (RISER ONLY)
TRANSITION GASKET IF REQUIRED
BALL VALVE DRAIN
QUICK DISCONNECT FITTING (TYP.)
6" 90° BEND
ISOLATION BUTTERFLY VALVE
6" VENT PIPING -DIP PUSH-ON RESTRAINED JOINTS
SEE NOTE 2
1" DIA. DRAIN HOLES AT QUARTER POINTS OF MANHOLE
NON-SHRINK GROUT
8" COMBINATION AIR VALVE (TYP.)
TOP OF CDF BACKFILL
8" INLET, STEEL, PIPE-THREADED x FLANGED LENGTH TO ALLOW VALVE OPERATION
24" TYPE 2 TEE
FLANGED, BOLTED CONNECTION TO STUB
SEE NOTE 3
SEE NOTE 1
PUMPBACK PIPELINE FROM HATCHERY
CDF PIPE BEDDING AND BACKFILL
SUPPLY PIPELINE TO HATCHERY
PIPE INVERT SEE TABLE
AIR VALVE ACCESS MANHOLE
SECTION
SCALE: NTS
AIR VALVE AND FLOW METER MANHOLE DATA TABLE
STATION | MH TYPE. | PIPE INVERT ELEV. | RIM ELEV. | PIPE TYPE | MH DIA.
PBT 1+41 (PUMPBACK ONLY, SEE NOTE 4) | AIR VALVE | 1189.00 | 1196.00 | HDPE | 60"
SLT 12+75 | AIR VALVE | 1167.05 | 1175.3 | HDPE | 120"
SLT 26+50 | AIR VALVE | 1161.00 | 1171.5 | HDPE | 120"
SLT 62+50 (PUMPBACK ONLY, SEE NOTE 5) | AIR VALVE | 1140.43 | 1148.30 | HDPE | 60"
SLT 63+25 | FLOW METER | 1141.06 | 1147.60 | HDPE | 48"
SLT 64+00 | FLOW METER | 1139.66 | 1148.80 | HDPE | 48"
FRAME AND COVER
HDPE PUMPBACK OR SUPPLY PIPELINE
LADDER
FLOW
TUBE STYLE PROPELLER FLOW METER WITH FLOW STRAIGHTENING VANES
PRECAST 48"ø MANHOLE
TYPICAL FLOW METER ACCESS MANHOLE
DETAIL
SCALE: NTS
(SIM)
24" ø FRAME AND COVER "METER" EMBOSSED OR WELDED ONTO COVER
RIM ELEV. SEE TABLE
PRECAST 48"ø MANHOLE
PIPE BEDDING AND TRENCH EXCAVATION
EMBEDDED LADDER STEP (TYP.)
1" DIA. DRAIN HOLES AT QUARTER POINTS OF MANHOLE
TOP OF CDF BACKFILL
TUBE STYLE PROPELLER FLOW METER WITH FLOW STRAIGHTENING VANES
CDF PIPE BEDDING AND BACKFILL
PIPE INVERT SEE TABLE
TYPICAL FLOW METER ACCESS MANHOLE
SECTION
SCALE: NTS
NOTES:
1. 24" BLIND FLANGE WITH WORDS "SUPPLY LINE" STENCILED IN 2" HIGH LETTERS AND 2 HANDLES..
2. 24" BLIND FLANGE WITH WORDS "PUMP BACK LINE" STENCILED IN 2" HIGH LETTERS AND 2 HANDLES.
3. 8" DIA. STEEL PIPE SPOOL WITH FLANGED END WELDED OR THREADED TO BLIND FLANGE TYP.
4. AIR VALVE AT PBT STA. 1+41 FOR PUMPBACK PIPELINE ONLY. MANHOLE DIAMETER TO BE REDUCED TO 60" AND DUAL VENTS REDUCED TO A SINGLE 6" VENT FOR SINGLE PIPELINE APPLICATION. CORE DRILLED HOLE FOR VENT MOVED TO MANHOLE LID, OPPOSITE OF 36" ACCESS FRAME AND COVER. 6" VENT PIPE WITH RETURN BEND AND BEEHIVE STRAINER TO BE MOUNTED DIRECTLY ABOVE MANHOLE VIA CONTRACTOR FABRICATED MOUNTING PLATE.
5. AIR VALVE AT SLT STA 63+00 FOR PUMPBACK PIPELINE ONLY. MANHOLE DIAMETER TO BE REDUCED TO 60" AND DUAL VENTS REDUCED TO A SINGLE 6" VENT FOR SINGLE PIPELINE APPLICATION.
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
REV. DATE DESCRIPTION BY
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
PIPING SECTIONS AND DETAILS
TYPICAL AIR VALVE MANHOLE
JACOBS
DESIGNED DLA
DRAWN LN
CHECKED RGW
DATE 08/04
DRAWING NO. 1F-WA-257A-140-18.0
SHEET C15 OF 63
P:\W25303\120001.700CAD\700CAD01.74\WORK\LEWSC015.DWG 08-21-04 10:22PM


36" DIA. PIPE (TO PUMPBACK SUMP)
℄ PIPE (TYP.)
END SHAPED 48" DIA. CHANNEL AT OUTSIDE FACE OF WALL
CONCRETE BLOCKOUT, GROUT IN EMBEDDED GATE GUIDES PER GATE MANUFACTURER REQUIREMENTS
1'-0" CONC. WALL (TYP.) (SEE NOTE 3)
12' DIA. MANHOLE (I.D.)
EXISTING 48" DIA. PIPE
EXISTING 48" DIA. PIPE
MANHOLE ℄
PROVIDE 2" RADIUS AT CHANNEL TRANSITIONS
℄ MANHOLE
CONTRACTOR TO DETERMINE (TYP.)
PLAN
DRAIN INTERCEPT
C.I. VALVE BOX (TYP.)
24" MANHOLE FRAME AND COVER
PLAN
SUMP COVER
#4 BARS AT 12" O.C. EA. WAY, EA. FACE
DRILL 5/8" ø HOLE, EMBED REBAR DOWEL 8" MIN. INTO EXIST. CONCRETE USING HILTI ADHESIVE OR APPROVED EQUAL
PRECAST CONCRETE MANHOLE SLAB OR WALL (SHOWN FOR SLAB)
TYPICAL INTERIOR MANHOLE WALL REINFORCING
(SEE NOTE 3)
SECTION
NOT TO SCALE
NON-RISING STEM SLIDE GATE (TYP. OF 2) WITH 2" AWWA NUT
EL. 1130.5
EL. 1122.50
EL. 1119.50
NON-SHRINK GROUT (TYP.)
FLEXIBLE COUPLING (TYP.)
EMBEDDED GATE GUIDE (TYP.)
TO RIVER
S=0.00210
I.E. 1115.24
I.E. 1115.26
FROM HATCHERY
S=0.00210
EMBEDDED SEAL PLATE, SEE SECTION
EL. 1112.50
12'-0"
14'-0"
SECTION
24" MANHOLE FRAME AND COVER
2" AWWA NUT ACTUATORS IN C.I. VALVE BOXES
EMBEDDED LADDER STEPS
EL. 1122.50 TOP OF WALL
EL. 1119.50
EMBEDDED GATE GUIDE
FORMED UNREINFORCED CONCRETE CHANNEL INVERT
I.E. 1115.25
I.E. 1115.26
36" DIA. PIPE
TO PUMPBACK SUMP
S=0.00165
EMBEDDED SEAL PLATE, SEE SECTION
19'-0"
6'-6"
1'-0"
12'-0"
14'-0"
SECTION
SEAL PLATE WITH STUDS BENT TO MATCH GATE AND EMBEDDED IN ROUNDED BOTTOM OF CHANNEL PER GATE MANUFACTURER
SECTION
NOT TO SCALE
NOTES:
1. LOCATIONS OF VALVE BOXES SHOWN APPROXIMATED TO CENTER OF WALLS AND SHALL BE COORDINATED WITH GATE VENDOR TO MATCH GATE STEM LOCATIONS.
2. GATES G-8 AND G-9 SHALL BE ROUND BOTTOM GATES TO MATCH THE 48-INCH DIAMETER CHANNEL BOTTOM IN THE MANHOLE. SEE GATE SHEDULE ON SHT. M4 AND SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
3. INTERIOR CONCRETE WALLS MAY BE CAST-IN-PLACE (SHOWN) OR PRECAST WITH APPROPRIATE ATTACHMENTS MADE TO THE MANHOLE WALLS AND SLAB.
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
JE JACOBS
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
PIPING SECTIONS AND DETAILS
PUMPBACK SYSTEM
DRAIN INTERCEPT
DESIGNED DLA
DRAWN LN
CHECKED RGW
DATE 08/04
DRAWING NO. 1F-WA-257A-140-19.0
SHEET C16 OF 63
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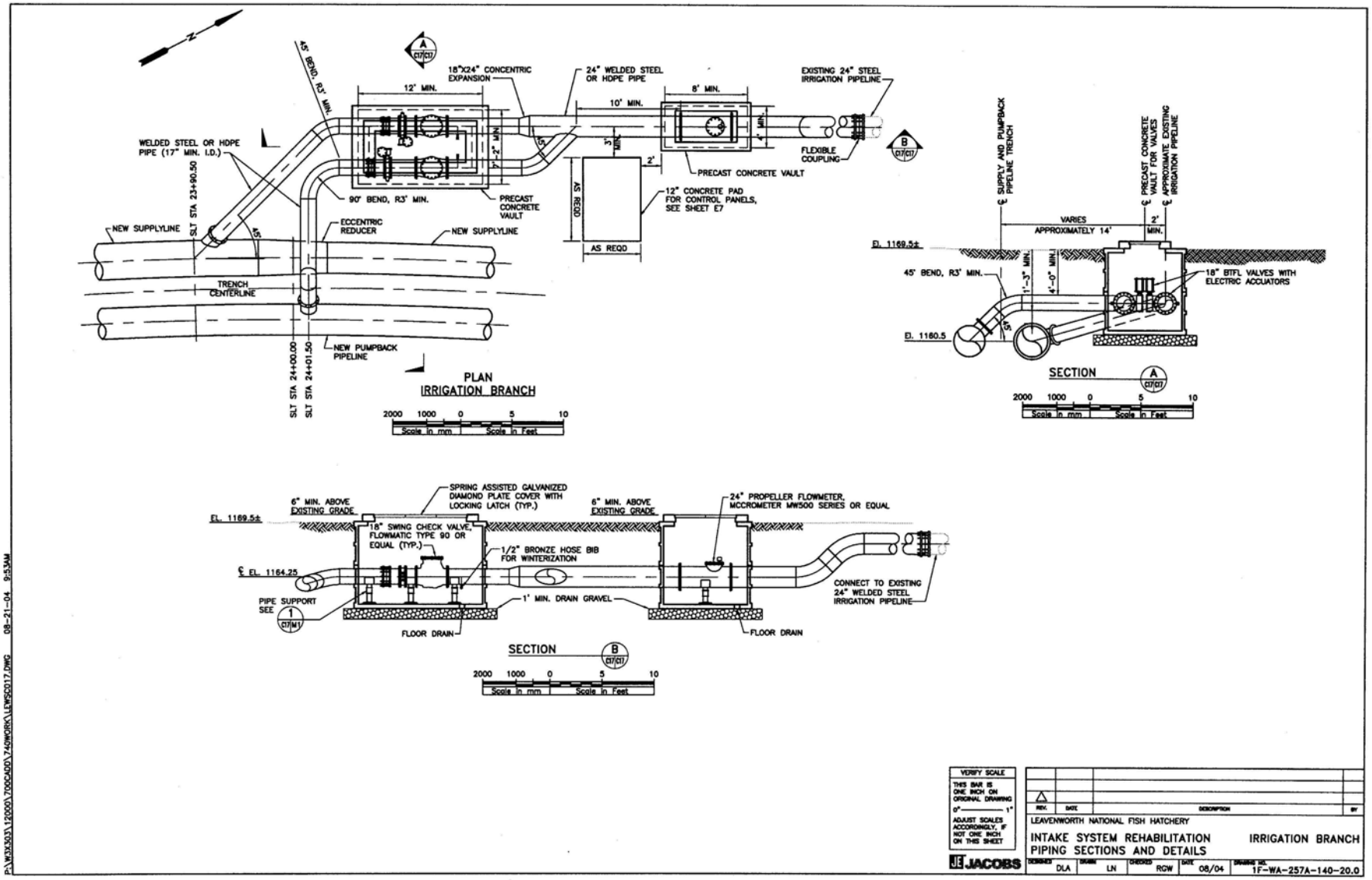
N
45° BEND, R3' MIN.
18"X24" CONCENTRIC EXPANSION
12' MIN.
24" WELDED STEEL OR HDPE PIPE
10' MIN.
8' MIN.
EXISTING 24" STEEL IRRIGATION PIPELINE
WELDED STEEL OR HDPE PIPE (17" MIN. I.D.)
SLT STA 23+90.50
90° BEND, R3' MIN.
PRECAST CONCRETE VAULT
3' MIN
2' MIN
4' MIN
5'
3' MIN
2'
AS REQD
PRECAST CONCRETE VAULT
FLEXIBLE COUPLING
12" CONCRETE PAD FOR CONTROL PANELS, SEE SHEET E7
NEW SUPPLYLINE
ECCENTRIC REDUCER
NEW SUPPLYLINE
45°
TRENCH CENTERLINE
NEW PUMPBACK PIPELINE
SLT STA 24+00.00
SLT STA 24+01.50
PLAN
IRRIGATION BRANCH
2000 1000 0 5 10
Scale in mm Scale in Feet
SUPPLY AND PUMPBACK PIPELINE TRENCH
PRECAST CONCRETE VAULT FOR VALVES
APPROXIMATE EXISTING IRRIGATION PIPELINE
VARIES APPROXIMATELY 14'
2' MIN.
El. 1169.5±
45° BEND, R3' MIN.
1'-3" MIN.
4'-0" MIN.
18" BTFL VALVES WITH ELECTRIC ACCUATORS
El. 1160.5
45°
SECTION
2000 1000 0 5 10
Scale in mm Scale in Feet
6" MIN. ABOVE EXISTING GRADE
SPRING ASSISTED GALVANIZED DIAMOND PLATE COVER WITH LOCKING LATCH (TYP.)
6" MIN. ABOVE EXISTING GRADE
24" PROPELLER FLOWMETER, MCCROMETER MW500 SERIES OR EQUAL
El. 1169.5±
18" SWING CHECK VALVE, FLOWMATIC TYPE 90 OR EQUAL (TYP.)
1/2" BRONZE HOSE BIB FOR WINTERIZATION
℄ EL. 1164.25
PIPE SUPPORT SEE
CONNECT TO EXISTING 24" WELDED STEEL IRRIGATION PIPELINE
1' MIN. DRAIN GRAVEL
FLOOR DRAIN
FLOOR DRAIN
SECTION
2000 1000 0 5 10
Scale in mm Scale in Feet
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
REV. DATE DESCRIPTION BY
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION IRRIGATION BRANCH
PIPING SECTIONS AND DETAILS
DESIGNED DLA DRAWN LN CHECKED RGW DATE 08/04
DRAWING NO. 1F-WA-257A-140-20.0
JE JACOBS
SHEET C17 OF 63
P:\W33033\12000\700CADD\740WORK\LEWPS017.DWG 08-21-04 9:53AM

# GENERAL STRUCTURAL NOTES:

## GENERAL

THE GENERAL CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND SITE CONDITIONS BEFORE STARTING WORK. THE ENGINEER SHALL BE NOTIFIED OF ANY DISCREPANCY. USE DETAIL MARKED "TYPICAL" WHEREVER APPLICABLE. CHANGES, OMISSIONS OR SUBTITUTIONS ARE NOT PERMITTED WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER. REFER TO SPECIFICATIONS FOR FURTHER REQUIREMENTS. ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE LATEST EDITION OF THE INTERNATIONAL BUILDING CODE (IBC 2003).

THE DESIGN ADEQUACY, AND SAFETY OF ERECTION BRACING, SHORING, TEMPORARY SUPPORTS, ETC. IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR, AND HAS NOT BEEN CONSIDERED BY THE ENGINEER OF RECORD. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE PRIOR TO THE COMPLETION OF ALL SHEAR WALLS, ROOF AND FLOOR DIAPHRAGMS AND FINISH MATERIALS. THE CONTRACTOR SHALL PROVIDE THE NECESSARY BRACING TO PROVIDE STABILITY PRIOR TO THE APPLICATION OF THE ABOVE MENTIONED COMPONENTS.

THE GENERAL NOTES APPLY TO ALL STRUCTURES UNLESS NOTED OTHERWISE (U.N.O.). LOCATION AND SIZE OF ANCHOR BOLTS FOR SPECIFIC EQUIPMENT SHALL BE SPECIFIED BY THE VENDOR. CONTRACTOR SHALL COORDINATE LOCATIONS OF STRUCTURAL OPENINGS, PENETRATIONS, AND EMBEDDED ITEMS WITH THE MECHANICAL, ARCHITECTURAL, ELECTRICAL, PLUMBING, AND VENTILATION SECTIONS OF THE DRAWINGS (IF APPLICABLE) AND WITH SUPPLIERS AND SUBCONTRACTORS AS MAY BE REQUIRED.

## SHOP DRAWINGS

SHOP DRAWINGS, WHERE REQUIRED, SHALL BE CHECKED AND APPROVED BY THE GENERAL CONTRACTOR PRIOR TO SUBMITTING TO ENGINEER FOR REVIEW. GENERAL CONTRACTOR IS RESPONSIBLE FOR VERIFICATION AND COORDINATION OF DIMENSIONS AND DETAILS FOR EACH SUBCONTRACTOR.

## DESIGN LOADS

ROOF SNOW LOAD: 90 PSF

FOR SCREEN STRUCTURE AND PUMP STATION: Ps = 53 PSF, Punbalanced = 114 PSF (APPLIED ONLY ON ONE SIDE OF ROOF)
FLOOR LIVE LOAD (SCREEN STRUCTURE): 100 PSF
BASIC WIND SPEED: 90 MPH, EXPOSURE B
SEISMIC LOADING: SITE CLASS D, SEISMIC GROUP I, SEISMIC DESIGN CATEGORY D, SHORT PERIOD RESPONSE ACCELERATION, S(ds)=0.555,
1-SECOND PERIOD RESPONSE ACCELERATION, S(d1)=0.287, R (RESPONSE MODIFICATION COEFF.) = 2.5, IMPORTANCE FACTOR, I =1.0

## FOUNDATION

DESIGN ALLOWABLE SOIL BEARING PRESSURE = 2000 PSF
DESIGN LATERAL SOIL LOAD (AT-REST) = 60 PSF/FT. OF DEPTH
DESIGN LATERAL SOIL LOAD (ACTIVE) = 45 PSF/FT. OF DEPTH

CONTRACTOR SHALL ASSUME BLASTING IS NOT PERMITTED AS A BEDROCK / ROCK REMOVAL METHOD.

CONTRACTOR SHALL NOTIFY THE INSPECTOR ONCE THE BUILDING OR STRUCTURE FOUNDATION CONDITIONS FOR EACH CONSTRUCTION SITE ARE EXPOSED THROUGH EXCAVATION SO THAT THE GOVERNMENT CAN INSPECT THE EXISTING FOUNDATION MATERIALS. IF THE EXISTING FOUNDATION CONDITIONS ARE DETERMINED TO BE DIFFERENT THAN THOSE INDICATED OR ASSUMED ON THE DRAWINGS, CONTRACTOR SHALL PREPARE THE FOUNDATION MATERIAL PER THE GOVERNMENT'S DIRECTION.

UNLESS OTHERWISE INDICATED ON THE DRAWINGS, ALL STRUCTURES ARE ASSUMED TO BE FOUNDED ON SOIL. SIMILARLY, WALLS ARE ASSUMED TO RETAIN SOIL. WHERE WALLS ARE TO BE CONSTRUCTED AT BEDROCK CUTS, CAST CONCRETE AGAINST ROCK OR BACKFILL SPACE BETWEEN CAST WALL AND ROCK WITH LEAN CONCRETE. PROVIDE ROCK ANCHORS FROM THE CONCRETE STRUCTURE TO THE ROCK AS INDICATED ON THE DRAWINGS. REFER TO SPECIFICATIONS SECTION 01000, PARAGRAPH 1A.01.F.6 – "SUBSURFACE CONDITIONS" FOR MORE INFORMATION.

EXTEND ALL EXTERIOR FOOTINGS 3'-0" MINIMUM BELOW FINISHED GRADE, U.N.O. BOTTOM OF ALL FOOTINGS TO BEAR ON NATIVE, INORGANIC, UNDISTURBED SOIL OR BEDROCK, UNO OR UNLESS OTHERWISE DIRECTED BY THE GOVERNMENT. NO FOOTING SHALL BEAR HIGHER THAN 1 VERTICAL TO 1.5 HORIZONTAL SLOPE ABOVE ANY EXCAVATION, EXISTING OR PLANNED. CONTRACTOR SHALL PROVIDE TEMPORARY SHORING TO PREVENT MOVEMENT OF WALLS IF BACKFILL IS PLACED BEFORE FLOOR SYSTEM IS IN PLACE. THERE SHALL BE 95% COMPACTION (ASTM D1557 MODIFIED PROCTOR DENSITY) OF ALL BACKFILL SOIL UNDER SLABS ON GRADE.

## CAST-IN-PLACE CONCRETE

ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI AT 28 DAYS.
MAXIMUM SLUMP: 3" FOR SLABS AND FOOTINGS; 4" FOR WALLS, COLUMNS, AND BEAMS.
CONSTRUCTION TO BE IN ACCORDANCE WITH ACI 318-02/318R-02 "BUILDING CODE AND COMMENTARY".
ADHESIVE ANCHORS: "HY-150" BY HILTI, INC. OR APPROVED EQUAL. ICBO CERTIFICATION REQUIRED, SPECIAL INSPECTION REQUIRED.
PROVIDE ½" NON-SHRINK GROUT UNDER ALL STEEL BASE PLATES WHEN PLACED AGAINST CONCRETE SURFACE, UNO.

ALL WATER CONTAINMENT STRUCTURES SHALL BE TESTED FOR WATER TIGHTNESS. TESTING OF WATER CONTAINMENT STRUCTURES FOR WATER TIGHTNESS SHALL BE PERFORMED IN ACCORDANCE WITH ACI 350/350R-01: "CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES AND COMMENTARY".

## REINFORCING STEEL

WELDED WIRE FABRIC (W.W.F): ASTM A82 AND A185. IN FLAT SHEETS LAP 1 1/2 MESH MINIMUM.
DEFORMED BARS: ASTM A615, GRADE 60. SECURELY TIE IN PLACE WITH DOUBLE ANNEALED 16 GA IRON WIRE OR APPROVED CLIPS. REINFORCEMENT SHALL BE IN ACCORDANCE WITH SECTION 1907 OF THE IBC.

UNLESS NOTED OTHERWISE, PROVIDE CLEAR COVER AT REINFORCING BARS AS FOLLOWS:
CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH = 3"
CONCRETE EXPOSED TO EARTH OR WEATHER = 2"
CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT WITH THE GROUND INCLUDING WALLS, SLABS,
COLUMNS, AND BEAMS = 1 1/2"

## REINFORCING STEEL (CONT.)

NO WELDING OF REINFORCING BARS IS PERMITTED. SUBMIT SHOP DRAWINGS OF REINFORCING STEEL FOR ENGINEER REVIEW PRIOR TO FABRICATION. CUTTING REINFORCING BARS WITH TORCH AND/OR FIELD BENDING NOT PERMITTED.

## MASONRY

NO SPECIAL INSPECTION, FULLY GROUTED MASONRY COMPRESSIVE STRENGTH, f'm, SHALL BE 2500 PSI.
CONCRETE MASONRY UNITS SHALL BE MEDIUM WEIGHT AND CONFORM TO IBC SECTION 2103, GRADE N-1, AND BE LAID IN RUNNING BOND WITH TYPE "S" (IBC SECTION 2103.7) MORTAR HAVING MINIMUM COMPRESSIVE STRENGTH OF 1800 PSI AT 28 DAYS. GROUT ALL CELLS WITH GROUT HAVING MINIMUM COMPRESSIVE STRENGTH OF 2,000 PSI IN LIFTS NOT EXCEEDING 4 FEET IN HEIGHT. GROUT SHALL CONFORM TO IBC SECTION 2103.10 AND GROUT TESTING PER ASTM C1019-00B IS REQUIRED.

REINFORCING STEEL SHALL BE DEFORMED BARS PER ASTM A615, GRADE 60, (f'y=60,000 PSI). ALL REINFORCING STEEL SHALL BE IN PLACE PRIOR TO GROUTING WITH VERTICAL BARS HELD AT TOP, BOTTOM, AND 200 DIAMETERS MAXIMUM ON CENTERS. PROVIDE HORIZONTAL BOND BEAMS WITH REINFORCING AND SPACING AS INDICATED ON THE PLANS. BOND BEAMS SHALL BE CONTINUOUS IN ALL CMU WALLS. ALL HORIZONTAL BARS SHALL BE PLACED IN BOND BEAMS OR LINTEL BEAM UNITS. ALL BOND BEAM BLOCKS SHALL BE "DEEP CUT" UNITS. PROVIDE CORNER BARS TO MATCH THE WALL HORIZONTAL REINFORCING AT ALL INTERSECTIONS. LAP ALL BARS 40 x DIAMETERS, 1'-6" MINIMUM, UNLESS NOTED OTHERWISE. SUBMIT SHOP DRAWINGS OF REINFORCING STEEL FOR ENGINEER REVIEW PRIOR TO FABRICATION OF CMU WALLS.

CONTRACTOR SHALL PROVIDE TEMPORARY BRACING FOR MASONRY WALLS AS REQUIRED UNTIL CONNECTIONS TO FLOOR AND/OR ROOF DIAPHRAGMS ARE COMPLETED.

## STRUCTURAL AND MISCELLANEOUS STEEL

CHANNELS, ANGLES, PLATES, AND BARS: ASTM A36, Fy = 36 KSI
W BEAMS: ASTM 992, Fy = 50 KSI
PIPE: ASTM A53, Fy = 35 KSI MINIMUM
TUBING: ASTM A500, GRADE B, Fy = 46 KSI
STANDARD BOLTS: ASTM A307 MACHINE BOLTS (USE UNLESS NOTED OTHERWISE)
HIGH STRENGTH BOLTS: ASTM A325, TYPE 3, FULLY TIGHTEN (USE WHERE INDICATED IN THE PLANS)
HEADED ANCHOR STUD (H.A.S.) ASTM A108-69T, Fy =50 KSI, END WELDED PER MANUFACTURER'S RECOMMENDATIONS.
WELDING ELECTRODES OR WIRES: E70XX SERIES
EXPANSION ANCHORS: AISI 316 STAINLESS STEEL (USE UNLESS NOTED OTHERWISE); "KWIK BOLT II" BY HILTI INC. OR APPROVED EQUAL. ICBO CERTIFICATION REQUIRED, SPECIAL INSPECTION REQUIRED.

ERECTION AND FABRICATION IN ACCORDANCE WITH AISC "SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS", 9TH ED. WELDING SHALL CONFORM TO AWS D1.1, LATEST EDITION, "STRUCTURAL WELDING CODE – STEEL".
ALL WELDING SHALL BE PERFORMED BY AWS CERTIFIED WELDERS. ALL COLUMNS AND BEAMS TO BE FROM UNSPLICED LENGTHS UNLESS NOTED OTHERWISE.
SUBMIT SHOP DRAWINGS SHOWING SIZES, DIMENSIONS, AND REQUIRED CONNECTION DETAILS FOR ENGINEER REVIEW PRIOR TO FABRICATION.
ALL FERROUS METAL PRODUCTS SHALL BE HOT-DIPPED GALVANIZED U.N.O.

## WOOD AND FRAMING

DETAILS NOT SHOWN OTHERWISE SHALL BE CONSTRUCTED TO IBC SECTION 2308 – CONVENTIONAL LIGHT-FRAME CONSTRUCTION PROVISIONS. ALL WOOD AND FRAMING SHALL CONFORM TO THE MINIMUM STANDARDS AND QUALITY OUTLINED IN SECTION 2303 OF THE IBC. MINIMUM NAILING, UNLESS NOTED OTHERWISE, SHALL CONFORM TO TABLE 2304.9.1 AND TABLE 2306.3.1 OF THE IBC, ACCORDINGLY. USE GALVANIZED COMMON NAILS ONLY.

TIMBER: STRUCTURAL TIMBER AND LUMBER TO BE VISUALLY GRADED DOUGLAS-FIR LARCH PER WWPA OR WCLIB GRADING RULES. MAXIMUM MOISTURE CONTENT = 19%.

| USE: | Fb: | GRADE: |
|---|---|---|
| 2 X BEAMS | 1000 PSI | NO.1 |
| GABLE WALLS | 875 PSI | NO.2 |
| ALL OTHER LUMBER | 875 PSI | NO.2 OR BETTER |

SHEATHING SHALL BE PER IBC 2303.1.4 – WOOD STRUCTURAL PANELS, SPAN RATING 24/16 FOR ROOF AND WALLS. SEE PLANS FOR THICKNESS.

PRESSURE TREATED LUMBER: ALL WOOD IN DIRECT CONTACT WITH CONCRETE OR MASONRY SHALL BE PRESSURE TREATED IN ACCORDANCE WITH AMERICAN WOOD-PRESERVERS ASSOCIATION (AWPA) STANDARD SPECIFICATIONS C1, C9, C15, C18 AND M-4.

ROOF TRUSSES SHALL BE FACTORY MANUFACTURED AND DESIGNED FOR THE DIMENSIONS AND LOADS INDICATED ON THE PLANS WITH 3X MIN. FRAMING. TRUSSES SHALL BE DESIGNED, SUBMITTED, AND MANUFACTURED IN ACCORDANCE WITH SECTION 2303.4 OF THE IBC. THE DESIGN SHALL BE UNDER THE SUPERVISION OF AND SEALED BY A REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF WASHINGTON. ALL BRACING SHALL BE PER MANUFACTURER'S RECOMMENDATIONS AS ACCEPTED BY THE ENGINEER.

## MISCELLANEOUS

DIMENSION VERIFICATION:
DIMENSIONS AND ELEVATIONS ON DRAWINGS FOR EXISTING ITEMS SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO FABRICATION OR CONSTRUCTION.

VERIFY DIMENSIONS OF OPENINGS IN FLOORS, ROOFS, AND WALLS, AND ASSOCIATED SURROUNDING FRAMING AS WELL AS ANCHOR BOLT SIZES AND LOCATIONS FOR MECHANICAL EQUIPMENT, WITH ACTUAL EQUIPMENT FURNISHED FOR THE PROJECT. THE CONFIGURATION OF STRUCTURAL FRAMING REQUIRED TO SUPPORT MECHANICAL, PLUMBING, AND ELECTRICAL EQUIPMENT IS BASED ON PRELIMINARY PRODUCT INFORMATION. VERIFY WITH THE MANUFACTURER OF THE EQUIPMENT FURNISHED FOR THE PROJECT THAT THE CONFIGURATION IS SUITABLE.

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" — 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

| NO. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| △ | | | |

LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION — NOTES
GENERAL STRUCTURAL

JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| ASB | LN | KMR | 08/04 | 1F-WA-257A-140-21.0 |

SHEET 51 OF 63

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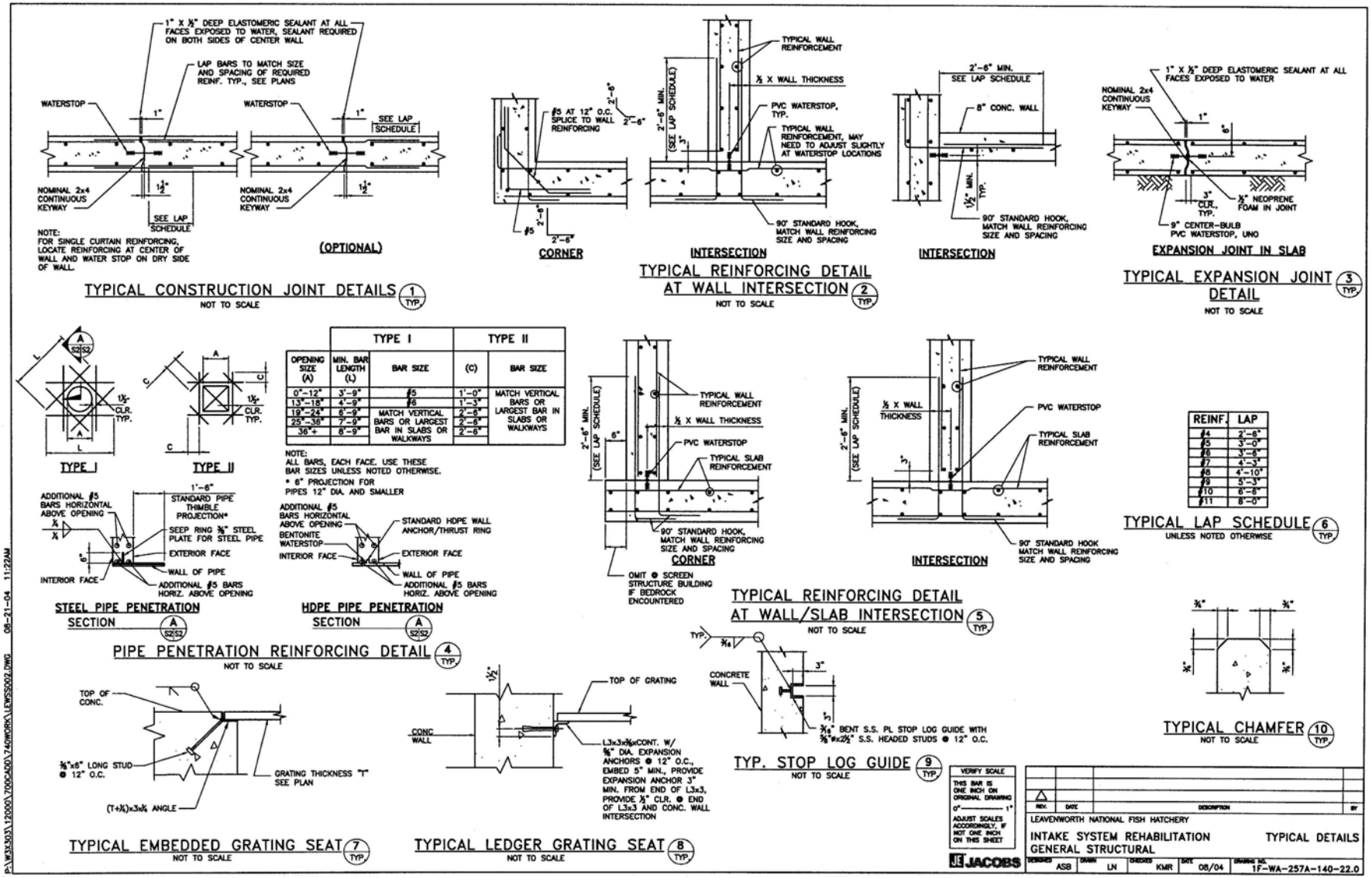
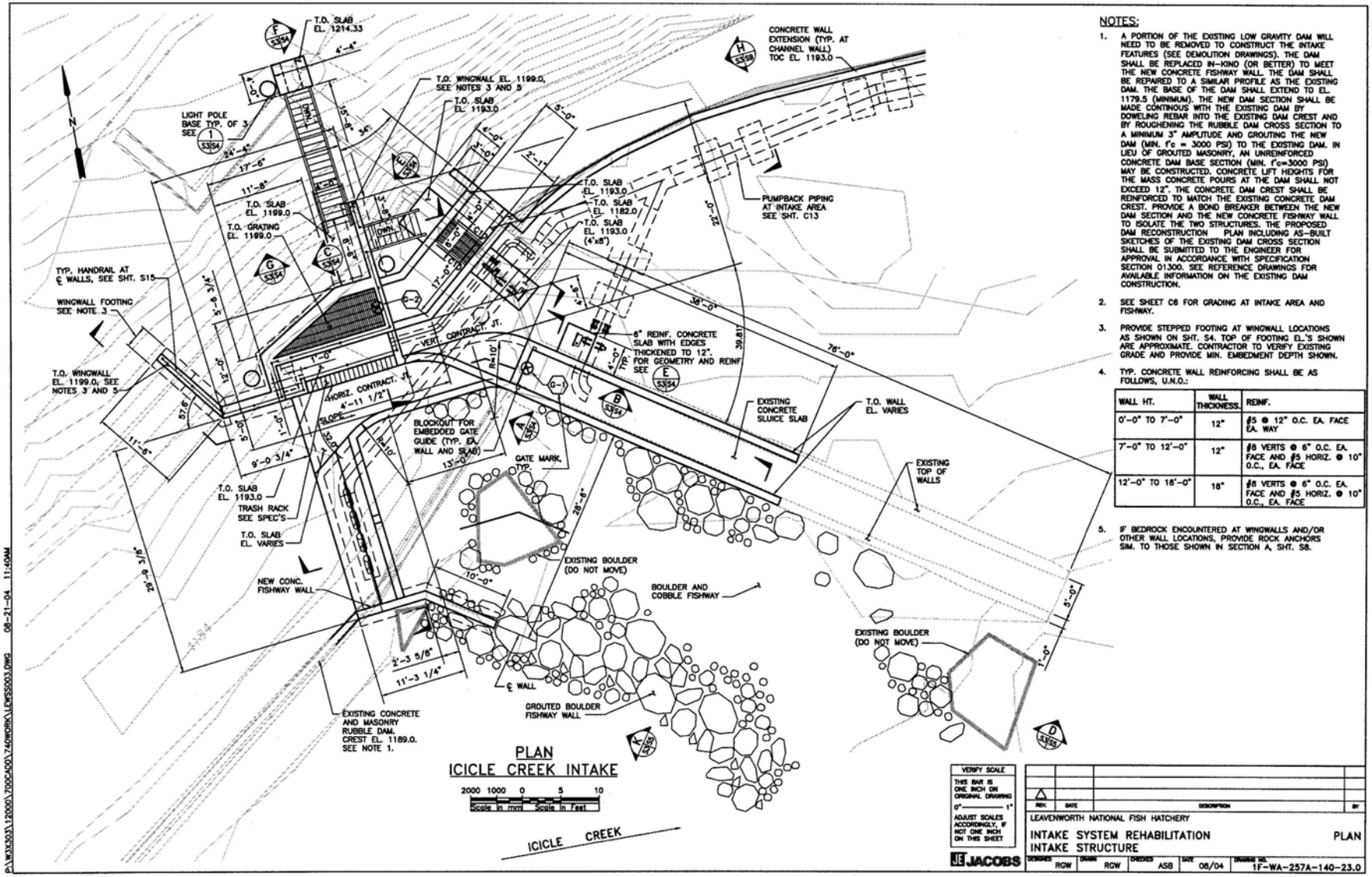



| OPENING SIZE (A) | TYPE I MIN. BAR LENGTH (L) | TYPE I BAR SIZE | TYPE II (C) | TYPE II BAR SIZE |
|---|---|---|---|---|
| 0"–12" | 3'–9" | #5 | 1'–0" | MATCH VERTICAL BARS OR LARGEST BAR IN SLABS OR WALKWAYS |
| 13"–18" | 4'–9" | #6 | 1'–3" | |
| 19"–24" | 6'–9" | MATCH VERTICAL BARS OR LARGEST BAR IN SLABS OR WALKWAYS | 2'–6" | |
| 25"–36" | 7'–9" | | 2'–6" | |
| 36"+ | 8'–9" | | 2'–6" | |

| REINF. | LAP |
|---|---|
| #4 | 2'–6" |
| #5 | 3'–0" |
| #6 | 3'–6" |
| #7 | 4'–3" |
| #8 | 4'–10" |
| #9 | 5'–3" |
| #10 | 6'–6" |
| #11 | 8'–0" |

TYPICAL LAP SCHEDULE 6 TYP.
UNLESS NOTED OTHERWISE

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|




PLAN
ICICLE CREEK INTAKE

2000 1000 0 5 10
Scale in mm Scale in Feet

NOTES:

1. A PORTION OF THE EXISTING LOW GRAVITY DAM WILL NEED TO BE REMOVED TO CONSTRUCT THE INTAKE FEATURES (SEE DEMOLITION DRAWINGS). THE DAM SHALL BE REPLACED IN-KIND (OR BETTER) TO MEET THE NEW CONCRETE FISHWAY WALL. THE DAM SHALL BE REPAIRED TO A SIMILAR PROFILE AS THE EXISTING DAM. THE BASE OF THE DAM SHALL EXTEND TO EL. 1179.5 (MINIMUM). THE NEW DAM SECTION SHALL BE MADE CONTINOUS WITH THE EXISTING DAM BY DOWELING REBAR INTO THE EXISTING DAM CREST AND BY ROUGHENING THE RUBBLE DAM CROSS SECTION TO A MINIMUM 3" AMPLITUDE AND GROUTING THE NEW DAM (MIN. f'c = 3000 PSI) TO THE EXISTING DAM. IN LIEU OF GROUTED MASONRY, AN UNREINFORCED CONCRETE DAM BASE SECTION (MIN. f'c=3000 PSI) MAY BE CONSTRUCTED. CONCRETE LIFT HEIGHTS FOR THE MASS CONCRETE POURS AT THE DAM SHALL NOT EXCEED 12". THE CONCRETE DAM CREST SHALL BE REINFORCED TO MATCH THE EXISTING CONCRETE DAM CREST. PROVIDE A BOND BREAKER BETWEEN THE NEW DAM SECTION AND THE NEW CONCRETE FISHWAY WALL TO ISOLATE THE TWO STRUCTURES. THE PROPOSED DAM RECONSTRUCTION PLAN INCLUDING AS-BUILT SKETCHES OF THE EXISTING DAM CROSS SECTION SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL IN ACCORDANCE WITH SPECIFICATION SECTION 01300. SEE REFERENCE DRAWINGS FOR AVAILABLE INFORMATION ON THE EXISTING DAM CONSTRUCTION.
2. SEE SHEET C6 FOR GRADING AT INTAKE AREA AND FISHWAY.
3. PROVIDE STEPPED FOOTING AT WINGWALL LOCATIONS AS SHOWN ON SHT. S4. TOP OF FOOTING EL.'S SHOWN ARE APPROXIMATE. CONTRACTOR TO VERIFY EXISTING GRADE AND PROVIDE MIN. EMBEDMENT DEPTH SHOWN.
4. TYP. CONCRETE WALL REINFORCING SHALL BE AS FOLLOWS, U.N.O.:

| WALL HT. | WALL THICKNESS. | REINF. |
|---|---|---|
| 0'-0" TO 7'-0" | 12" | #5 @ 12" O.C. EA. FACE EA. WAY |
| 7'-0" TO 12'-0" | 12" | #8 VERTS @ 6" O.C. EA. FACE AND #5 HORIZ. @ 10" O.C., EA. FACE |
| 12'-0" TO 18'-0" | 18" | #8 VERTS @ 6" O.C. EA. FACE AND #5 HORIZ. @ 10" O.C., EA. FACE |

5. IF BEDROCK ENCOUNTERED AT WINGWALLS AND/OR OTHER WALL LOCATIONS, PROVIDE ROCK ANCHORS SIM. TO THOSE SHOWN IN SECTION A, SHT. S8.

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

| NO. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | | |

LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION — PLAN
INTAKE STRUCTURE

JE JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| RGW | RGW | ASB | 08/04 | 1F-WA-257A-140-23.0 |

SHEET 53 OF 63

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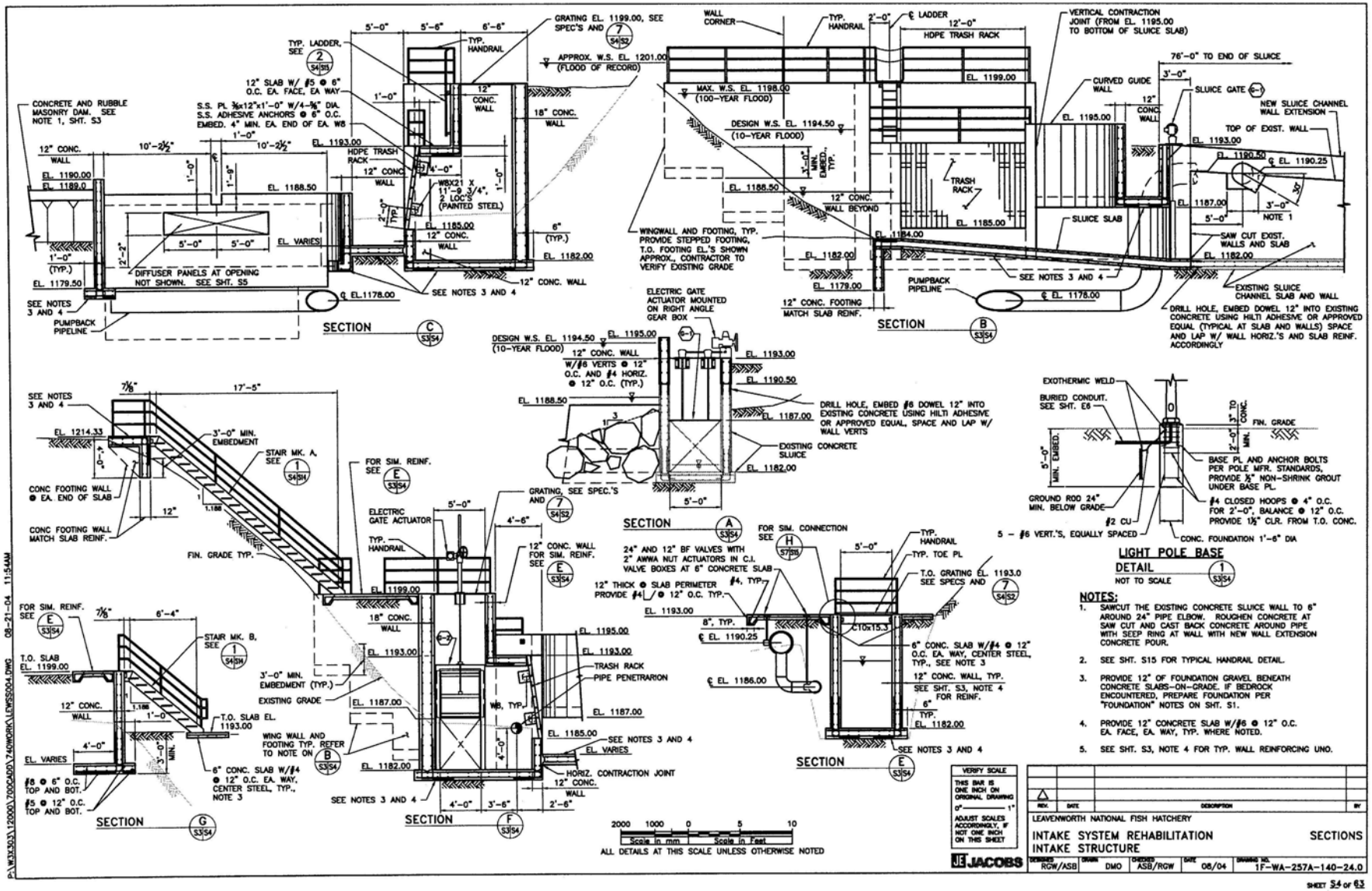
SECTION C S3/S4
SECTION B S3/S4
SECTION A S3/S4
SECTION E S3/S4
SECTION F S3/S4
SECTION G S3/S4
LIGHT POLE BASE DETAIL 1 S3/S4
NOT TO SCALE
NOTES:
1. SAWCUT THE EXISTING CONCRETE SLUICE WALL TO 6" AROUND 24" PIPE ELBOW. ROUGHEN CONCRETE AT SAW CUT AND CAST BACK CONCRETE AROUND PIPE WITH SEEP RING AT WALL WITH NEW WALL EXTENSION CONCRETE POUR.
2. SEE SHT. S15 FOR TYPICAL HANDRAIL DETAIL.
3. PROVIDE 12" OF FOUNDATION GRAVEL BENEATH CONCRETE SLABS-ON-GRADE. IF BEDROCK ENCOUNTERED, PREPARE FOUNDATION PER "FOUNDATION" NOTES ON SHT. S1.
4. PROVIDE 12" CONCRETE SLAB W/#6 @ 12" O.C. EA. FACE, EA. WAY, TYP. WHERE NOTED.
5. SEE SHT. S3, NOTE 4 FOR TYP. WALL REINFORCING UNO.
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
JE JACOBS
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
INTAKE STRUCTURE
SECTIONS
DESIGNED RGW/ASB
DRAWN DMO
CHECKED ASB/RGW
DATE 08/04
DRAWING NO. 1F-WA-257A-140-24.0
SHEET S4 OF 63
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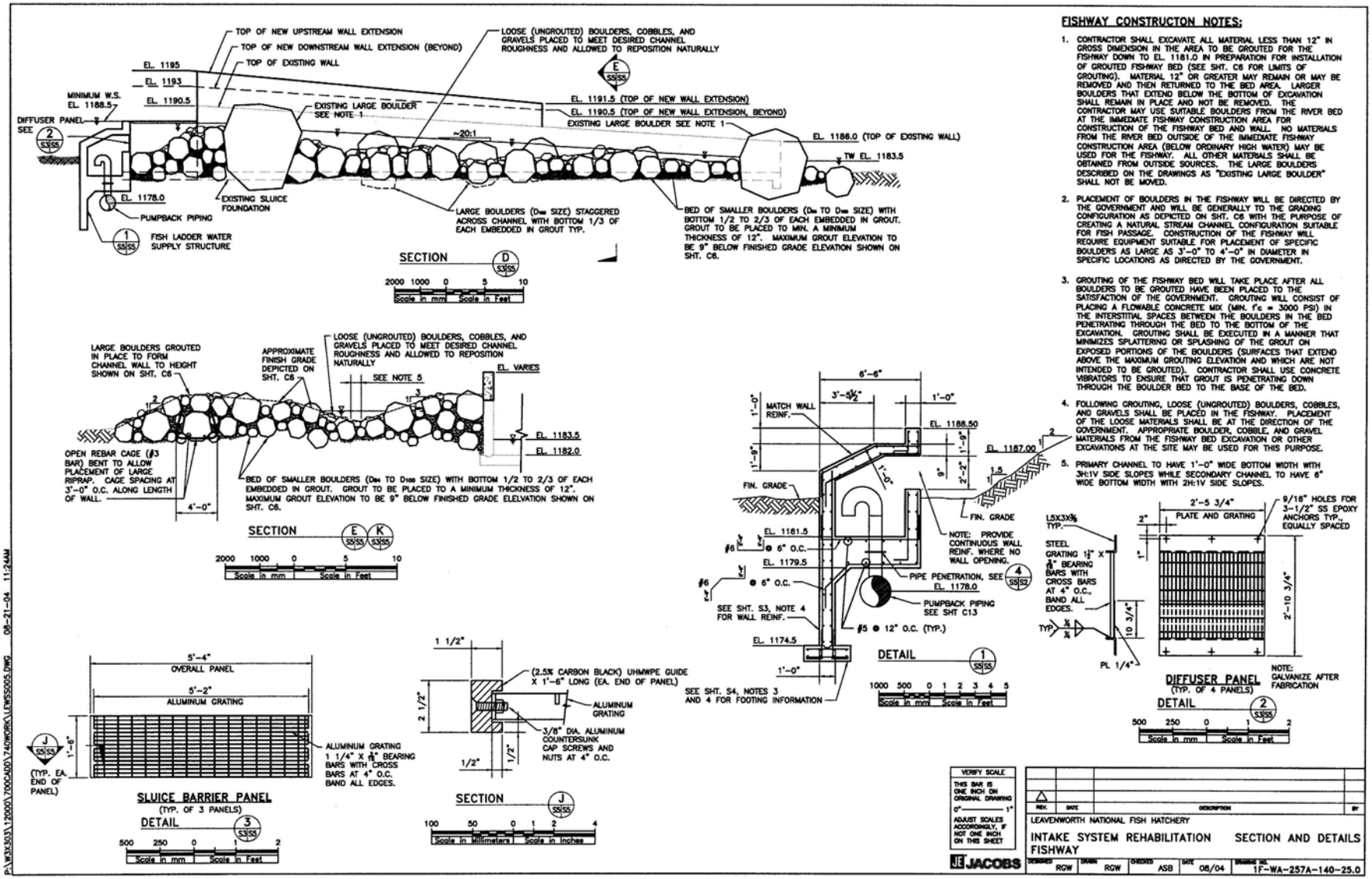
TOP OF NEW UPSTREAM WALL EXTENSION
TOP OF NEW DOWNSTREAM WALL EXTENSION (BEYOND)
TOP OF EXISTING WALL
LOOSE (UNGROUTED) BOULDERS, COBBLES, AND GRAVELS PLACED TO MEET DESIRED CHANNEL ROUGHNESS AND ALLOWED TO REPOSITION NATURALLY
EL. 1195
EL. 1193
EL. 1190.5
MINIMUM W.S. EL. 1188.5
DIFFUSER PANEL SEE 2 S3/S5
EXISTING LARGE BOULDER SEE NOTE 1
EL. 1191.5 (TOP OF NEW WALL EXTENSION)
EL. 1190.5 (TOP OF NEW WALL EXTENSION, BEYOND)
EXISTING LARGE BOULDER SEE NOTE 1
~20:1
EL. 1186.0 (TOP OF EXISTING WALL)
TW EL. 1183.5
EL. 1178.0
EXISTING SLUICE FOUNDATION
PUMPBACK PIPING
FISH LADDER WATER SUPPLY STRUCTURE
LARGE BOULDERS (D100 SIZE) STAGGERED ACROSS CHANNEL WITH BOTTOM 1/3 OF EACH EMBEDDED IN GROUT TYP.
BED OF SMALLER BOULDERS (D84 TO D100 SIZE) WITH BOTTOM 1/2 TO 2/3 OF EACH EMBEDDED IN GROUT. GROUT TO BE PLACED TO MIN. A MINIMUM THICKNESS OF 12". MAXIMUM GROUT ELEVATION TO BE 9" BELOW FINISHED GRADE ELEVATION SHOWN ON SHT. C6.
SECTION D S3/S5
2000 1000 0 5 10
Scale in mm Scale in Feet
LARGE BOULDERS GROUTED IN PLACE TO FORM CHANNEL WALL TO HEIGHT SHOWN ON SHT. C6
APPROXIMATE FINISH GRADE DEPICTED ON SHT. C6
LOOSE (UNGROUTED) BOULDERS, COBBLES, AND GRAVELS PLACED TO MEET DESIRED CHANNEL ROUGHNESS AND ALLOWED TO REPOSITION NATURALLY
SEE NOTE 5
EL. VARIES
EL. 1183.5
EL. 1182.0
OPEN REBAR CAGE (#3 BAR) BENT TO ALLOW PLACEMENT OF LARGE RIPRAP. CAGE SPACING AT 3'-0" O.C. ALONG LENGTH OF WALL.
4'-0"
BED OF SMALLER BOULDERS (D84 TO D100 SIZE) WITH BOTTOM 1/2 TO 2/3 OF EACH EMBEDDED IN GROUT. GROUT TO BE PLACED TO A MINIMUM THICKNESS OF 12". MAXIMUM GROUT ELEVATION TO BE 9" BELOW FINISHED GRADE ELELVATION SHOWN ON SHT. C6.
SECTION E K S5/S5 S3/S5
2000 1000 0 5 10
Scale in mm Scale in Feet
6'-6"
3'-5½"
1'-0"
MATCH WALL REINF.
EL. 1188.50
EL. 1187.00
FIN. GRADE
EL. 1181.5
#6 @ 6" O.C.
EL. 1179.5
NOTE: PROVIDE CONTINUOUS WALL REINF. WHERE NO WALL OPENING.
PIPE PENETRATION, SEE 4 S5/S2
EL. 1178.0
PUMPBACK PIPING SEE SHT C13
SEE SHT. S3, NOTE 4 FOR WALL REINF.
#5 @ 12" O.C. (TYP.)
EL. 1174.5
SEE SHT. S4, NOTES 3 AND 4 FOR FOOTING INFORMATION
DETAIL 1 S5/S5
1000 500 0 1 2 3 4 5
Scale in mm Scale in Feet
FISHWAY CONSTRUCTON NOTES:
1. CONTRACTOR SHALL EXCAVATE ALL MATERIAL LESS THAN 12" IN GROSS DIMENSION IN THE AREA TO BE GROUTED FOR THE FISHWAY DOWN TO EL. 1181.0 IN PREPARATION FOR INSTALLATION OF GROUTED FISHWAY BED (SEE SHT. C6 FOR LIMITS OF GROUTING). MATERIAL 12" OR GREATER MAY REMAIN OR MAY BE REMOVED AND THEN RETURNED TO THE BED AREA. LARGER BOULDERS THAT EXTEND BELOW THE BOTTOM OF EXCAVATION SHALL REMAIN IN PLACE AND NOT BE REMOVED. THE CONTRACTOR MAY USE SUITABLE BOULDERS FROM THE RIVER BED AT THE IMMEDIATE FISHWAY CONSTRUCTION AREA FOR CONSTRUCTION OF THE FISHWAY BED AND WALL. NO MATERIALS FROM THE RIVER BED OUTSIDE OF THE IMMEDIATE FISHWAY CONSTRUCTION AREA (BELOW ORDINARY HIGH WATER) MAY BE USED FOR THE FISHWAY. ALL OTHER MATERIALS SHALL BE OBTAINED FROM OUTSIDE SOURCES. THE LARGE BOULDERS DESCRIBED ON THE DRAWINGS AS "EXISTING LARGE BOULDER" SHALL NOT BE MOVED.
2. PLACEMENT OF BOULDERS IN THE FISHWAY WILL BE DIRECTED BY THE GOVERNMENT AND WILL BE GENERALLY TO THE GRADING CONFIGURATION AS DEPICTED ON SHT. C6 WITH THE PURPOSE OF CREATING A NATURAL STREAM CHANNEL CONFIGURATION SUITABLE FOR FISH PASSAGE. CONSTRUCTION OF THE FISHWAY WILL REQUIRE EQUIPMENT SUITABLE FOR PLACEMENT OF SPECIFIC BOULDERS AS LARGE AS 3'-0" TO 4'-0" IN DIAMETER IN SPECIFIC LOCATIONS AS DIRECTED BY THE GOVERNMENT.
3. GROUTING OF THE FISHWAY BED WILL TAKE PLACE AFTER ALL BOULDERS TO BE GROUTED HAVE BEEN PLACED TO THE SATISFACTION OF THE GOVERNMENT. GROUTING WILL CONSIST OF PLACING A FLOWABLE CONCRETE MIX (MIN. f'c = 3000 PSI) IN THE INTERSTITIAL SPACES BETWEEN THE BOULDERS IN THE BED PENETRATING THROUGH THE BED TO THE BOTTOM OF THE EXCAVATION. GROUTING SHALL BE EXECUTED IN A MANNER THAT MINIMIZES SPLATTERING OR SPLASHING OF THE GROUT ON EXPOSED PORTIONS OF THE BOULDERS (SURFACES THAT EXTEND ABOVE THE MAXIMUM GROUTING ELEVATION AND WHICH ARE NOT INTENDED TO BE GROUTED). CONTRACTOR SHALL USE CONCRETE VIBRATORS TO ENSURE THAT GROUT IS PENETRATING DOWN THROUGH THE BOULDER BED TO THE BASE OF THE BED.
4. FOLLOWING GROUTING, LOOSE (UNGROUTED) BOULDERS, COBBLES, AND GRAVELS SHALL BE PLACED IN THE FISHWAY. PLACEMENT OF THE LOOSE MATERIALS SHALL BE AT THE DIRECTION OF THE GOVERNMENT. APPROPRIATE BOULDER, COBBLE, AND GRAVEL MATERIALS FROM THE FISHWAY BED EXCAVATION OR OTHER EXCAVATIONS AT THE SITE MAY BE USED FOR THIS PURPOSE.
5. PRIMARY CHANNEL TO HAVE 1'-0" WIDE BOTTOM WIDTH WITH 3H:1V SIDE SLOPES WHILE SECONDARY CHANNEL TO HAVE 6" WIDE BOTTOM WIDTH WITH 2H:1V SIDE SLOPES.
2'-5 3/4"
PLATE AND GRATING
9/16" HOLES FOR 3-1/2" SS EPOXY ANCHORS TYP., EQUALLY SPACED
L5X3X5/16 TYP.
STEEL GRATING 1" X 3/16" BEARING BARS WITH CROSS BARS AT 4" O.C., BAND ALL EDGES.
10 3/4"
2'-10 3/4"
PL 1/4"
DIFFUSER PANEL (TYP. OF 4 PANELS)
DETAIL 2 S3/S5
500 250 0 1 2
Scale in mm Scale in Feet
NOTE: GALVANIZE AFTER FABRICATION
5'-4" OVERALL PANEL
5'-2" ALUMINUM GRATING
1'-6"
(TYP. EA. END OF PANEL)
ALUMINUM GRATING 1 1/4" X 3/16" BEARING BARS WITH CROSS BARS AT 4" O.C. BAND ALL EDGES.
SLUICE BARRIER PANEL (TYP. OF 3 PANELS)
DETAIL 3 S3/S5
500 250 0 1 2
Scale in mm Scale in Feet
1 1/2"
2 1/2"
(2.5% CARBON BLACK) UHMWPE GUIDE X 1'-6" LONG (EA. END OF PANEL)
ALUMINUM GRATING
3/8" DIA. ALUMINUM COUNTERSUNK CAP SCREWS AND NUTS AT 4" O.C.
1/2"
1/2"
SECTION J S5/S5
100 50 0 1 2 4
Scale in Millimeters Scale in Inches
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
JACOBS
REV. DATE DESCRIPTION BY
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION FISHWAY
SECTION AND DETAILS
DESIGNED RGW DRAWN RGW CHECKED ASB DATE 08/04
DRAWING NO. 1F-WA-257A-140-25.0
SHEET S5 OF 63
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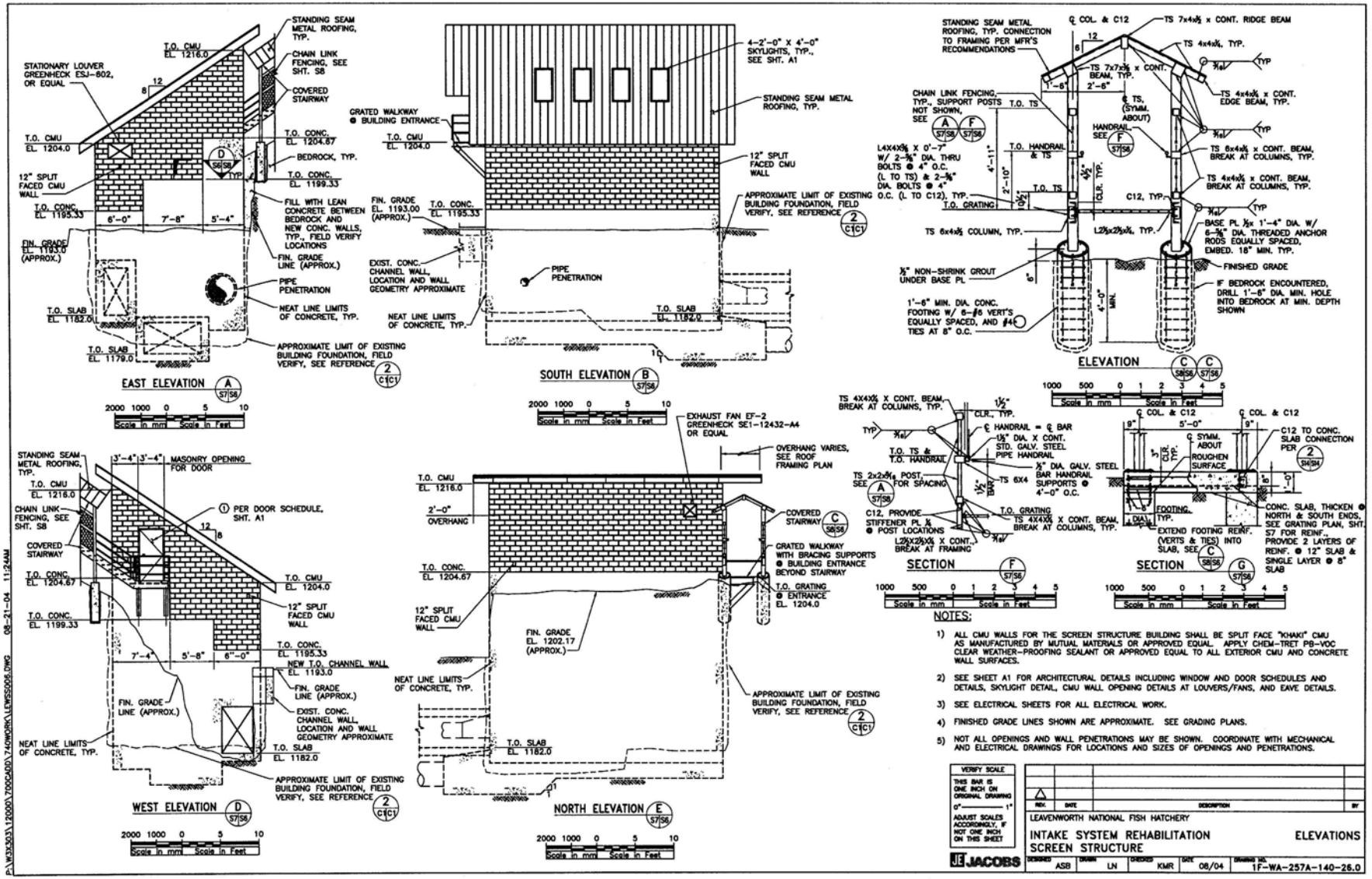
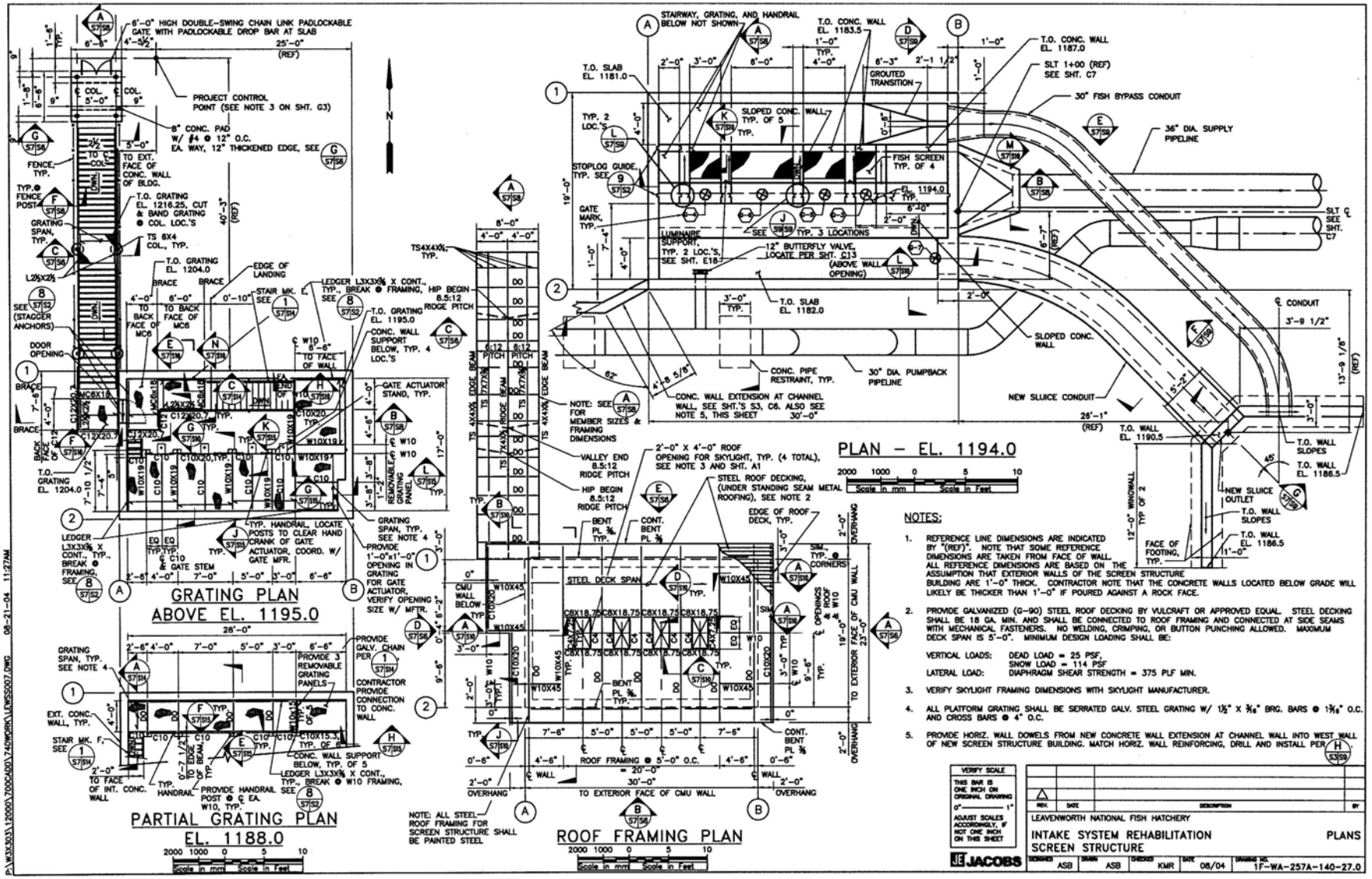
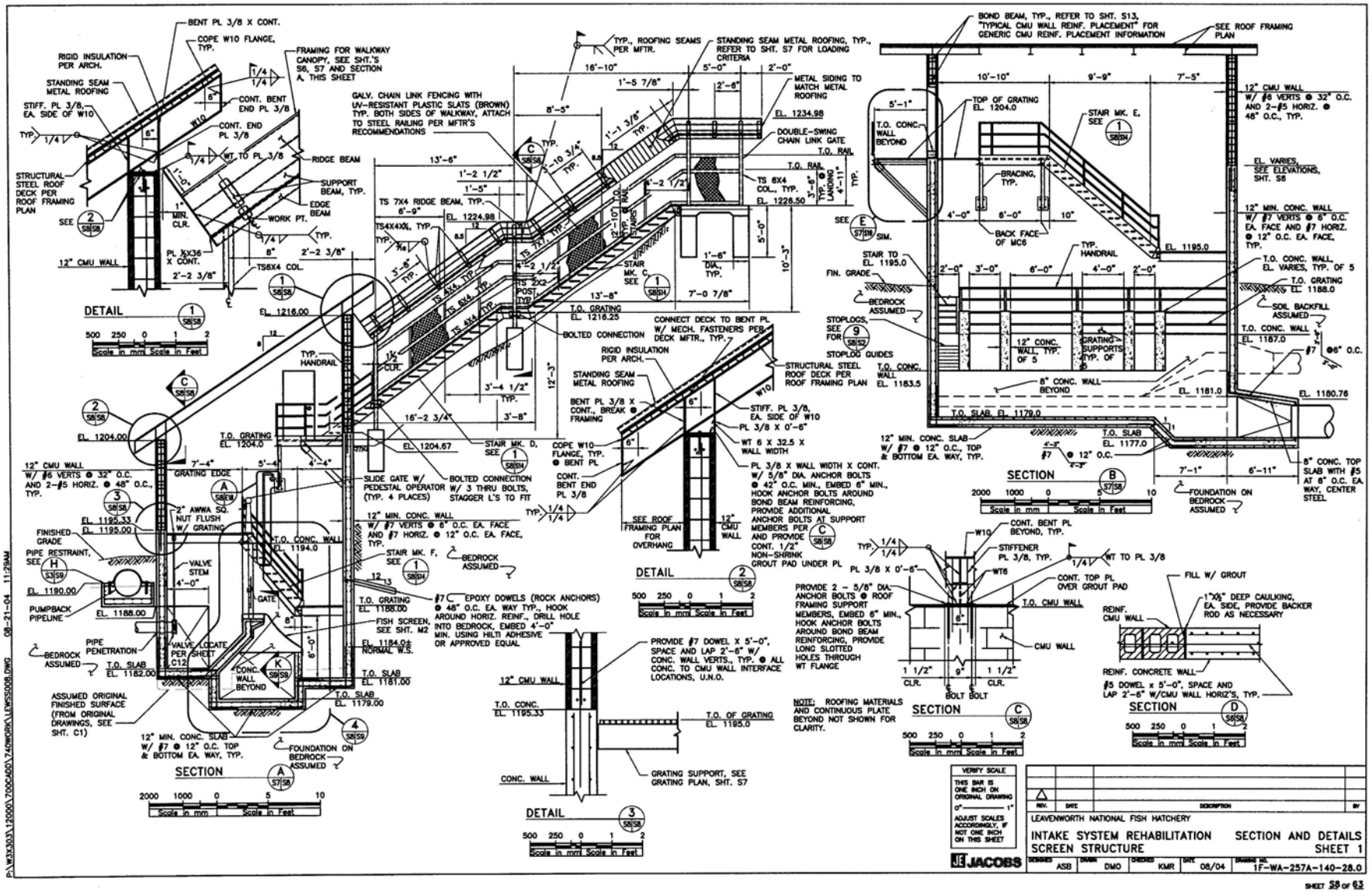
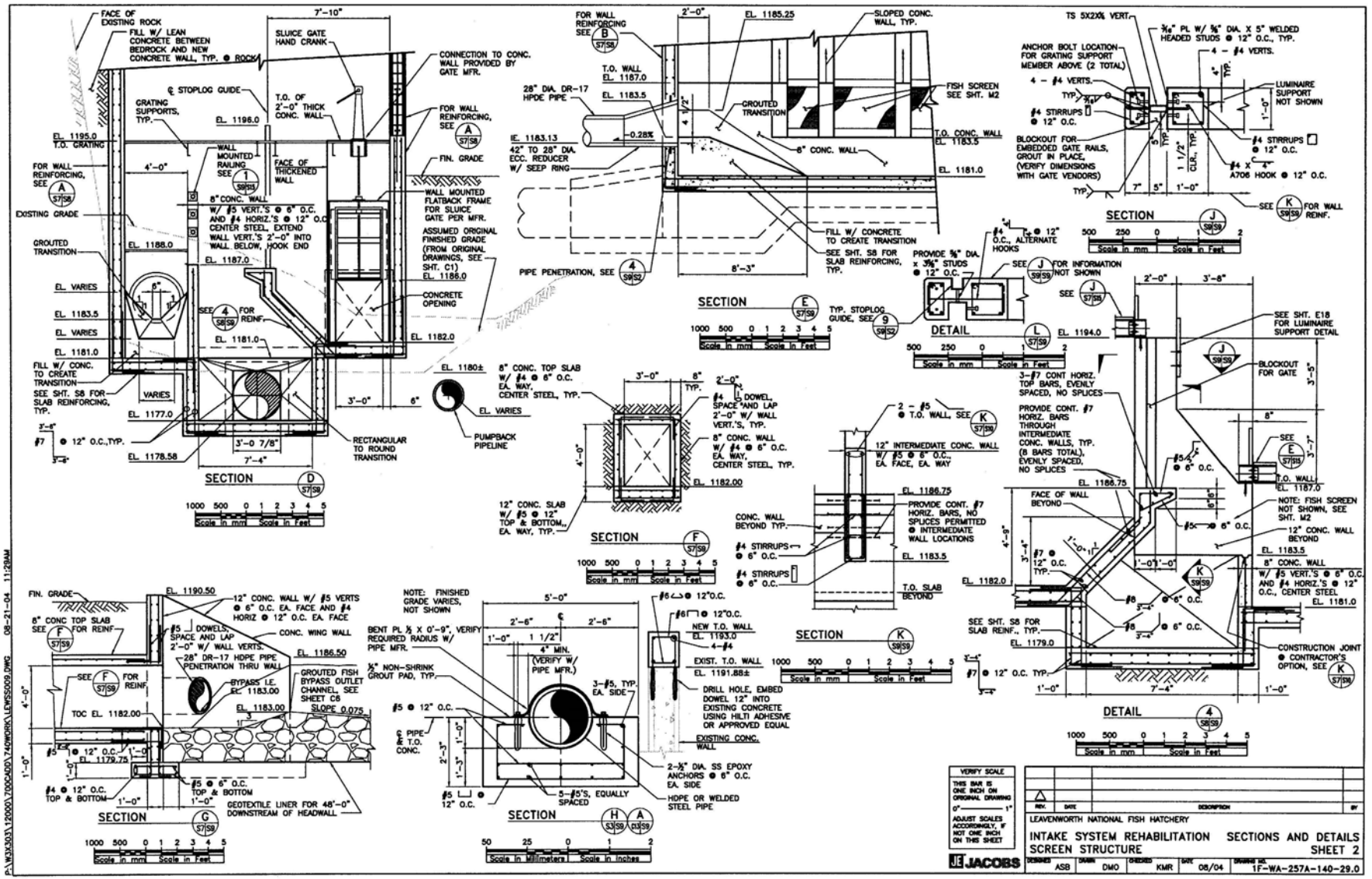
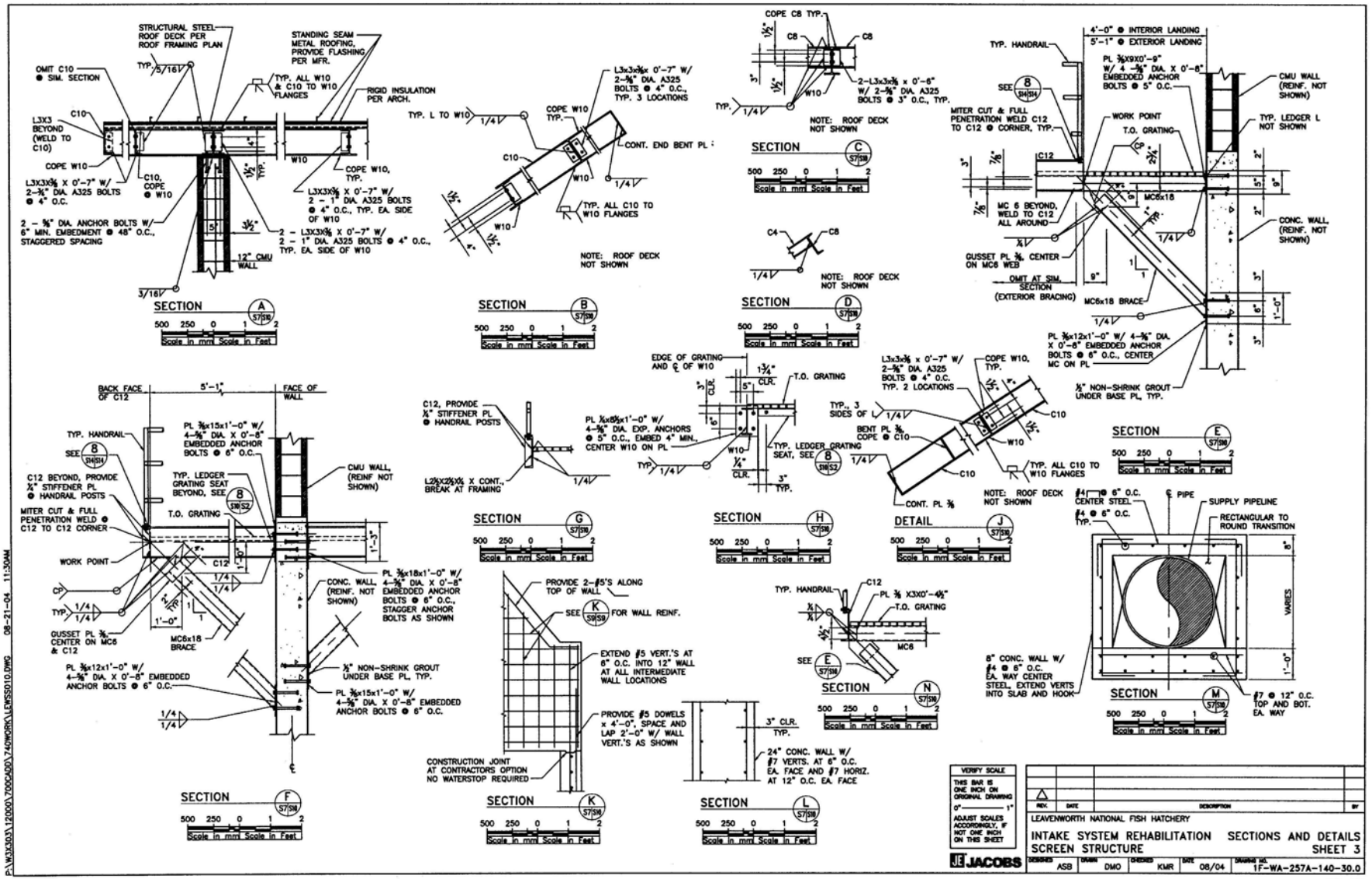
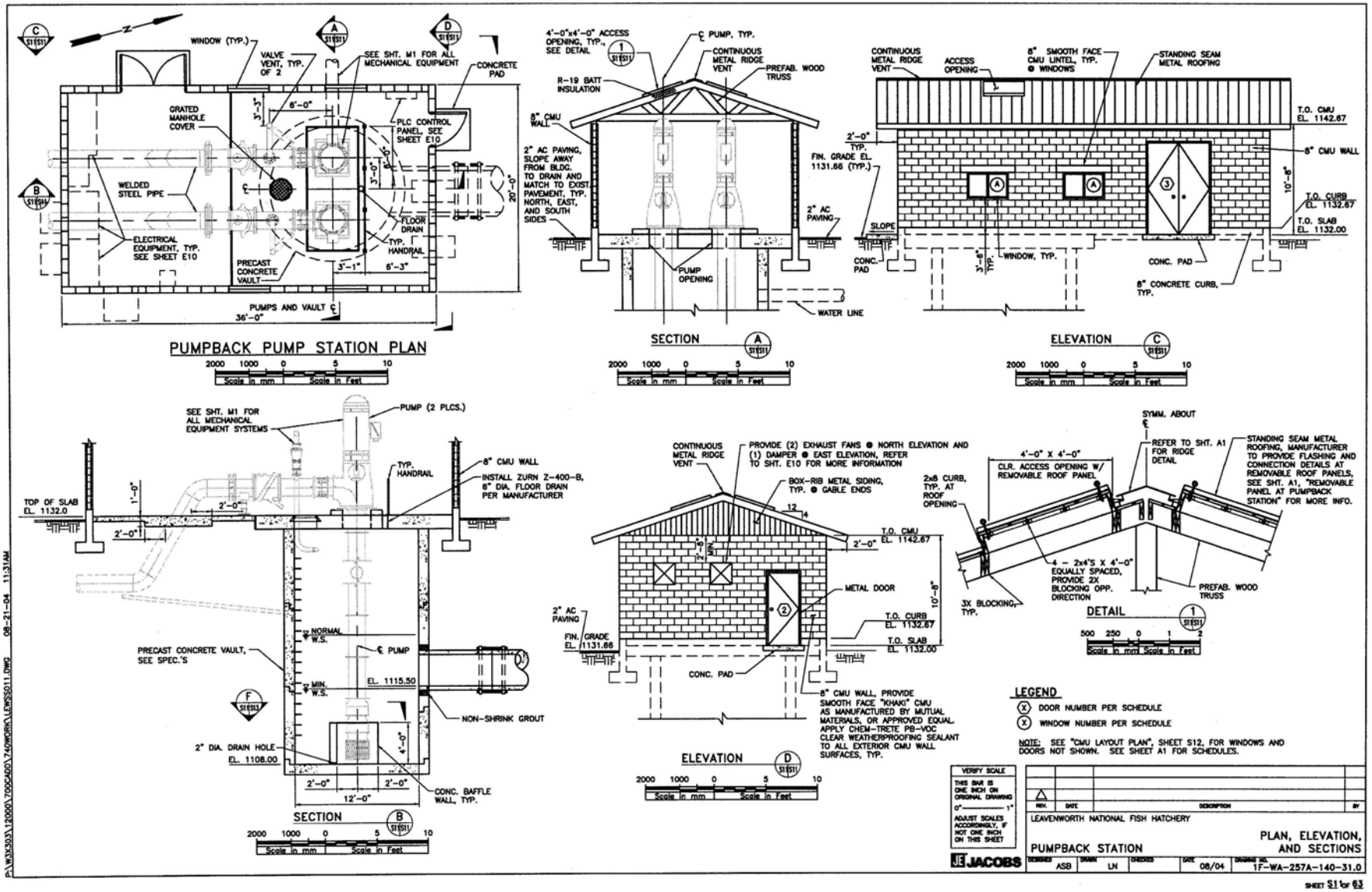

EAST ELEVATION
SOUTH ELEVATION
WEST ELEVATION
NORTH ELEVATION
ELEVATION
SECTION
SECTION
NOTES:
1) ALL CMU WALLS FOR THE SCREEN STRUCTURE BUILDING SHALL BE SPLIT FACE "KHAKI" CMU AS MANUFACTURED BY MUTUAL MATERIALS OR APPROVED EQUAL. APPLY CHEM-TRET PB-VOC CLEAR WEATHER-PROOFING SEALANT OR APPROVED EQUAL TO ALL EXTERIOR CMU AND CONCRETE WALL SURFACES.
2) SEE SHEET A1 FOR ARCHITECTURAL DETAILS INCLUDING WINDOW AND DOOR SCHEDULES AND DETAILS, SKYLIGHT DETAIL, CMU WALL OPENING DETAILS AT LOUVERS/FANS, AND EAVE DETAILS.
3) SEE ELECTRICAL SHEETS FOR ALL ELECTRICAL WORK.
4) FINISHED GRADE LINES SHOWN ARE APPROXIMATE. SEE GRADING PLANS.
5) NOT ALL OPENINGS AND WALL PENETRATIONS MAY BE SHOWN. COORDINATE WITH MECHANICAL AND ELECTRICAL DRAWINGS FOR LOCATIONS AND SIZES OF OPENINGS AND PENETRATIONS.
VERIFY SCALE
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
SCREEN STRUCTURE
ELEVATIONS
JE JACOBS
1F-WA-257A-140-26.0
SHEET 59 OF 63

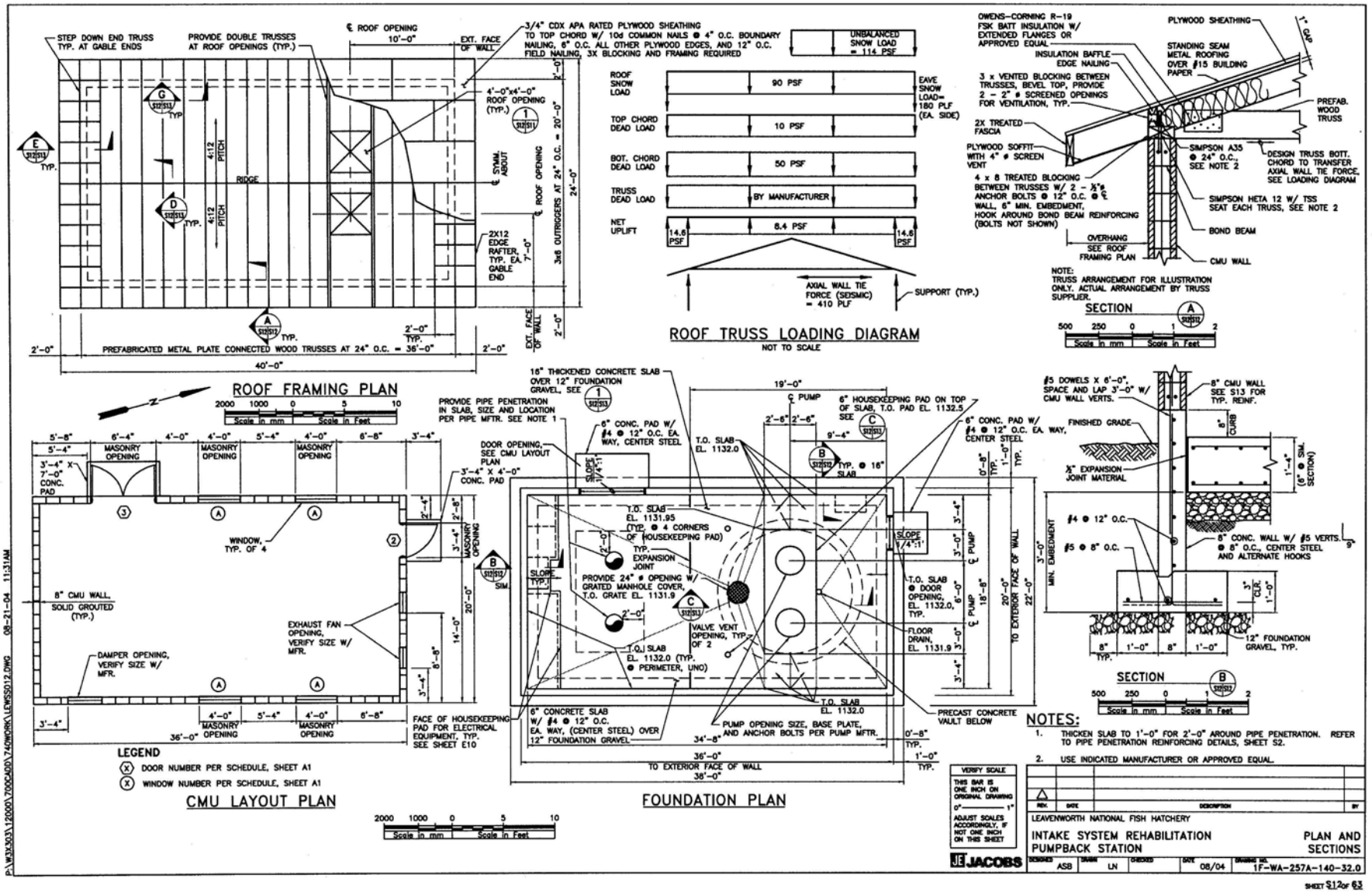

GRATING PLAN
ABOVE EL. 1195.0
PARTIAL GRATING PLAN
EL. 1188.0
PLAN – EL. 1194.0
ROOF FRAMING PLAN
NOTES:
1. REFERENCE LINE DIMENSIONS ARE INDICATED BY "(REF)". NOTE THAT SOME REFERENCE DIMENSIONS ARE TAKEN FROM FACE OF WALL. ALL REFERENCE DIMENSIONS ARE BASED ON THE ASSUMPTION THAT EXTERIOR WALLS OF THE SCREEN STRUCTURE BUILDING ARE 1'-0" THICK. CONTRACTOR NOTE THAT THE CONCRETE WALLS LOCATED BELOW GRADE WILL LIKELY BE THICKER THAN 1'-0" IF POURED AGAINST A ROCK FACE.
2. PROVIDE GALVANIZED (G-90) STEEL ROOF DECKING BY VULCRAFT OR APPROVED EQUAL. STEEL DECKING SHALL BE 18 GA. MIN. AND SHALL BE CONNECTED TO ROOF FRAMING AND CONNECTED AT SIDE SEAMS WITH MECHANICAL FASTENERS. NO WELDING, CRIMPING, OR BUTTON PUNCHING ALLOWED. MAXIMUM DECK SPAN IS 5'-0". MINIMUM DESIGN LOADING SHALL BE:
VERTICAL LOADS: DEAD LOAD = 25 PSF, SNOW LOAD = 114 PSF
LATERAL LOAD: DIAPHRAGM SHEAR STRENGTH = 375 PLF MIN.
3. VERIFY SKYLIGHT FRAMING DIMENSIONS WITH SKYLIGHT MANUFACTURER.
4. ALL PLATFORM GRATING SHALL BE SERRATED GALV. STEEL GRATING W/ 1½" X 3/16" BRG. BARS @ 1 3/16" O.C. AND CROSS BARS @ 4" O.C.
5. PROVIDE HORIZ. WALL DOWELS FROM NEW CONCRETE WALL EXTENSION AT CHANNEL WALL INTO WEST WALL OF NEW SCREEN STRUCTURE BUILDING. MATCH HORIZ. WALL REINFORCING, DRILL AND INSTALL PER H S3/S9
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
JACOBS
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
SCREEN STRUCTURE
PLANS
DESIGNED ASB
DRAWN ASB
CHECKED KMR
DATE 08/04
DRAWING NO. 1F-WA-257A-140-27.0
SHEET S7 OF 63

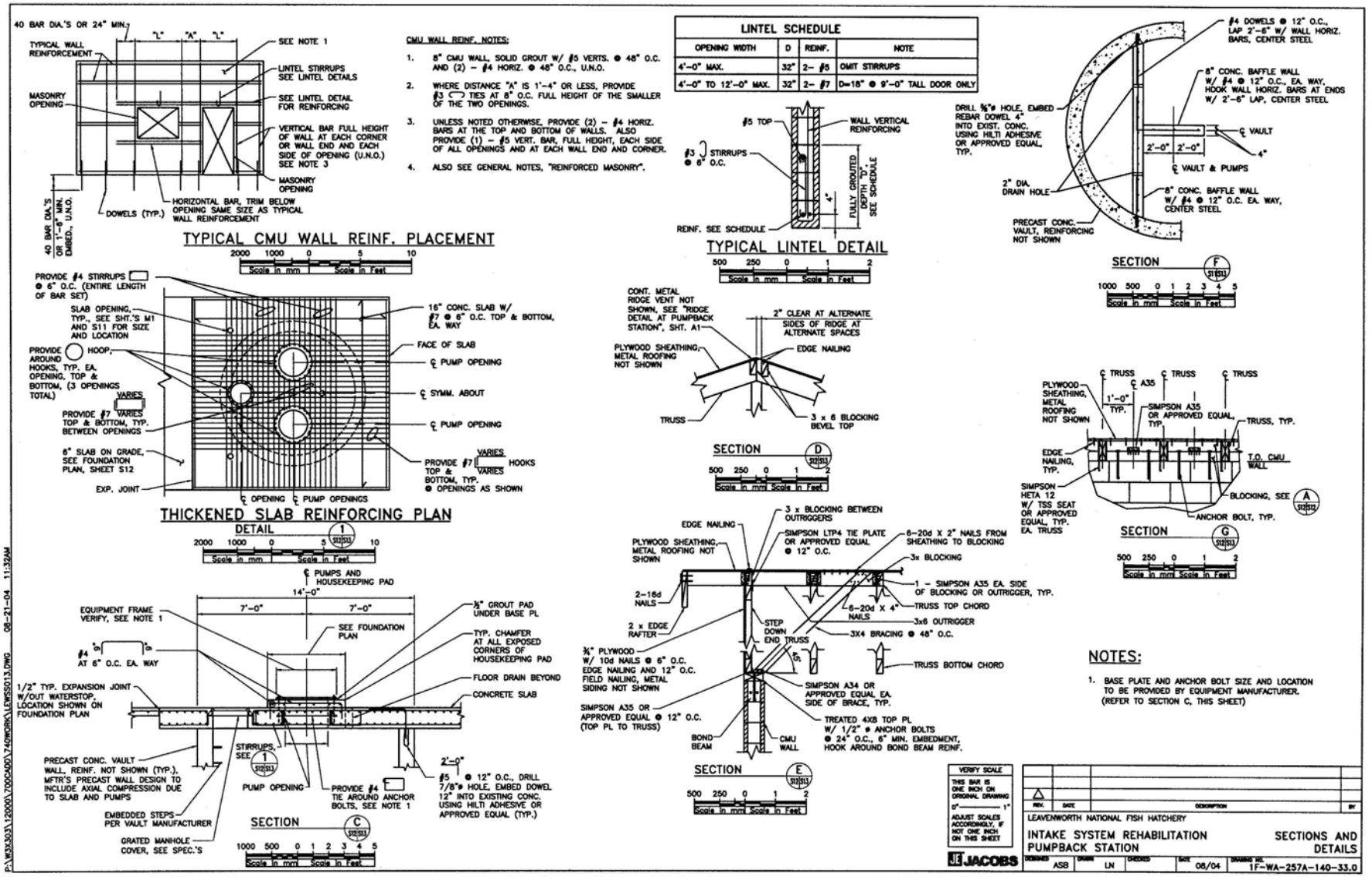

DETAIL 1 S8/S8
SECTION A S7/S8
SECTION B S7/S8
SECTION C S8/S8
SECTION D S6/S8
DETAIL 2 S8/S8
DETAIL 3 S8/S8
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION SECTION AND DETAILS
SCREEN STRUCTURE SHEET 1
JACOBS
1F-WA-257A-140-28.0
SHEET 59 OF 63

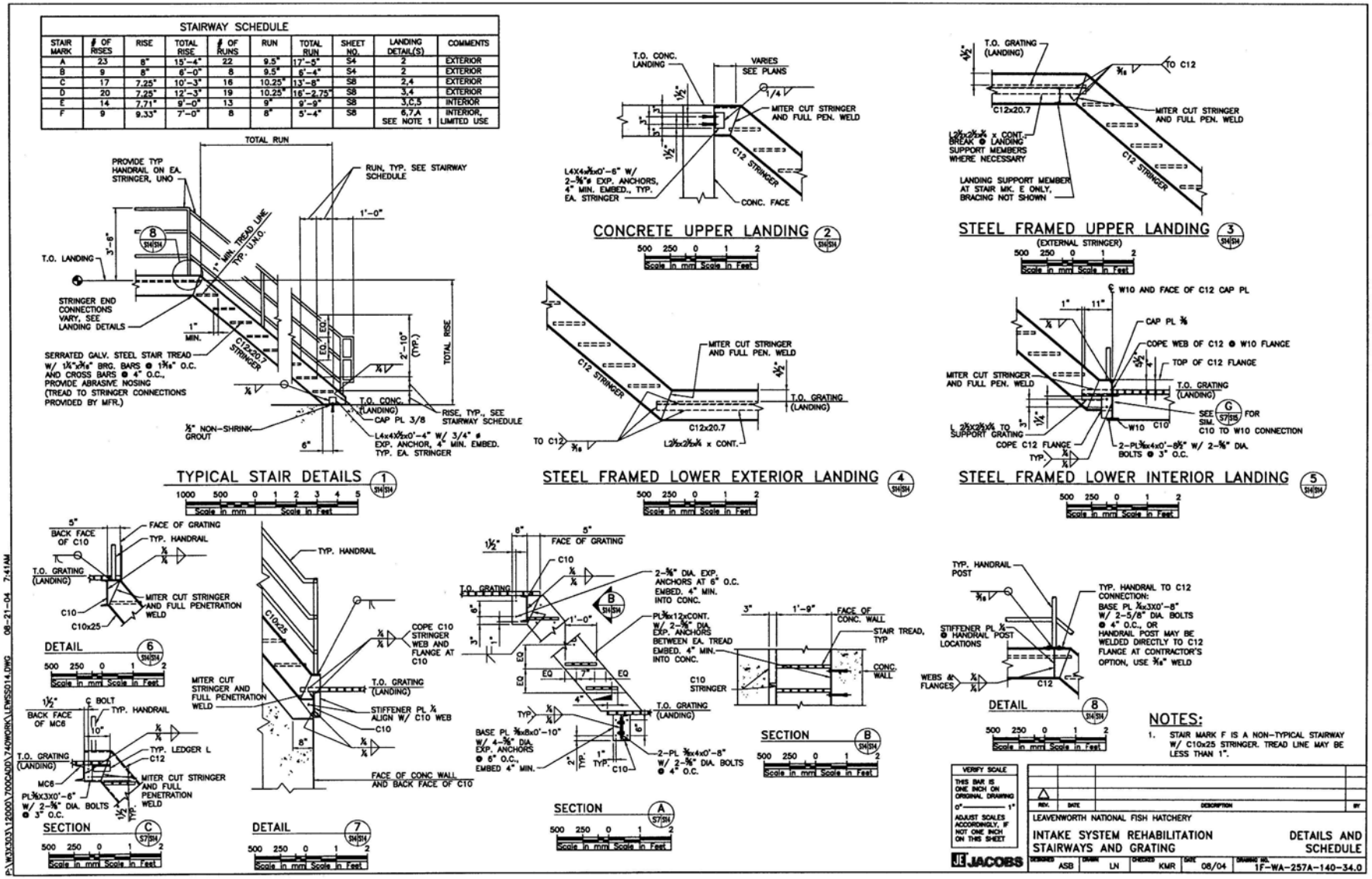

SECTION D S7/S8
SECTION E S7/S9
SECTION F S7/S8
SECTION G S7/S8
SECTION H S3/S9 A S13/S9
SECTION J S9/S9
SECTION K S9/S9
DETAIL L S7/S9
DETAIL 4 S8/S9
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION SECTIONS AND DETAILS
SCREEN STRUCTURE SHEET 2
JE JACOBS
1F-WA-257A-140-29.0
SHEET S9 OF 63

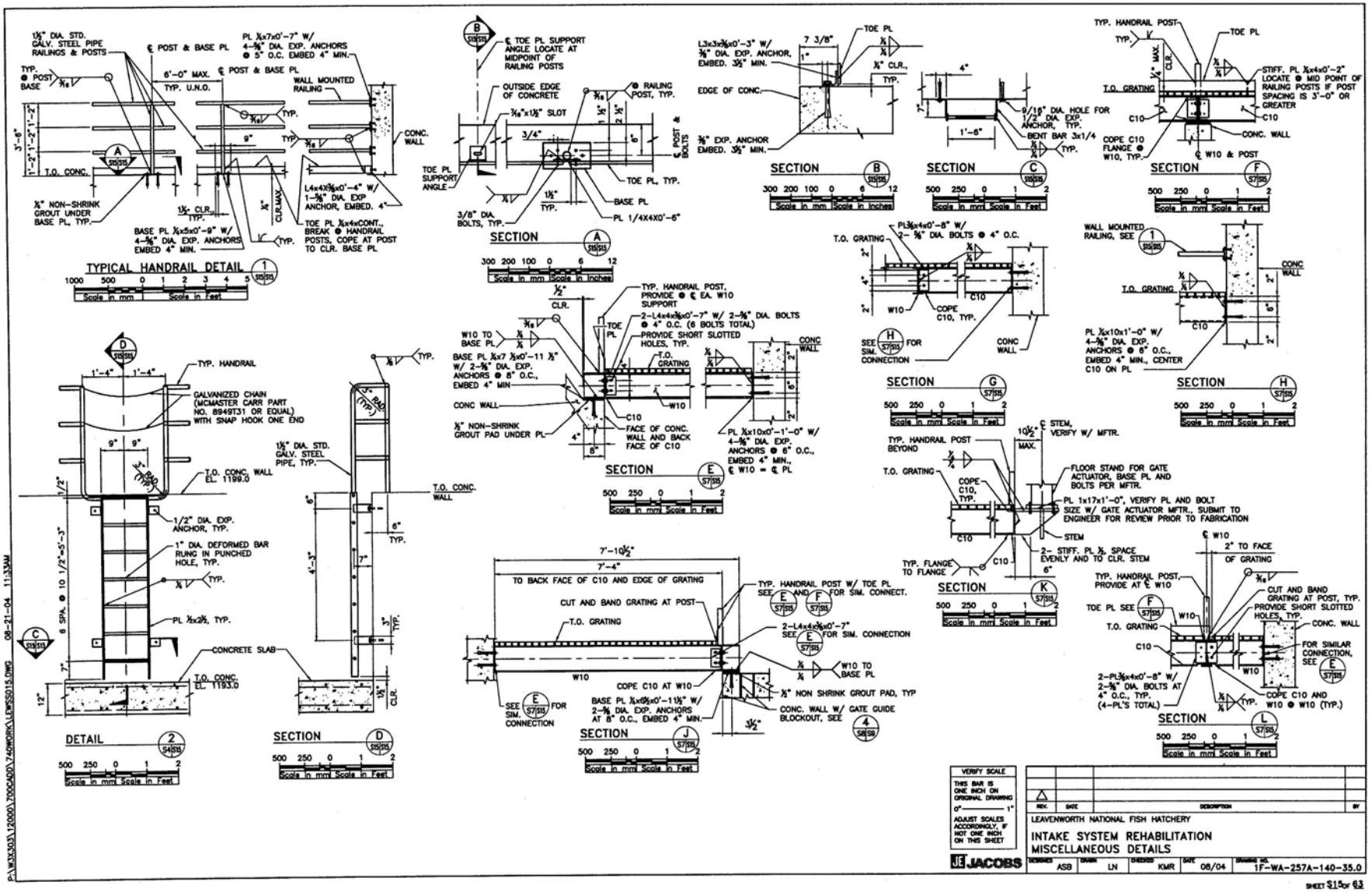

SECTION A S7/S18
SECTION B S7/S18
SECTION C S7/S18
SECTION D S7/S18
SECTION E S7/S18
SECTION F S7/S18
SECTION G S7/S18
SECTION H S7/S18
DETAIL J S7/S18
SECTION K S7/S18
SECTION L S7/S18
SECTION M S7/S18
SECTION N S7/S18
NOTE: ROOF DECK NOT SHOWN
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
JACOBS
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION SECTIONS AND DETAILS
SCREEN STRUCTURE SHEET 3
1F-WA-257A-140-30.0
SHEET S10 OF 63

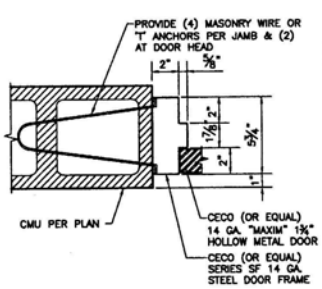

PUMPBACK PUMP STATION PLAN
SECTION A
ELEVATION C
SECTION B
ELEVATION D
DETAIL
LEGEND
(X) DOOR NUMBER PER SCHEDULE
(X) WINDOW NUMBER PER SCHEDULE
NOTE: SEE "CMU LAYOUT PLAN", SHEET S12, FOR WINDOWS AND DOORS NOT SHOWN. SEE SHEET A1 FOR SCHEDULES.
LEAVENWORTH NATIONAL FISH HATCHERY
PUMPBACK STATION
PLAN, ELEVATION, AND SECTIONS
JE JACOBS
1F-WA-257A-140-31.0
SHEET S1 OF 63


ROOF FRAMING PLAN
ROOF TRUSS LOADING DIAGRAM
NOT TO SCALE
CMU LAYOUT PLAN
FOUNDATION PLAN
SECTION
SECTION
NOTES:
1. THICKEN SLAB TO 1'-0" FOR 2'-0" AROUND PIPE PENETRATION. REFER TO PIPE PENETRATION REINFORCING DETAILS, SHEET S2.
2. USE INDICATED MANUFACTURER OR APPROVED EQUAL.
LEGEND
(X) DOOR NUMBER PER SCHEDULE, SHEET A1
(X) WINDOW NUMBER PER SCHEDULE, SHEET A1
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
PUMPBACK STATION
PLAN AND SECTIONS
JE JACOBS
1F-WA-257A-140-32.0
SHEET S12 OF 63

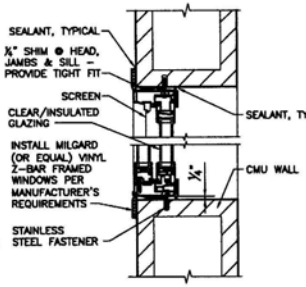

TYPICAL CMU WALL REINF. PLACEMENT
CMU WALL REINF. NOTES:
1. 8" CMU WALL, SOLID GROUT W/ #5 VERTS. @ 48" O.C. AND (2) – #4 HORIZ. @ 48" O.C., U.N.O.
2. WHERE DISTANCE "A" IS 1'-4" OR LESS, PROVIDE #3 TIES AT 8" O.C. FULL HEIGHT OF THE SMALLER OF THE TWO OPENINGS.
3. UNLESS NOTED OTHERWISE, PROVIDE (2) – #4 HORIZ. BARS AT THE TOP AND BOTTOM OF WALLS. ALSO PROVIDE (1) – #5 VERT. BAR, FULL HEIGHT, EACH SIDE OF ALL OPENINGS AND AT EACH WALL END AND CORNER.
4. ALSO SEE GENERAL NOTES, "REINFORCED MASONRY".
LINTEL SCHEDULE
OPENING WIDTH | D | REINF. | NOTE
4'-0" MAX. | 32" | 2- #5 | OMIT STIRRUPS
4'-0" TO 12'-0" MAX. | 32" | 2- #7 | D=18" @ 9'-0" TALL DOOR ONLY
TYPICAL LINTEL DETAIL
THICKENED SLAB REINFORCING PLAN
DETAIL 1
SECTION C
SECTION D
SECTION E
SECTION F
SECTION G
NOTES:
1. BASE PLATE AND ANCHOR BOLT SIZE AND LOCATION TO BE PROVIDED BY EQUIPMENT MANUFACTURER. (REFER TO SECTION C, THIS SHEET)
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION PUMPBACK STATION
SECTIONS AND DETAILS
JACOBS
1F-WA-257A-140-33.0
SHEET S13 OF 63


STAIRWAY SCHEDULE
STAIR MARK | # OF RISES | RISE | TOTAL RISE | # OF RUNS | RUN | TOTAL RUN | SHEET NO. | LANDING DETAIL(S) | COMMENTS
A | 23 | 8" | 15'-4" | 22 | 9.5" | 17'-5" | S4 | 2 | EXTERIOR
B | 9 | 8" | 6'-0" | 8 | 9.5" | 6'-4" | S4 | 2 | EXTERIOR
C | 17 | 7.25" | 10'-3" | 16 | 10.25" | 13'-8" | S8 | 2,4 | EXTERIOR
D | 20 | 7.25" | 12'-3" | 19 | 10.25" | 16'-2.75" | S8 | 3,4 | EXTERIOR
E | 14 | 7.71" | 9'-0" | 13 | 9" | 9'-9" | S8 | 3,C,5 | INTERIOR
F | 9 | 9.33" | 7'-0" | 8 | 8" | 5'-4" | S8 | 6,7,A SEE NOTE 1 | INTERIOR, LIMITED USE
TYPICAL STAIR DETAILS
CONCRETE UPPER LANDING
STEEL FRAMED UPPER LANDING
(EXTERNAL STRINGER)
STEEL FRAMED LOWER EXTERIOR LANDING
STEEL FRAMED LOWER INTERIOR LANDING
DETAIL
SECTION
NOTES:
1. STAIR MARK F IS A NON-TYPICAL STAIRWAY W/ C10x25 STRINGER. TREAD LINE MAY BE LESS THAN 1".
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
STAIRWAYS AND GRATING
DETAILS AND SCHEDULE
JACOBS
ASB
LN
KMR
08/04
1F-WA-257A-140-34.0
SHEET S14 OF 63

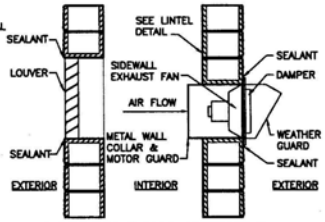

TYPICAL HANDRAIL DETAIL
DETAIL
SECTION
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
MISCELLANEOUS DETAILS
JE JACOBS
ASB
LN
KMR
08/04
1F-WA-257A-140-35.0



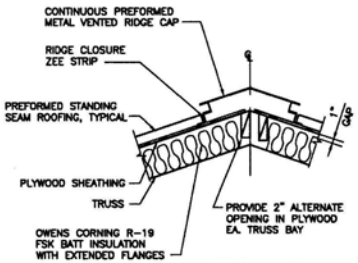

EXT. DOOR JAMB/HEAD AT PUMPBACK STATION



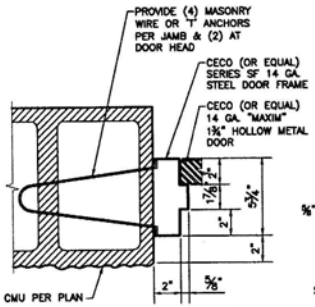

SILL/HEADER DETAIL AT PUMPBACK STATION



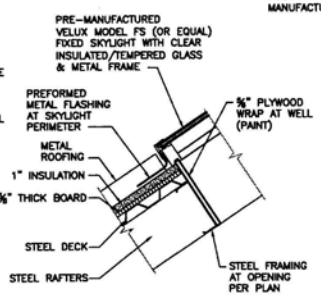

LOUVER/FAN DETAILS



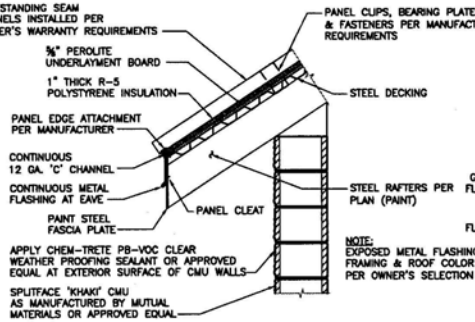

RIDGE DETAIL AT PUMPBACK STATION



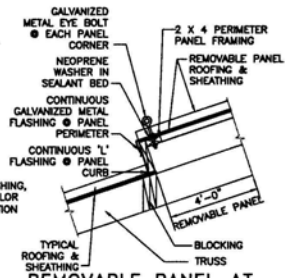

EXT. DOOR JAMB/HEAD AT SCREEN STRUCTURE




SKYLIGHT DETAIL AT SCREEN STRUCTURE

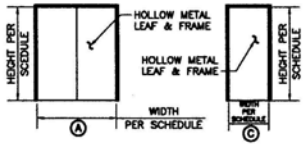



EAVE DETAIL AT SCREEN STRUCTURE




REMOVABLE PANEL AT PUMPBACK STATION

## DOOR TYPES:




## HARDWARE GROUPS:

HARDWARE GROUP A (DOOR #1)

1½ PR. BUTTS – STANLEY FBB191 4½ X 4½ NRP
1 EA. LOCKSET – BEST 35H7F15H630
1 EA. CLOSER – NORTON 7501BF
1 EA. THRESHOLD – PEMKO 2005AS
1 EA. KICKPLATE – HAGER 190S, 10" X 32"
1 EA. WEATHERSTRIP – PEMKO S88D
1 EA. DOOR BOTTOM – PEMKO 411ARL

HARDWARE GROUP B (DOOR #2)

1½ PR. BUTTS – STANLEY FBB191 4½ X 4½ NRP
1 EA. EXIT DEVICE – VON DUPRIN 990TP
1 EA. CLOSER – NORTON 7501BF
1 EA. THRESHOLD – PEMKO 2005AS
1 EA. KICKPLATE – HAGER 190S, 10" X 32"
1 EA. WEATHERSTRIP – PEMKO S88D
1 EA. DOOR BOTTOM – PEMKO 411ARL

HARDWARE GROUP C (PAIR DOORS #3)

4 PR. BUTTS – STANLEY FBB191 4½ X 4½ NRP
1 EA. LOCKSET – BEST 35H7F15H630
2 FLUSH BOLTS BBW 5020-628
1 EA. D.P. STRIKE BBW 5048X-628
1 EA. CLOSER – NORTON 7501BF
1 EA. THRESHOLD – PEMKO 2005AS

## WINDOW TYPES:


### DOOR SCHEDULE

| MARK | DOOR SIZE | DOOR THK. | DOOR MATERIAL | DOOR TYPE | DOOR CLOSER | DOOR FIRE RATING | DOOR FINISH | FRAME MATERIAL | FRAME FINISH | LOCK TYPE | HARDWARE GROUP | COMMENTS/REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3'X7' | 1-¾" | H.M. | B | YES | – | FACTORY | STL | PAINT | – | A | |
| 2 | 3'X7' | 1-¾" | H.M. | B | YES | – | FACTORY | STL | PAINT | – | B | |
| 3 | 6'X9' | 1-¾" | H.M. | A | YES | – | FACTORY | STL | PAINT | – | C | |

### WINDOW SCHEDULE

| MARK | WINDOW SIZE (MASONRY OPENING) WIDTH | HEIGHT | WINDOW TYPE | OPERATION | FRAME | DETAIL | GLAZING | THK. | WINDOW COVERING | COMMENTS/REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| A | 4'-0" | 2'-6" | – | SLIDER | VINYL | – | CLEAR | 3/16 | – | MAX. U=0.60, PROVIDE SCREEN |

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0"—1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| △ | | | |

LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
GENERAL ARCHITECTURAL
NOTES AND DETAILS

JE JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| ColGdn | LN | ASB | 08/04 | 1F-WA-257A-140-38.0 |

SHEET A1 OF 63

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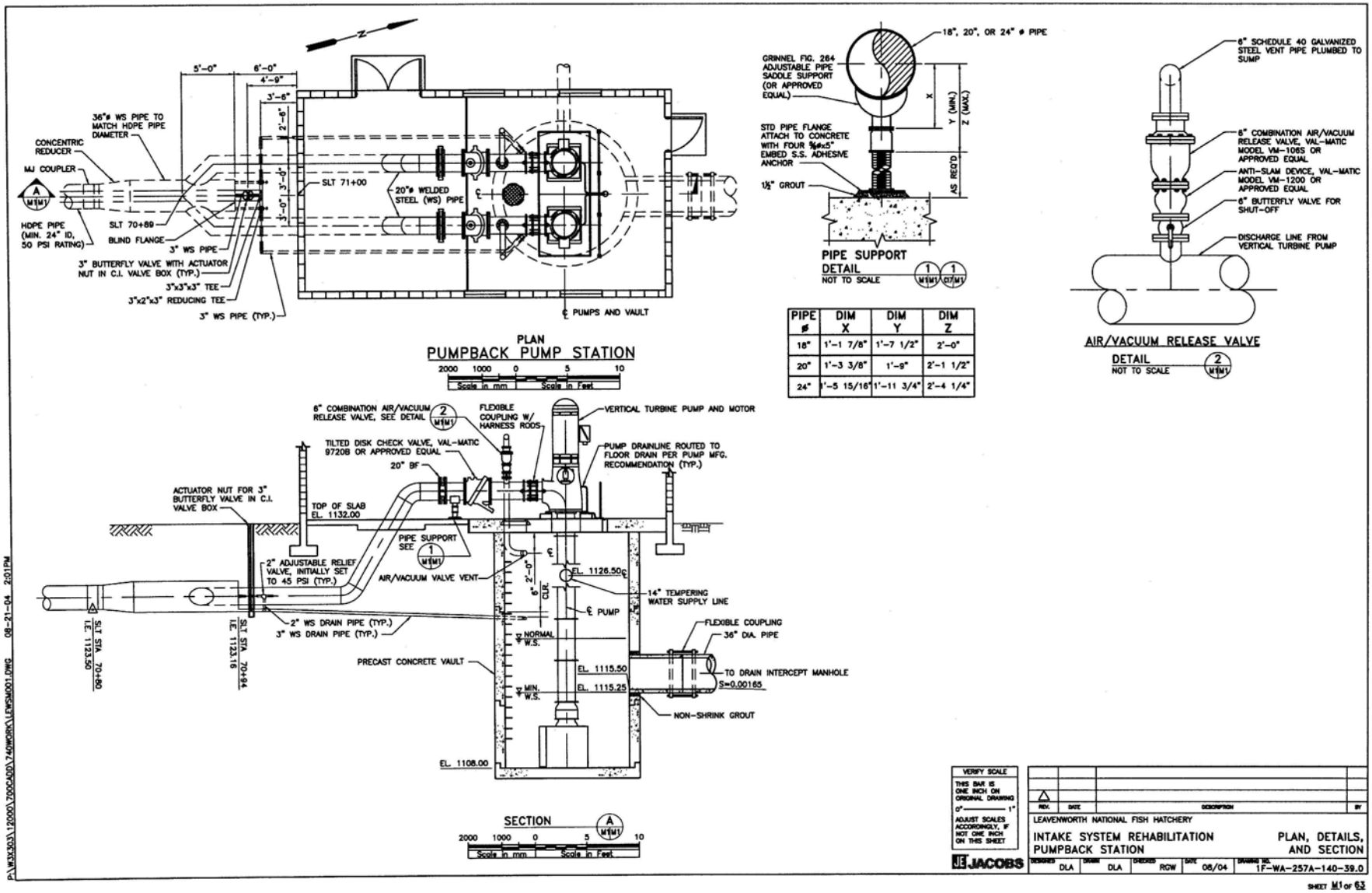
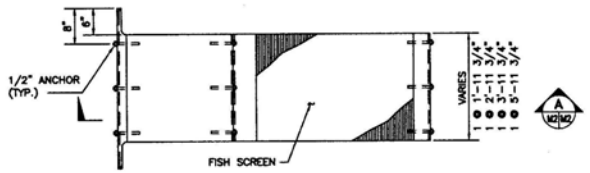
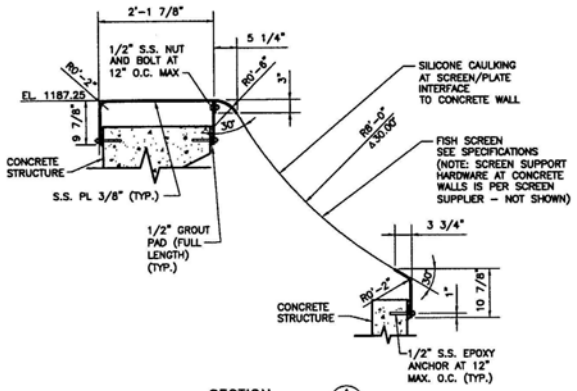



| PIPE ø | DIM X | DIM Y | DIM Z |
|---|---|---|---|
| 18" | 1'-1 7/8" | 1'-7 1/2" | 2'-0" |
| 20" | 1'-3 3/8" | 1'-9" | 2'-1 1/2" |
| 24" | 1'-5 15/16" | 1'-11 3/4" | 2'-4 1/4" |




PLAN




SECTION A M2/M2

FISH SCREEN ASSEMBLY

500 250 0 1 2

Scale in mm | Scale in Feet

NOTE:

FOR INSTALLED LOCATIONS OF FISH SCREENS SEE SHT. S8

P:\W3X330\12000\700CADD\740WORK\LENFSM002.DWG 08-21-04 9:09AM

VERIFY SCALE

THIS BAR IS ONE INCH ON ORIGINAL DRAWING

0" ——— 1"

ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | | |

LEAVENWORTH NATIONAL FISH HATCHERY

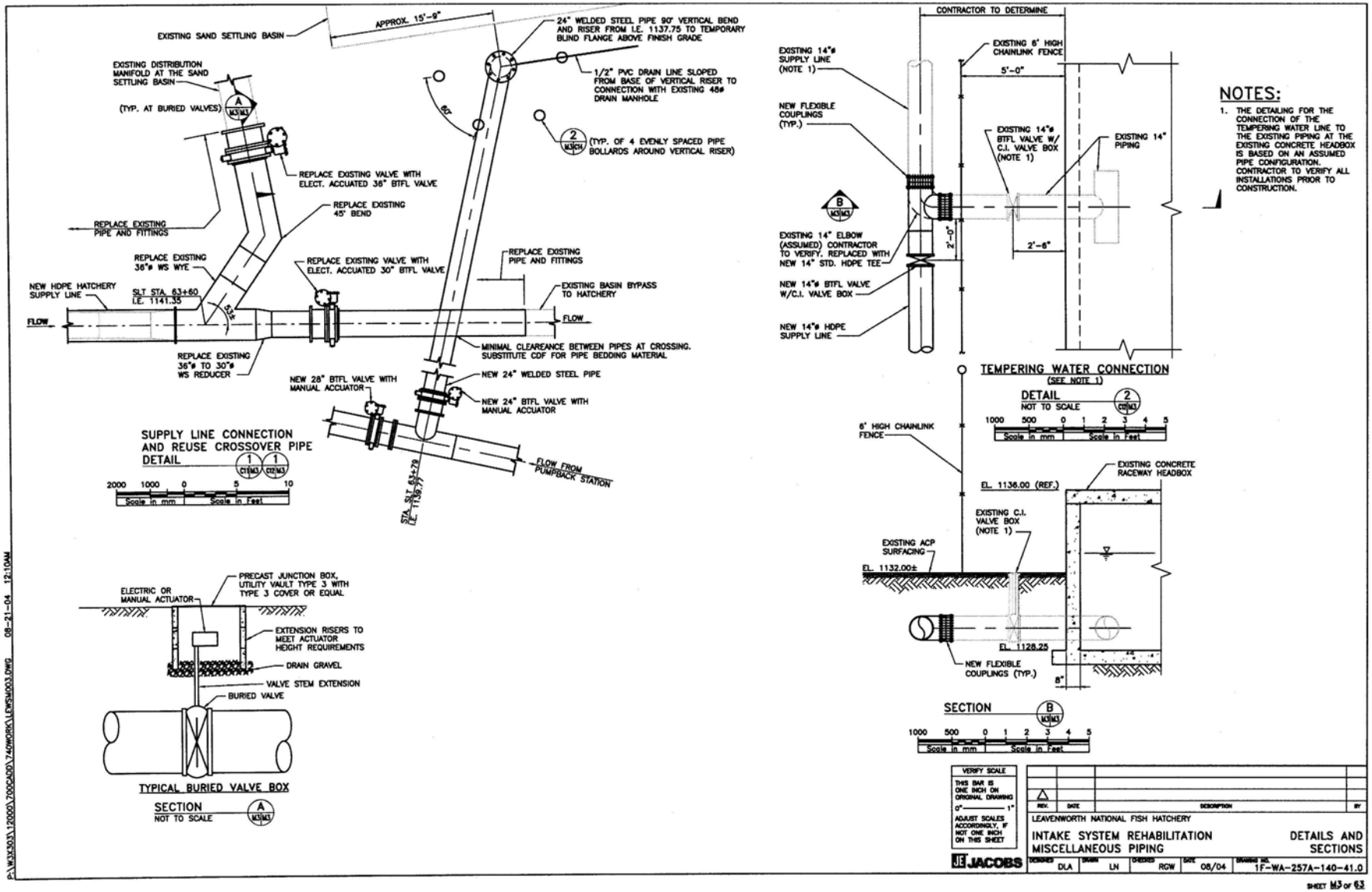
INTAKE SYSTEM REHABILITATION PLAN AND SECTION

COANDA SCREEN

JE JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| DLA | DLA | RGW | 08/04 | 1F-WA-257A-140-40.0 |

SHEET M2 OF 63


EXISTING SAND SETTLING BASIN
APPROX. 15'-9"
24" WELDED STEEL PIPE 90° VERTICAL BEND AND RISER FROM I.E. 1137.75 TO TEMPORARY BLIND FLANGE ABOVE FINISH GRADE
EXISTING DISTRIBUTION MANIFOLD AT THE SAND SETTLING BASIN
(TYP. AT BURIED VALVES)
1/2" PVC DRAIN LINE SLOPED FROM BASE OF VERTICAL RISER TO CONNECTION WITH EXISTING 48ø DRAIN MANHOLE
(TYP. OF 4 EVENLY SPACED PIPE BOLLARDS AROUND VERTICAL RISER)
REPLACE EXISTING VALVE WITH ELECT. ACCUATED 36" BTFL VALVE
REPLACE EXISTING 45° BEND
REPLACE EXISTING PIPE AND FITTINGS
REPLACE EXISTING 36"ø WS WYE
REPLACE EXISTING VALVE WITH ELECT. ACCUATED 30" BTFL VALVE
REPLACE EXISTING PIPE AND FITTINGS
EXISTING BASIN BYPASS TO HATCHERY
NEW HDPE HATCHERY SUPPLY LINE
SLT STA. 63+60
I.E. 1141.35
FLOW
FLOW
REPLACE EXISTING 36"ø TO 30"ø WS REDUCER
MINIMAL CLEARANCE BETWEEN PIPES AT CROSSING. SUBSTITUTE CDF FOR PIPE BEDDING MATERIAL
NEW 28" BTFL VALVE WITH MANUAL ACCUATOR
NEW 24" WELDED STEEL PIPE
NEW 24" BTFL VALVE WITH MANUAL ACCUATOR
FLOW FROM PUMPBACK STATION
STA. SLT 63+79
I.E. 1136.77
SUPPLY LINE CONNECTION AND REUSE CROSSOVER PIPE DETAIL
2000 1000 0 5 10
Scale in mm Scale in Feet
ELECTRIC OR MANUAL ACTUATOR
PRECAST JUNCTION BOX, UTILITY VAULT TYPE 3 WITH TYPE 3 COVER OR EQUAL
EXTENSION RISERS TO MEET ACTUATOR HEIGHT REQUIREMENTS
DRAIN GRAVEL
VALVE STEM EXTENSION
BURIED VALVE
TYPICAL BURIED VALVE BOX
SECTION
NOT TO SCALE
CONTRACTOR TO DETERMINE
EXISTING 14"ø SUPPLY LINE (NOTE 1)
EXISTING 6' HIGH CHAINLINK FENCE
5'-0"
NEW FLEXIBLE COUPLINGS (TYP.)
EXISTING 14"ø BTFL VALVE W/ C.I. VALVE BOX (NOTE 1)
EXISTING 14" PIPING
EXISTING 14" ELBOW (ASSUMED) CONTRACTOR TO VERIFY, REPLACED WITH NEW 14" STD. HDPE TEE
2'-0"
2'-6"
NEW 14"ø BTFL VALVE W/C.I. VALVE BOX
NEW 14"ø HDPE SUPPLY LINE
NOTES:
1. THE DETAILING FOR THE CONNECTION OF THE TEMPERING WATER LINE TO THE EXISTING PIPING AT THE EXISTING CONCRETE HEADBOX IS BASED ON AN ASSUMED PIPE CONFIGURATION. CONTRACTOR TO VERIFY ALL INSTALLATIONS PRIOR TO CONSTRUCTION.
TEMPERING WATER CONNECTION (SEE NOTE 1)
DETAIL
NOT TO SCALE
1000 500 0 1 2 3 4 5
Scale in mm Scale in Feet
6' HIGH CHAINLINK FENCE
EXISTING CONCRETE RACEWAY HEADBOX
EL. 1136.00 (REF.)
EXISTING C.I. VALVE BOX (NOTE 1)
EXISTING ACP SURFACING
EL. 1132.00±
EL. 1128.25
NEW FLEXIBLE COUPLINGS (TYP.)
8"
SECTION
1000 500 0 1 2 3 4 5
Scale in mm Scale in Feet
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
REV. DATE DESCRIPTION BY
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
MISCELLANEOUS PIPING
DETAILS AND SECTIONS
JACOBS
DESIGNED DLA
DRAWN LN
CHECKED RGW
DATE 08/04
DRAWING NO. 1F-WA-257A-140-41.0
SHEET M3 OF 63
P:\W32303\120000\700CAD\740WORK\LEWSM003.DWG 08-21-04 12:10AM

## GATE SCHEDULE

| GATE LOCATION | REF. NO. | TYPE OF GATE | SIZE OF GATE OPENING W" x H" | HEADS IN FT. OF WATER | | | | TYPE OF FRAME | LIFT DEVICE | | GATE INVERT | OPERATOR ELEV. | DRAWING REFERENCE | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MAX. HEAD | | OPER. HEAD | | | TYPE | STEM | | | | |
| | | | | SEAT | UNSEAT | SEAT | UNSEAT | | | | | | | |
| INTAKE SLUICE | G-1 | STAINLESS STEEL | 60x60 | 20 | – | 10 | – | Q, E, P | GEARED OPERATOR | NON-RISING | 1182.0 | 1193.0 | SHT. S3 (PLAN) SHT. S4 (SECTION A) | DUAL STEM WITH SUBMERSIBLE ELECTRIC ACTUATOR |
| INTAKE CANAL | G-2 | STAINLESS STEEL | 48x60 | 20 | – | 10 | – | Q, F, P | GEARED OPERATOR W/ PEDESTAL LIFT | RISING | 1182.0 | 1202.0 | SHT. S3 (PLAN) SHT. S4 (SECTION F) | SUBMERSIBLE ELECTRIC ACTUATOR AND STEM COVER |
| SCREEN BUILDING | G-3 | STAINLESS STEEL | 24x24 | 5 | 5 | 5 | – | Q, E, P | GEARED OPERATOR W/ PEDESTAL LIFT | RISING | 1187.25 | 1198.0 | SHT. S7 (PLAN) | HAND CRANK |
| SCREEN BUILDING | G-4 | STAINLESS STEEL | 36x24 | 5 | 5 | 5 | – | Q, E, P | GEARED OPERATOR W/ PEDESTAL LIFT | RISING | 1187.25 | 1198.0 | SHT. S7 (PLAN) | HAND CRANK |
| SCREEN BUILDING | G-5 | STAINLESS STEEL | 48x24 | 5 | 5 | 5 | – | Q, E, P | GEARED OPERATOR W/ PEDESTAL LIFT | RISING | 1187.25 | 1198.0 | SHT. S7 (PLAN) | HAND CRANK |
| SCREEN BUILDING | G-6 | STAINLESS STEEL | 72x36 | 5 | 5 | 5 | – | Q, E, P | GEARED OPERATOR W/ PEDESTAL LIFT | RISING | 1187.25 | 1198.0 | SHT. S7 (PLAN) | HAND CRANK |
| SCREEN BUILDING | G-7 | STAINLESS STEEL | 36x48 | 20 | 20 | 10 | 10 | Q, F, P | GEARED OPERATOR W/ PEDESTAL LIFT | RISING | 1182.0 | 1198.0 | SHT. S7 (PLAN) | HAND CRANK |
| DRAIN INTERCEPT | G-8 | STAINLESS STEEL | 48x51 | 10 | – | 10 | – | Q, E, P | 2" AWWA NUT | NON-RISING | 1115.25 | 1130.5 | SHT. C16 (SECTION B) | 48" DIA. HALF-ROUND BOTTOM |
| DRAIN INTERCEPT | G-9 | STAINLESS STEEL | 48x87 | 10 | 10 | 10 | – | Q, E, P | 2" AWWA NUT | NON-RISING | 1115.25 | 1130.5 | SHT. C16 (SECTION A) | 48" DIA. HALF-ROUND BOTTOM |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

**LEGEND**
Q = FLUSHBOTTOM SEAL
F = FLATBACK
E = EMBEDDED
P = ULTRA-HIGH MOLECULAR WEIGHT (UHMW) BEARING STRIPS

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VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" ——— 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

JACOBS

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| | | | |

LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
MISCELLANEOUS PIPING
GATE AND VALVE SCHEDULES

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| DLA | LN | RGW | 08/04 | 1F-WA-257A-140-42.0 |

SHEET M4 OF 63

## POWER DISTRIBUTION EQUIPMENT

- T — TRANSFORMER
- MOTOR STARTER
- COMBINATION MOTOR STARTER WITH DISCONNECT SWITCH
- F — DISCONNECT/SAFETY SWITCH–FUSED
- DISCONNECT/SAFETY SWITCH–NONFUSED
- MAGNETIC CONTACTOR
- ENCLOSED CIRCUIT BREAKER
- S — MOTOR AND HORSEPOWER
- M — MOTOR – FRACTIONAL HORSE POWER
- $_M — FRACTIONAL HP MANUAL STARTER
- MSH — MOTOR SPACE HEATER
- CONNECT POINT FOR MECHANICAL OR OTHER EQUIPMENT
- UNIT HEATER CONNECTION
- F — FIRE ALARM PULL STATION

## CONDUIT AND WIRE

- CONDUIT EXPOSED
- CONDUIT CONCEALED IN WALL OR ABOVE CEILING OR EMBEDDED IN CONCRETE OR BELOW GRADE
- EXISTING CONDUCTORS TO BE REMOVED
- CONDUIT TURNING TOWARD VIEWER
- CONDUIT TURNING AWAY FROM VIEWER
- CONDUIT CHANGE IN ELEVATION
- CAPPED CONDUIT
- "LB" CONDUIT BODY FITTING
- "T" CONDUIT BODY FITTING
- CONDUIT PASSING BETWEEN FLOORS
- EMBEDDED CONDUIT STUB–OUT
- J — JUNCTION BOX – INDOOR WITH KNOCKOUTS
- J — JUNCTION BOX – CAST
- LIQUIDTIGHT FLEXIBLE METAL CONDUIT
- WIRES: 3–HOT, 1–NEUTRAL, 2–SWITCHED LEGS, 1–GROUND
- SB1–3 — HOME RUN TO SB–1 CIRCUIT 3
- CALLOUT:
  - EP10–1,3 = PANEL NUMBER EP10, CIRCUITS 1 & 3 OR EQUIPMENT TAG CIRCUIT NUMBER
  - 2#1/0 & #6 G = NUMBER OF WIRES & WIRE SIZE / GROUND SIZE
  - 1½"C. = CONDUIT SIZE

## GROUNDING

- GROUND
- GROUND CONDUCTOR
- GROUND CONNECTION – EXOTHERMIC WELD
- GROUND CONNECTION BOLTED
- GROUND ROD WITH EXOTHERMIC WELD CONNECTION

## FIXTURES AND DEVICES

- FLUORESCENT FIXTURE
- NIGHT LIGHT, FLUORESCENT, UNSWITCHED
- FLUORESCENT OR HID FIXTURE – PENDANT MOUNTED
- EMERGENCY LIGHTING UNIT BATTERY PACK AND TWO LIGHTS (CONNECT UNSWITCHED TO LIGHTING CIRCUIT INDICATED)
- EXIT LIGHT (ARROW AS REQUIRED) – CONNECT UNSWITCHED TO LTG CIRCUIT INDICATED
- $_{5c} / $_{5c} — SUBSCRIPTS: 5 = CIRCUIT 5, c = SWITCH c
- A — FIXTURE TYPE 'A', SEE LUMINAIRE SCHEDULE ON DRAWINGS
- WALL MOUNTED FIXTURE
- POLE MOUNTED FLOOD LIGHTS
- DUPLEX RECEPTACLE 125VAC, 20A, 2P, 3W, NEMA 5–20
- FOUR–PLEX RECEPTACLE 125VAC, 20A, 2P, 3W, NEMA 5–20
- $_{WP}^{4} — SUBSCRIPTS: WP = WEATHER PROOF; GFI = GROUND FAULT INTERRUPTER; 4 = CIRCUIT 4; IG = ISOLATED GROUND; EWC = ELECTRIC WATER COOLER
- $_a — WALL SWITCH, SINGLE POLE 125VAC, 20A. SUBSCRIPTS: a = SWITCH IDENTIFIER; 3 = 3 WAY SWITCH; 4 = 4 WAY SWITCH; K = KEY SWITCH
- LC — LIGHTING CONTACTOR
- CS — CONTROL STATION
- DISTRIBUTION SWITCHBOARD OR PANELBOARD 480V, 3 PHASE
- LIGHTING PANEL BOARD 120/240V, SINGLE – PHASE

## SCHEMATIC DIAGRAM SYMBOLS

- FUSE
- TRANSFORMER, 3 PHASE, DELTA–WYE, GND.
- C — LIGHTING CONTACTOR COIL
- M — MOTOR STARTER COIL
- C M — CONTACT – NORMALLY OPEN, NORMALLY CLOSED; C=CONTACTOR COIL, M=MOTOR COIL
- MOTOR STARTER, COMBINATION, SIZED PER DRAWINGS. 3 POLE CIRCUIT BREAKER, W/THERMAL OVERLOAD ELEMENTS
- CPT — CONTROL POWER TRANSFORMER
- 40A 3P — CIRCUIT BREAKER (40=AMP TRIP RATING, 3=POLES)
- SWITCH – MANUAL
- 3 — SWITCH – 3 WAY TOGGLE TYPE
- M O — SELECTOR SWITCH – HAND–OFF AUTO
- LIGHTNING ARRESTER
- CURRENT TRANSFORMER
- POTENTIAL TRANSFORMER
- M — REVENUE METER
- OL(3) OL — MOTOR OVERLOAD ELEMENT – THREE (3)
- LIMIT SWITCH – NORMALLY OPEN
- T–1 — THERMOSTAT
- J — JUNCTION BOX
- D — LIGHTING FIXTURE – TYPE D
- DM — DAMPER MOTOR
- PILOT LIGHT, G= GREEN LENS, R=RED LENS

## NOTES:

1. ALL CONDUITS SHOWN SHALL BE 3/4", WITH #12 CONDUCTORS, WITH WIRING SHOWN BY TICK MARKS UNLESS OTHERWISE INDICATED.
2. UNDERGROUND CONDUITS SHALL BE AT A MINIMUM REQUIRED DEPTH OF 18" AND A MINIMUM DEPTH OF 24" UNDER VEHICULAR TRAFFIC AREAS.

## ABBREVIATIONS & CONVENTIONS CONT.

| | |
|---|---|
| SW | SWITCH |
| SB | SWITCHBOARD |
| SWGR | SWITCHGEAR |
| TOC | TOP OF CONCRETE |
| TSP | TWISTED, SHIELDED PAIR |
| TYP | TYPICAL |
| UH | UNIT HEATER |
| UL | UNDERWRITER'S LABORATORIES INC. |
| UG | UNDERGROUND |
| V | VOLTS |
| VFD | VARIABLE FREQUENCY DRIVE |
| W | WIRE, WITH, WIDE |
| WD | WIDE |
| W/ | WITH |
| WG | WIRE GAGE |
| WP | WEATHERPROOF |
| XFMR | TRANSFORMER |

## ABBREVIATIONS & CONVENTIONS

| | |
|---|---|
| # | DIAMETER, PHASE |
| @ | AT |
| A, AMPS | AMPERES |
| AF | AMPERE FRAME |
| ABV F.F. | ABOVE FINISH FLOOR |
| AHU | AIR HANDLER UNIT |
| APPRX | APPROXIMATELY |
| AT | AMPERE TRIP |
| ATS | AUTOMATIC TRANSFER SWITCH |
| ATU | AIR TERMINAL UNIT |
| AUX | AUXILIARY |
| AWG | AMERICAN WIRE GAUGE |
| B | BUS |
| BKBD | BACKBOARD |
| BKR | BREAKER |
| BLDG | BUILDING |
| C | CONDUIT |
| CB | CIRCUIT BREAKER |
| CH | CHILLER |
| CHWP | CHILLER WATER PUMP |
| CKT | CIRCUIT |
| CO | COUNTY |
| CONC | CONCRETE |
| CONT | CONTROL, CONTINUED |
| CT | CABLE TRAY, CURRENT TRANSFORMER |
| CTBX | CONTROL TERMINAL BOX |
| CTS | CURRENT TRANSFORMERS |
| CU | COPPER |
| CWP | CONDENSER WATER PUMP |
| DAS | DATA ACQUISITION SYSTEM |
| DS, DISC. SW | DISCONNECT SWITCH |
| DWG | DRAWING |
| EXF | EXHAUST FAN |
| EHH | ELECTRICAL HANDHOLE |
| EL | ELEVATION |
| ELECT | ELECTRICAL |
| EXIST | EXISTING |
| FT | FEET |
| FVR | FULL VOLTAGE REVERSING |
| FVNR | FULL VOLTAGE NON REVERSING |
| G, GND | GROUND |
| GEN | GENERATOR |
| GFI | GROUND FAULT INTERRUPTER |
| H | HIGH |
| HP | HORSEPOWER |
| HSP | HATCHERY SUPPLY PUMP |
| HTR | HEATER |
| ITBX | INSTRUMENT TERMINAL BOX |
| JB | JUNCTION BOX |
| KCM | THOUSAND CIRCULAR MILS |
| KV | KILOVOLT |
| KVA | KILOVOLT AMPERE |
| KW | KILOWATT |
| LA | LIGHTNING ARRESTER |
| LC | LIGHTING CONTACTER |
| LOC'D | LOCATED |
| LT | LIGHT |
| LTG | LIGHTING |
| MB | MAIN BREAKER |
| MCC | MOTOR CONTROL CENTER |
| MCP | MOTOR CIRCUIT PROTECTOR |
| MFG | MANUFACTURER |
| MH | MANHOLE |
| MIN | MINIMUM |
| MISC | MISCELLANEOUS |
| MLO | MAIN LUGS ONLY |
| MS | MOTOR STARTER |
| MSH | MOTOR SPACE HEATER |
| MTD | MOUNTED |
| MTG | MOUNTING |
| MTZ | MOTORIZED |
| NEC | NATIONAL ELECTRICAL CODE |
| NMC | NON METALLIC CONDUIT |
| NP | NAME PLATE |
| NTS | NOT TO SCALE |
| O.C. | ON CENTER |
| P | POLE |
| PB | PUSHBUTTON, PULLBOX |
| PE | PHOTOELECTRIC SENSOR (PHOTOCELL) |
| PH | PHASE |
| PNL | PANEL |
| PTBX | POWER TERMINAL BOX |
| PTS | POTENTIAL TRANSFORMERS |
| PUD | PUBLIC UTILITY DISTRICT |
| PVC | POLYVINYL CHLORIDE CONDUIT SCHEDULE 40 |
| REC, RECEPT | RECEPTACLE |
| RGS | RIGID GALVANIZED STEEL |
| RM | ROOM |
| SCKT | SHORT CIRCUIT CURRENT |
| SF | SUPPLY FAN |
| SCH | SCHEDULE |
| STA | STATION |

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

| REV. | DATE | DESCRIPTION | BY |
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LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
GENERAL ELECTRICAL
NOTES AND SYMBOL LEGEND

JE JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
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| STH | LN | JHM | 08/04 | 1F–WA–257A–140–44.0 |

SHEET E1 OF 63

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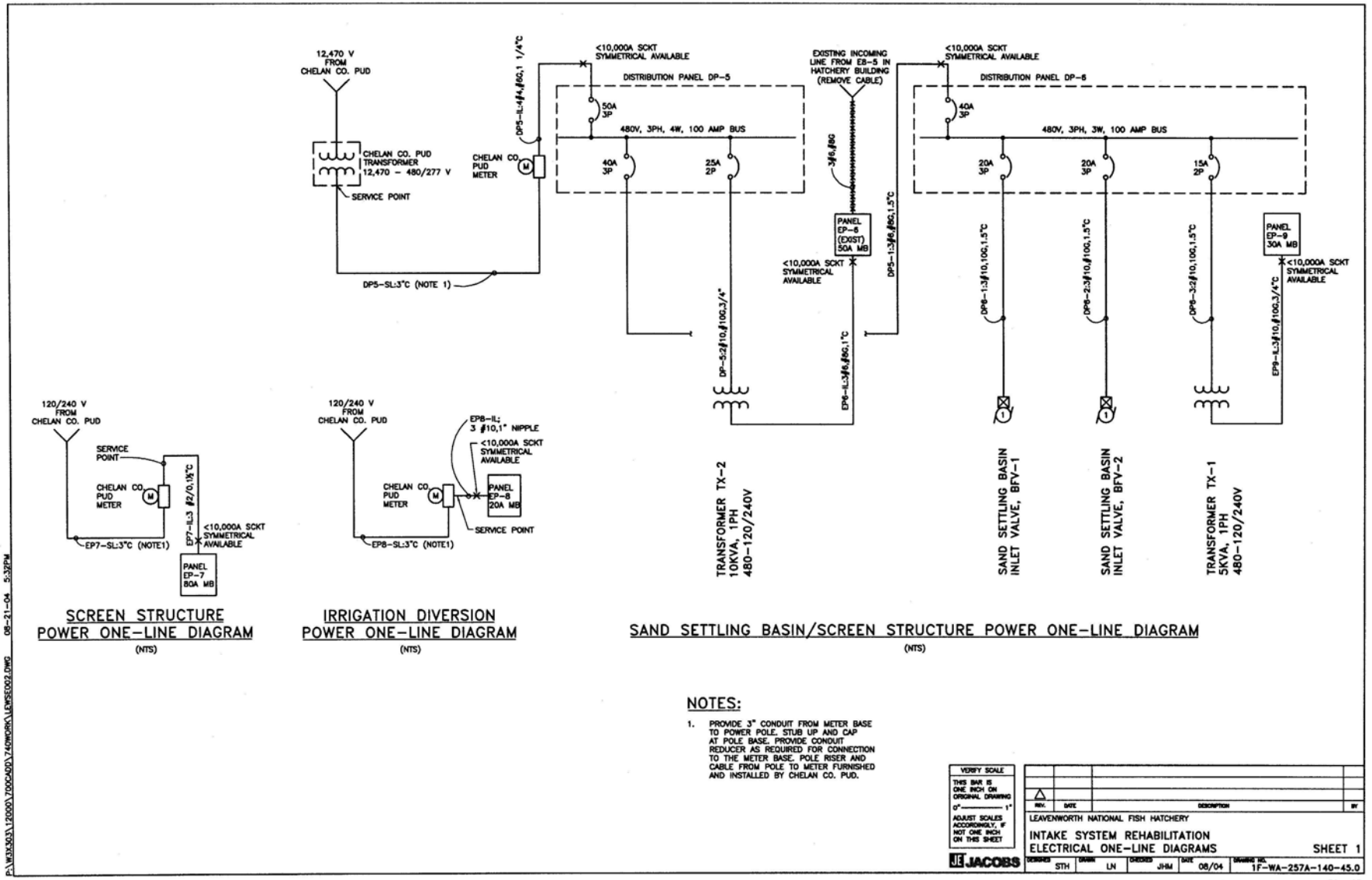


SCREEN STRUCTURE POWER ONE-LINE DIAGRAM
(NTS)

IRRIGATION DIVERSION POWER ONE-LINE DIAGRAM
(NTS)

SAND SETTLING BASIN/SCREEN STRUCTURE POWER ONE-LINE DIAGRAM
(NTS)

NOTES:

1. PROVIDE 3" CONDUIT FROM METER BASE TO POWER POLE. STUB UP AND CAP AT POLE BASE. PROVIDE CONDUIT REDUCER AS REQUIRED FOR CONNECTION TO THE METER BASE. POLE RISER AND CABLE FROM POLE TO METER FURNISHED AND INSTALLED BY CHELAN CO. PUD.

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

JE JACOBS

| REV. | DATE | DESCRIPTION | BY |
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LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
ELECTRICAL ONE-LINE DIAGRAMS SHEET 1

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
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| STH | LN | JHM | 08/04 | 1F-WA-257A-140-45.0 |

SHEET E2 OF 63

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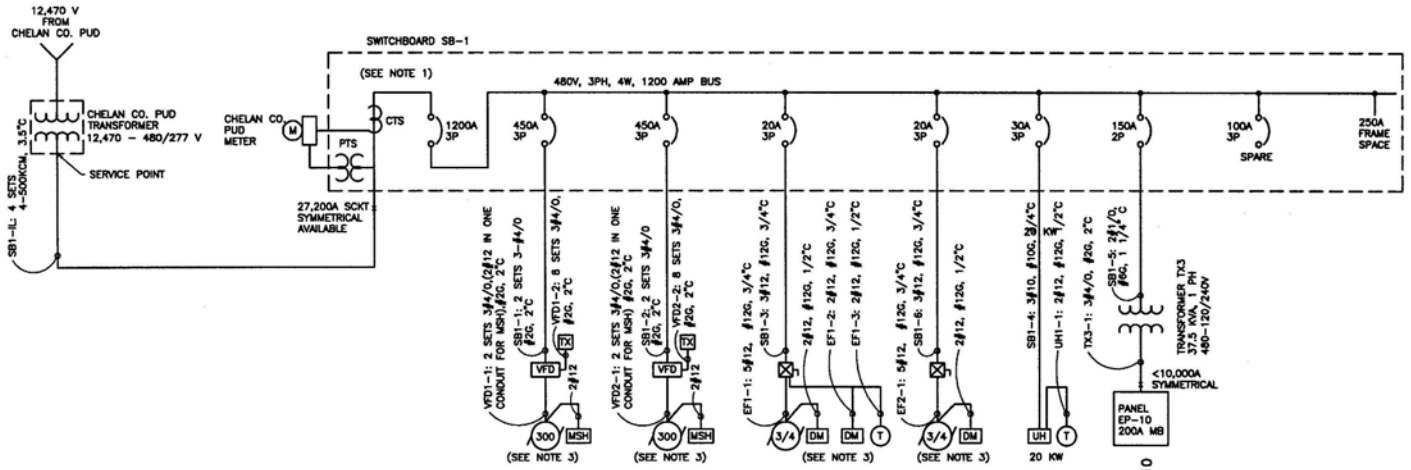


## PUMPBACK STATION POWER ONE-LINE DIAGRAM

(NTS)

## NOTES

1. THE SWITCHBOARD METERING SECTION SHALL BE CONFIGURED PER CHELAN CO. PUD REQUIREMENTS. THE CONTRACTOR SHALL OBTAIN CHELAN CO. PUD'S APPROVAL OF THE SWITCHBOARD SHOP DRAWING PRIOR TO RELEASING FOR MANUFACTURE.
2. SEE INTERCONNECTION DIAGRAMS FOR ADDITIONAL CABLE AND CONDUIT REQUIREMENTS.
3. ONE-LINE DIAGRAMS DO NOT SHOW THE EXACT INTERCONNECTION OF COMPONENTS. THE CONTRACTOR SHALL DETERMINE WIRING INTERCONNCTION AND CONDUIT REQUIREMENT BASED ON THE ACTUAL EQUIPMENT FURNISHED AND FIELD CONDITIONS.

VERIFY SCALE
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0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

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LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
ELECTRICAL ONE-LINE DIAGRAMS SHEET 2

JE JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
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| STH | LN | JHM | 08/04 | 1F-WA-257A-140-46.0 |

SHEET E3 OF 63

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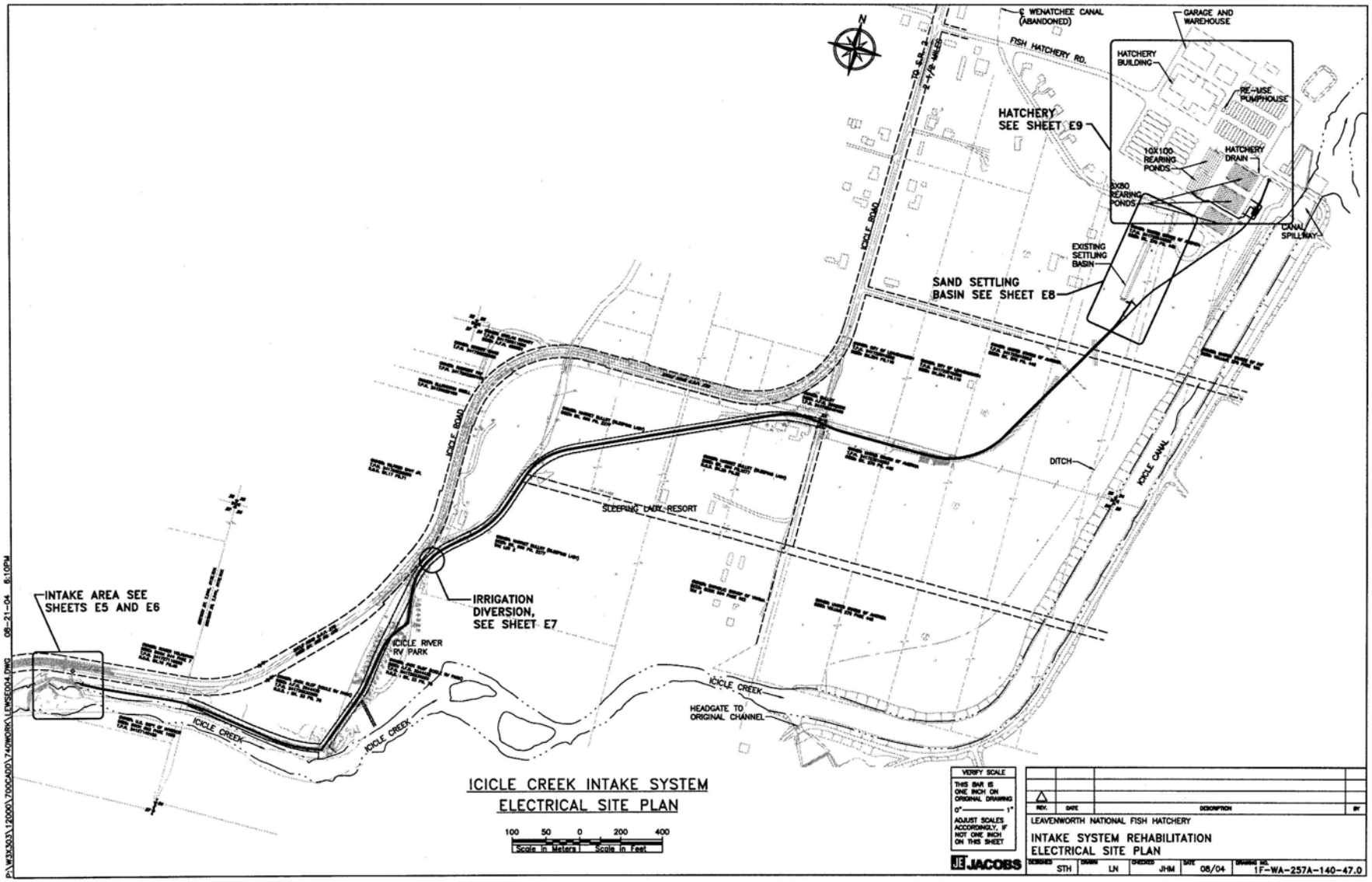
C WENATCHEE CANAL (ABANDONED)
GARAGE AND WAREHOUSE
FISH HATCHERY RD.
HATCHERY BUILDING
RE-USE PUMPHOUSE
HATCHERY SEE SHEET E9
10X100 REARING PONDS
HATCHERY DRAIN
8X80 REARING PONDS
CANAL SPILLWAY
EXISTING SETTLING BASIN
SAND SETTLING BASIN SEE SHEET E8
ICICLE ROAD
DITCH
ICICLE CANAL
SLEEPING LADY RESORT
INTAKE AREA SEE SHEETS E5 AND E6
IRRIGATION DIVERSION, SEE SHEET E7
ICICLE RIVER RV PARK
ICICLE CREEK
HEADGATE TO ORIGINAL CHANNEL
ICICLE CREEK INTAKE SYSTEM
ELECTRICAL SITE PLAN
100 50 0 200 400
Scale in Meters Scale in Feet
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
JE JACOBS
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
ELECTRICAL SITE PLAN
STH LN JHM 08/04
1F-WA-257A-140-47.0
SHEET E4 OF 63
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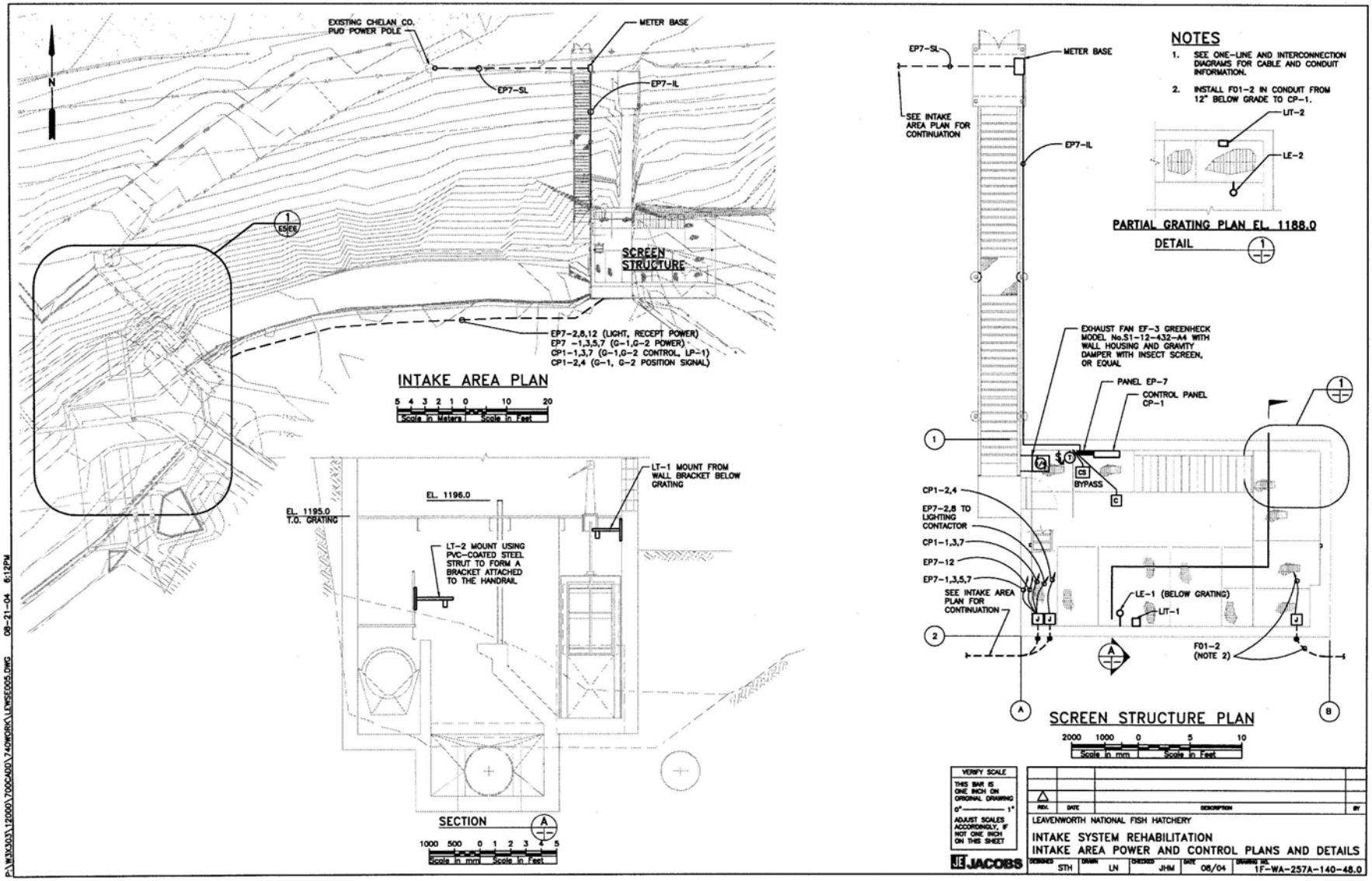
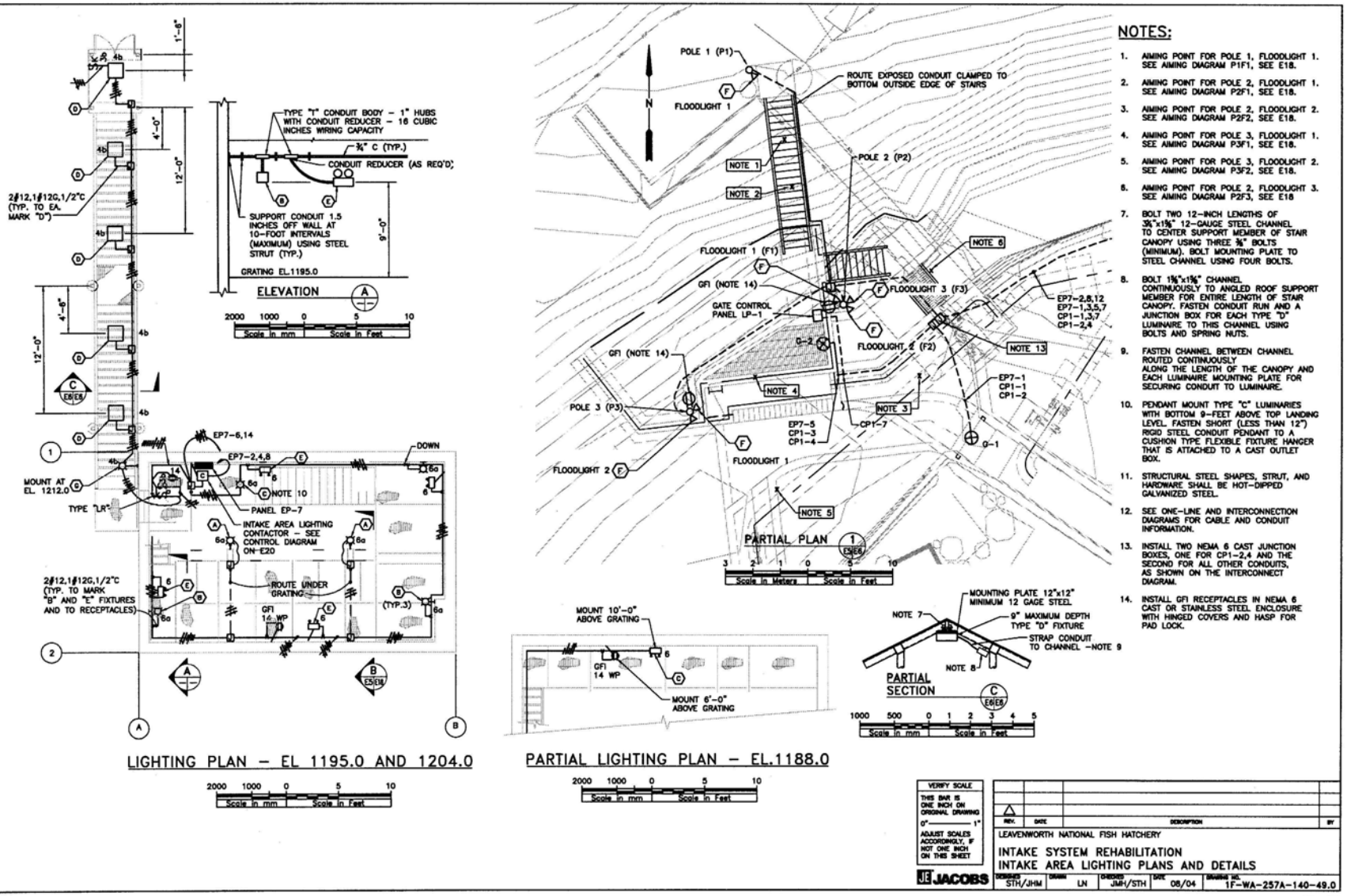
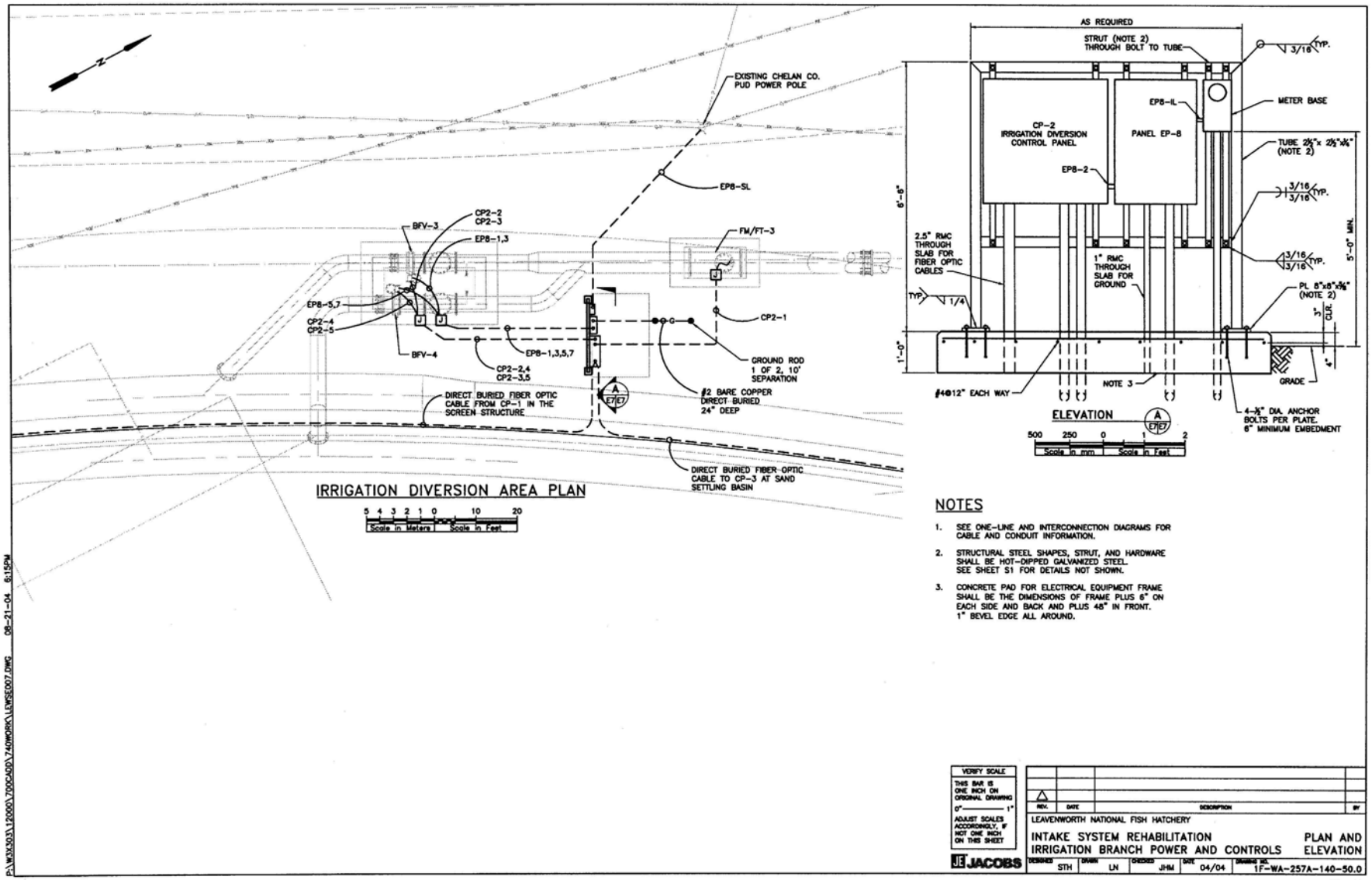
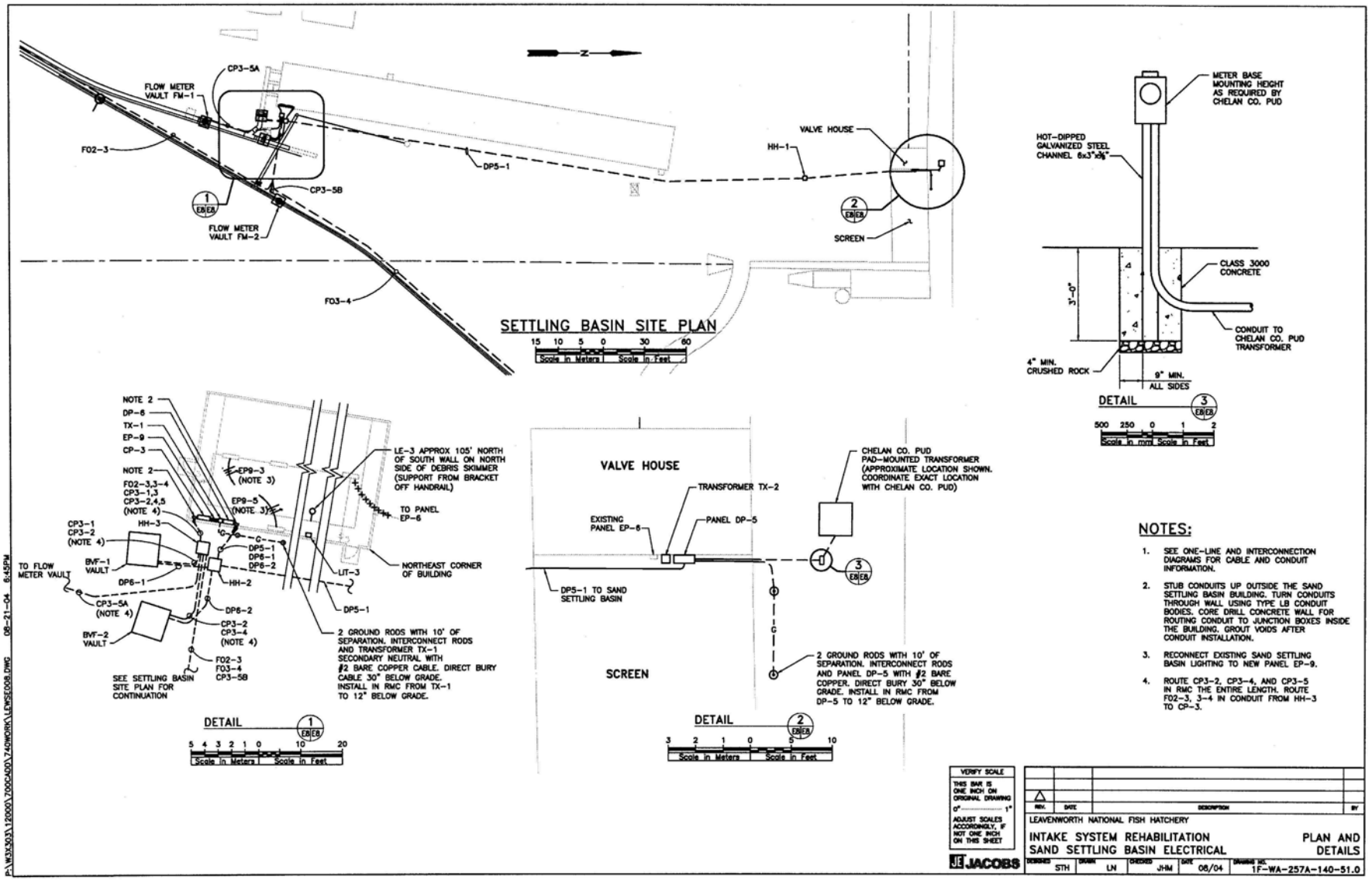

EXISTING CHELAN CO. PUD POWER POLE
METER BASE
EP7-SL
EP7-IL
SCREEN STRUCTURE
EP7-2,8,12 (LIGHT, RECEPT POWER)
EP7 -1,3,5,7 (G-1,G-2 POWER)
CP1-1,3,7 (G-1,G-2 CONTROL, LP-1)
CP1-2,4 (G-1, G-2 POSITION SIGNAL)
INTAKE AREA PLAN
Scale in Meters
Scale in Feet
EL. 1196.0
EL. 1195.0 T.O. GRATING
LT-1 MOUNT FROM WALL BRACKET BELOW GRATING
LT-2 MOUNT USING PVC-COATED STEEL STRUT TO FORM A BRACKET ATTACHED TO THE HANDRAIL
SECTION
Scale in mm
Scale in Feet
SEE INTAKE AREA PLAN FOR CONTINUATION
NOTES
1. SEE ONE-LINE AND INTERCONNECTION DIAGRAMS FOR CABLE AND CONDUIT INFORMATION.
2. INSTALL F01-2 IN CONDUIT FROM 12" BELOW GRADE TO CP-1.
LIT-2
LE-2
PARTIAL GRATING PLAN EL. 1188.0
DETAIL
EXHAUST FAN EF-3 GREENHECK MODEL No.S1-12-432-A4 WITH WALL HOUSING AND GRAVITY DAMPER WITH INSECT SCREEN, OR EQUAL
PANEL EP-7
CONTROL PANEL CP-1
BYPASS
CP1-2,4
EP7-2,8 TO LIGHTING CONTACTOR
CP1-1,3,7
EP7-12
EP7-1,3,5,7
LE-1 (BELOW GRATING)
LIT-1
F01-2 (NOTE 2)
SCREEN STRUCTURE PLAN
Scale in mm
Scale in Feet
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
REV. DATE DESCRIPTION BY
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
INTAKE AREA POWER AND CONTROL PLANS AND DETAILS
JACOBS
DESIGNED STH DRAWN LN CHECKED JHM DATE 08/04
DRAWING NO. 1F-WA-257A-140-48.0
SHEET E5 OF 63
P:\WA3033\12000\700CADD\74DWORK\LENSE005.DWG 08-21-04 6:12PM


NOTES:
1. AIMING POINT FOR POLE 1, FLOODLIGHT 1. SEE AIMING DIAGRAM P1F1, SEE E18.
2. AIMING POINT FOR POLE 2, FLOODLIGHT 1. SEE AIMING DIAGRAM P2F1, SEE E18.
3. AIMING POINT FOR POLE 2, FLOODLIGHT 2. SEE AIMING DIAGRAM P2F2, SEE E18.
4. AIMING POINT FOR POLE 3, FLOODLIGHT 1. SEE AIMING DIAGRAM P3F1, SEE E18.
5. AIMING POINT FOR POLE 3, FLOODLIGHT 2. SEE AIMING DIAGRAM P3F2, SEE E18.
6. AIMING POINT FOR POLE 2, FLOODLIGHT 3. SEE AIMING DIAGRAM P2F3, SEE E18
7. BOLT TWO 12-INCH LENGTHS OF 3⅜"x1⅝" 12-GAUGE STEEL CHANNEL TO CENTER SUPPORT MEMBER OF STAIR CANOPY USING THREE ⅜" BOLTS (MINIMUM). BOLT MOUNTING PLATE TO STEEL CHANNEL USING FOUR BOLTS.
8. BOLT 1⅝"x1⅝" CHANNEL CONTINUOUSLY TO ANGLED ROOF SUPPORT MEMBER FOR ENTIRE LENGTH OF STAIR CANOPY. FASTEN CONDUIT RUN AND A JUNCTION BOX FOR EACH TYPE "D" LUMINAIRE TO THIS CHANNEL USING BOLTS AND SPRING NUTS.
9. FASTEN CHANNEL BETWEEN CHANNEL ROUTED CONTINUOUSLY ALONG THE LENGTH OF THE CANOPY AND EACH LUMINAIRE MOUNTING PLATE FOR SECURING CONDUIT TO LUMINAIRE.
10. PENDANT MOUNT TYPE "C" LUMINARIES WITH BOTTOM 9-FEET ABOVE TOP LANDING LEVEL. FASTEN SHORT (LESS THAN 12") RIGID STEEL CONDUIT PENDANT TO A CUSHION TYPE FLEXIBLE FIXTURE HANGER THAT IS ATTACHED TO A CAST OUTLET BOX.
11. STRUCTURAL STEEL SHAPES, STRUT, AND HARDWARE SHALL BE HOT-DIPPED GALVANIZED STEEL.
12. SEE ONE-LINE AND INTERCONNECTION DIAGRAMS FOR CABLE AND CONDUIT INFORMATION.
13. INSTALL TWO NEMA 6 CAST JUNCTION BOXES, ONE FOR CP1-2,4 AND THE SECOND FOR ALL OTHER CONDUITS, AS SHOWN ON THE INTERCONNECT DIAGRAM.
14. INSTALL GFI RECEPTACLES IN NEMA 6 CAST OR STAINLESS STEEL ENCLOSURE WITH HINGED COVERS AND HASP FOR PAD LOCK.
ELEVATION
PARTIAL PLAN
PARTIAL SECTION
LIGHTING PLAN – EL 1195.0 AND 1204.0
PARTIAL LIGHTING PLAN – EL.1188.0
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
INTAKE AREA LIGHTING PLANS AND DETAILS
JACOBS
1F-WA-257A-140-49.0
SHEET E9 OF 63


EXISTING CHELAN CO. PUD POWER POLE
EP8-SL
BFV-3
CP2-2
CP2-3
EP8-1,3
FM/FT-3
EP8-5,7
CP2-4
CP2-5
BFV-4
CP2-1
EP8-1,3,5,7
CP2-2,4
CP2-3,5
GROUND ROD 1 OF 2, 10' SEPARATION
#2 BARE COPPER DIRECT-BURIED 24" DEEP
DIRECT BURIED FIBER OPTIC CABLE FROM CP-1 IN THE SCREEN STRUCTURE
DIRECT BURIED FIBER OPTIC CABLE TO CP-3 AT SAND SETTLING BASIN
IRRIGATION DIVERSION AREA PLAN
5 4 3 2 1 0 10 20
Scale in Meters Scale in Feet
AS REQUIRED
STRUT (NOTE 2) THROUGH BOLT TO TUBE
3/16 TYP.
METER BASE
EP8-1L
CP-2 IRRIGATION DIVERSION CONTROL PANEL
PANEL EP-8
EP8-2
TUBE 2½"x 2½"x¼" (NOTE 2)
3/16 3/16 TYP.
6'-6"
5'-0" MIN.
2.5" RMC THROUGH SLAB FOR FIBER OPTIC CABLES
1" RMC THROUGH SLAB FOR GROUND
PL ⅜"x8"x8" (NOTE 2)
TYP 1/4
1'-0"
#4@12" EACH WAY
NOTE 3
GRADE
4-¾" DIA. ANCHOR BOLTS PER PLATE. 6" MINIMUM EMBEDMENT
ELEVATION
500 250 0 1 2
Scale in mm Scale in Feet
NOTES
1. SEE ONE-LINE AND INTERCONNECTION DIAGRAMS FOR CABLE AND CONDUIT INFORMATION.
2. STRUCTURAL STEEL SHAPES, STRUT, AND HARDWARE SHALL BE HOT-DIPPED GALVANIZED STEEL. SEE SHEET S1 FOR DETAILS NOT SHOWN.
3. CONCRETE PAD FOR ELECTRICAL EQUIPMENT FRAME SHALL BE THE DIMENSIONS OF FRAME PLUS 6" ON EACH SIDE AND BACK AND PLUS 48" IN FRONT. 1" BEVEL EDGE ALL AROUND.
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
REV. DATE DESCRIPTION BY
JACOBS
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
IRRIGATION BRANCH POWER AND CONTROLS
PLAN AND ELEVATION
DESIGNED STH DRAWN LN CHECKED JHM DATE 04/04
DRAWING NO. 1F-WA-257A-140-50.0
SHEET E7 OF 63
P:\WA3031\12000\700CAD\740WORK\LEWSE007.DWG 08-21-04 6:15PM




## NOTES:

1. SEE ONE-LINE AND INTERCONNECTION DIAGRAMS FOR CABLE AND CONDUIT INFORMATION.
2. STUB CONDUITS UP OUTSIDE THE SAND SETTLING BASIN BUILDING. TURN CONDUITS THROUGH WALL USING TYPE LB CONDUIT BODIES. CORE DRILL CONCRETE WALL FOR ROUTING CONDUIT TO JUNCTION BOXES INSIDE THE BUILDING. GROUT VOIDS AFTER CONDUIT INSTALLATION.
3. RECONNECT EXISTING SAND SETTLING BASIN LIGHTING TO NEW PANEL EP-9.
4. ROUTE CP3-2, CP3-4, AND CP3-5 IN RMC THE ENTIRE LENGTH. ROUTE FO2-3, 3-4 IN CONDUIT FROM HH-3 TO CP-3.

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| △ | | | |

LEAVENWORTH NATIONAL FISH HATCHERY

INTAKE SYSTEM REHABILITATION
SAND SETTLING BASIN ELECTRICAL

PLAN AND DETAILS

JE JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| STH | LN | JHM | 08/04 | 1F-WA-257A-140-51.0 |

SHEET E9 OF 63

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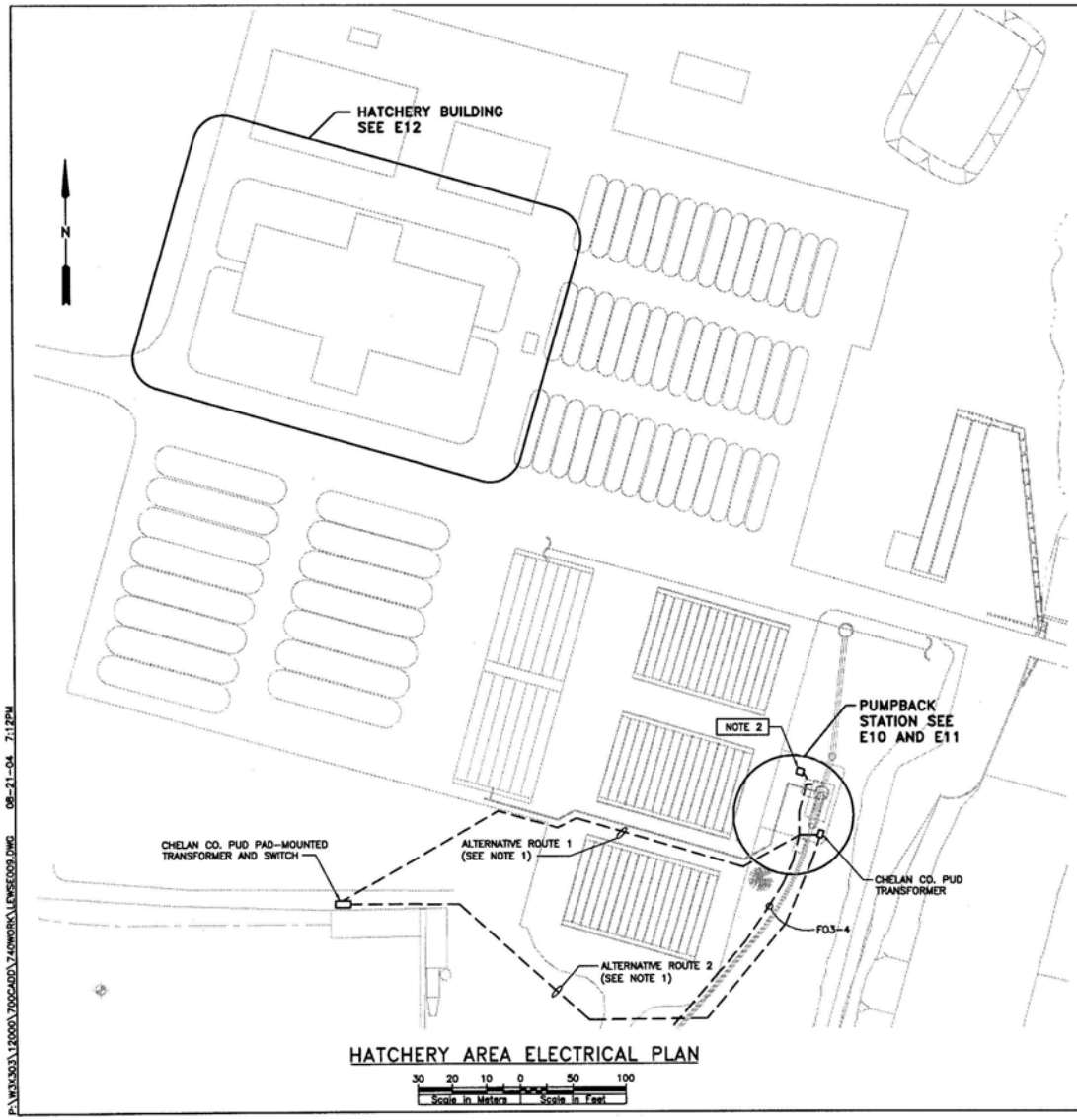


HATCHERY AREA ELECTRICAL PLAN

30 20 10 0 50 100

Scale in Meters | Scale in Feet

## NOTES:

1. PROVIDE TRENCH FOR PRIMARY CONDUIT FROM PAD-MOUNTED SWITCH TO TRANSFORMER AT THE PUMPBACK STATION. TRENCHING AND BACKFILL SHALL BE PER CHELAN CO. PUD REQUIREMENTS. COORDINATE FINAL ROUTE WITH CHELAN CO. PUD AND THE CONTRACTING OFFICER. TWO ALTERNATIVE ROUTES ARE INDICATED.
2. REMOVE EXISTING PANELBOARD AND RECEPTACLES FROM NORTH SIDE OF STORAGE BUILDING TO BE DEMOLISHED TO MAKE ROOM FOR PUMPBACK STATION. PROTECT FOR REINSTALLATION ON PUMPBACK STATION. INTERCEPT EXISTING FEEDER CONDUIT UNDERGROUND AND INSTALL A JUNCTION BOX. PROVIDE 1½" CONDUIT FROM REINSTALLED PANELBOARD TO JUNCTION BOX. SPLICE NEW #1 AND #8 GROUND CONDUCTORS TO EXISTING FEEDER CONDUCTORS IN JUNCTION BOX.

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| △ | | | |

LEAVENWORTH NATIONAL FISH HATCHERY

INTAKE SYSTEM REHABILITATION
HATCHERY ELECTRICAL PLAN

JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| STH | LN | JHM | 08/04 | 1F-WA-257A-140-52.0 |

SHEET E9 OF 63

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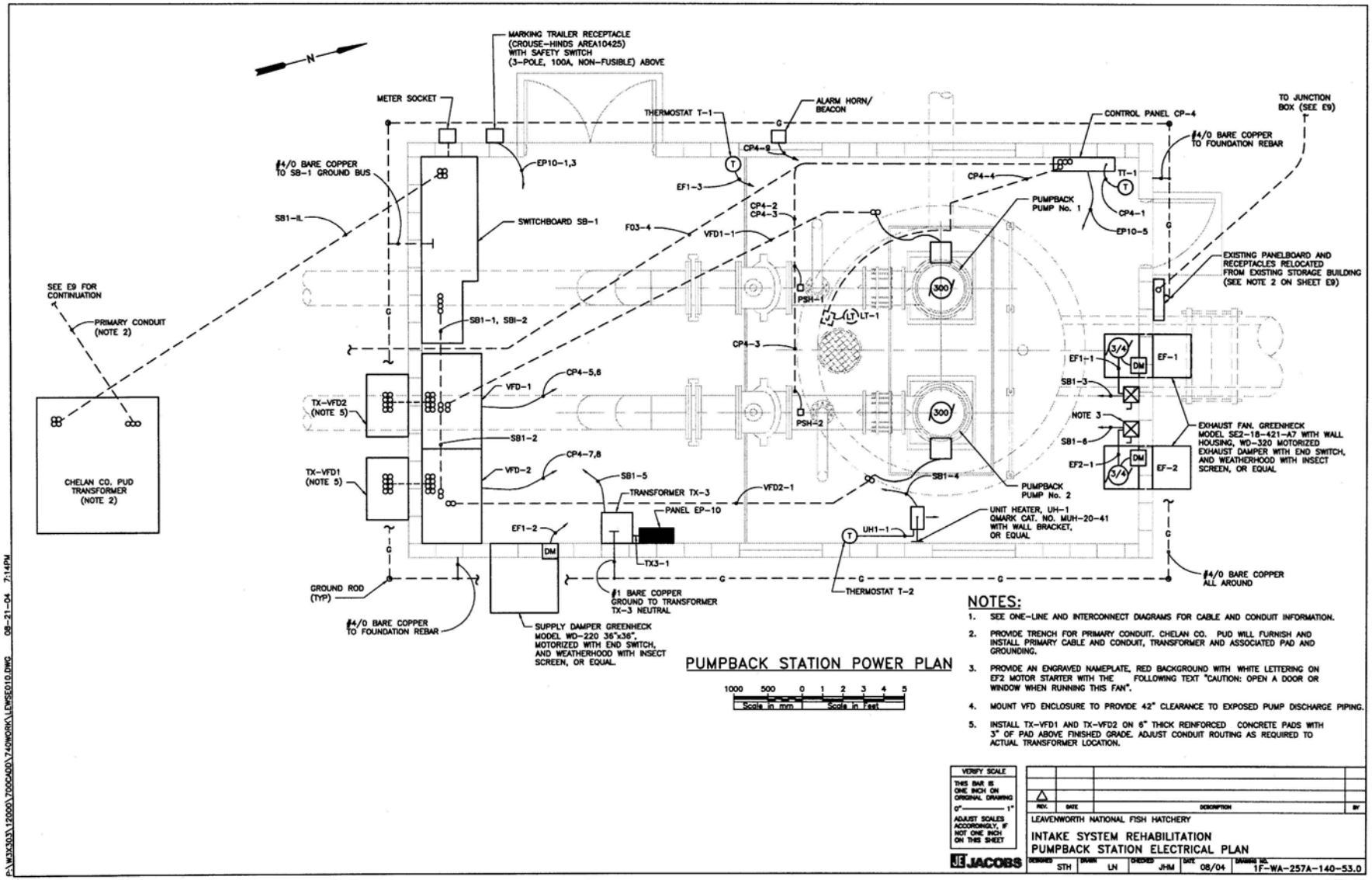


## NOTES:

1. SEE ONE-LINE AND INTERCONNECT DIAGRAMS FOR CABLE AND CONDUIT INFORMATION.
2. PROVIDE TRENCH FOR PRIMARY CONDUIT. CHELAN CO. PUD WILL FURNISH AND INSTALL PRIMARY CABLE AND CONDUIT, TRANSFORMER AND ASSOCIATED PAD AND GROUNDING.
3. PROVIDE AN ENGRAVED NAMEPLATE, RED BACKGROUND WITH WHITE LETTERING ON EF2 MOTOR STARTER WITH THE FOLLOWING TEXT "CAUTION: OPEN A DOOR OR WINDOW WHEN RUNNING THIS FAN".
4. MOUNT VFD ENCLOSURE TO PROVIDE 42" CLEARANCE TO EXPOSED PUMP DISCHARGE PIPING.
5. INSTALL TX-VFD1 AND TX-VFD2 ON 6" THICK REINFORCED CONCRETE PADS WITH 3" OF PAD ABOVE FINISHED GRADE. ADJUST CONDUIT ROUTING AS REQUIRED TO ACTUAL TRANSFORMER LOCATION.

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|

LEAVENWORTH NATIONAL FISH HATCHERY

INTAKE SYSTEM REHABILITATION
PUMPBACK STATION ELECTRICAL PLAN

JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| STH | LN | JHM | 08/04 | 1F-WA-257A-140-53.0 |

SHEET E10 OF 63

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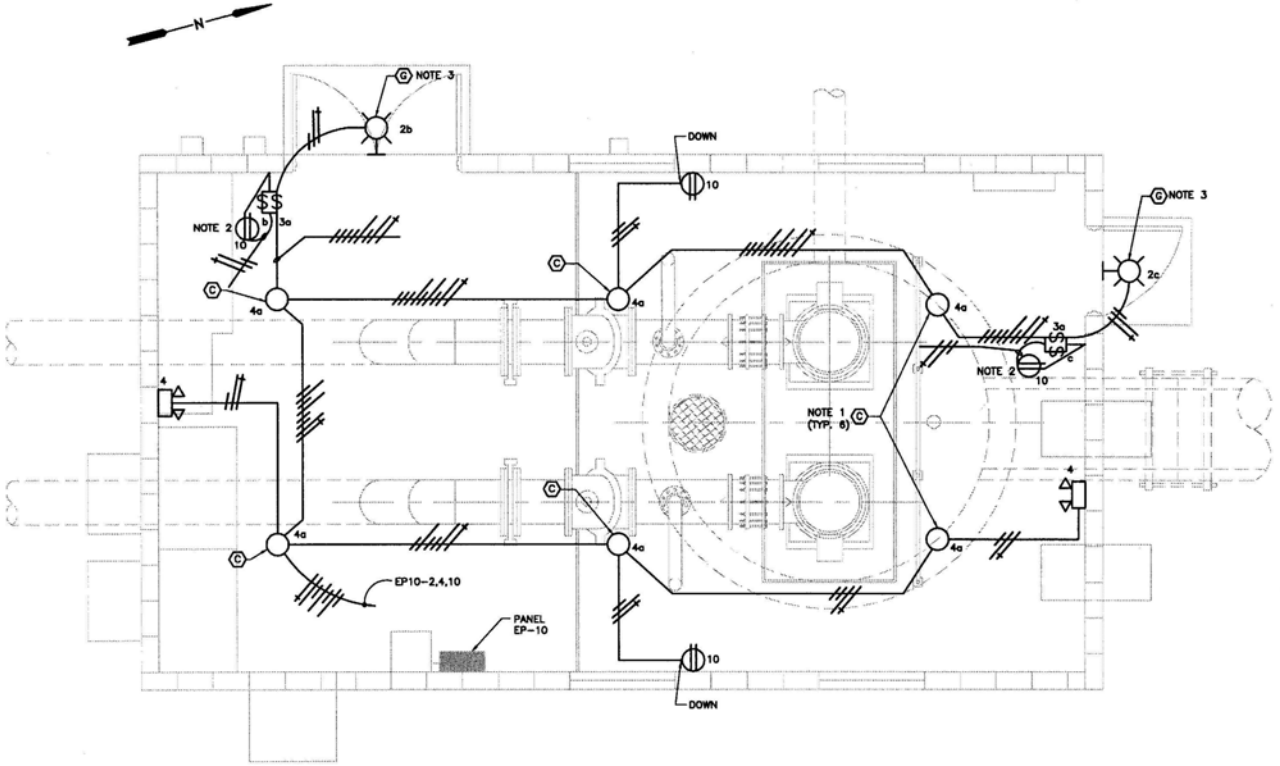


## PUMPBACK STATION LIGHTING PLAN

1000 500 0 1 2 3 4 5
Scale in mm | Scale in Feet

## NOTES

1. PENDANT MOUNT TYPE "C" LUMINARIES WITH BOTTOM 10-FEET ABOVE FINISHED FLOOR LEVEL. FASTEN SHORT (LESS THAN 12-INCH) RIGID STEEL CONDUIT PENDANT TO A CUSHION TYPE FLEXIBLE FIXTURE HANGER THAT IS ATTACHED TO A CAST OUTLET BOX. SUPPORT CAST BOX FROM A STEEL CHANNEL (STRUT) THAT BRIDGES BETWEEN ADJACENT JOINTS.
2. INSTALL SWITCH OUTLETS AND RECEPTACLES IN CAST DEVICE BOXES. RECEPTACLES LOCATED ADJACENT TO DOORS SHALL BE MOUNTED IN A SEPARATE BOX BENEATH THE SWITCH OUTLETS.
3. MOUNT THE TYPE "G" LUMINARES CENTERED OVER THE ENTRY DOORS WITH BOTTOM 10-FEET ABOVE THE CONCRETE PAD FINISHED LEVEL.

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" ——— 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

JE JACOBS

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | | |

LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
PUMPBACK STATION LIGHTING PLAN

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| JHM | LN | STH | 08/04 | 1F-WA-257A-140-54.0 |

SHEET E1 for 63

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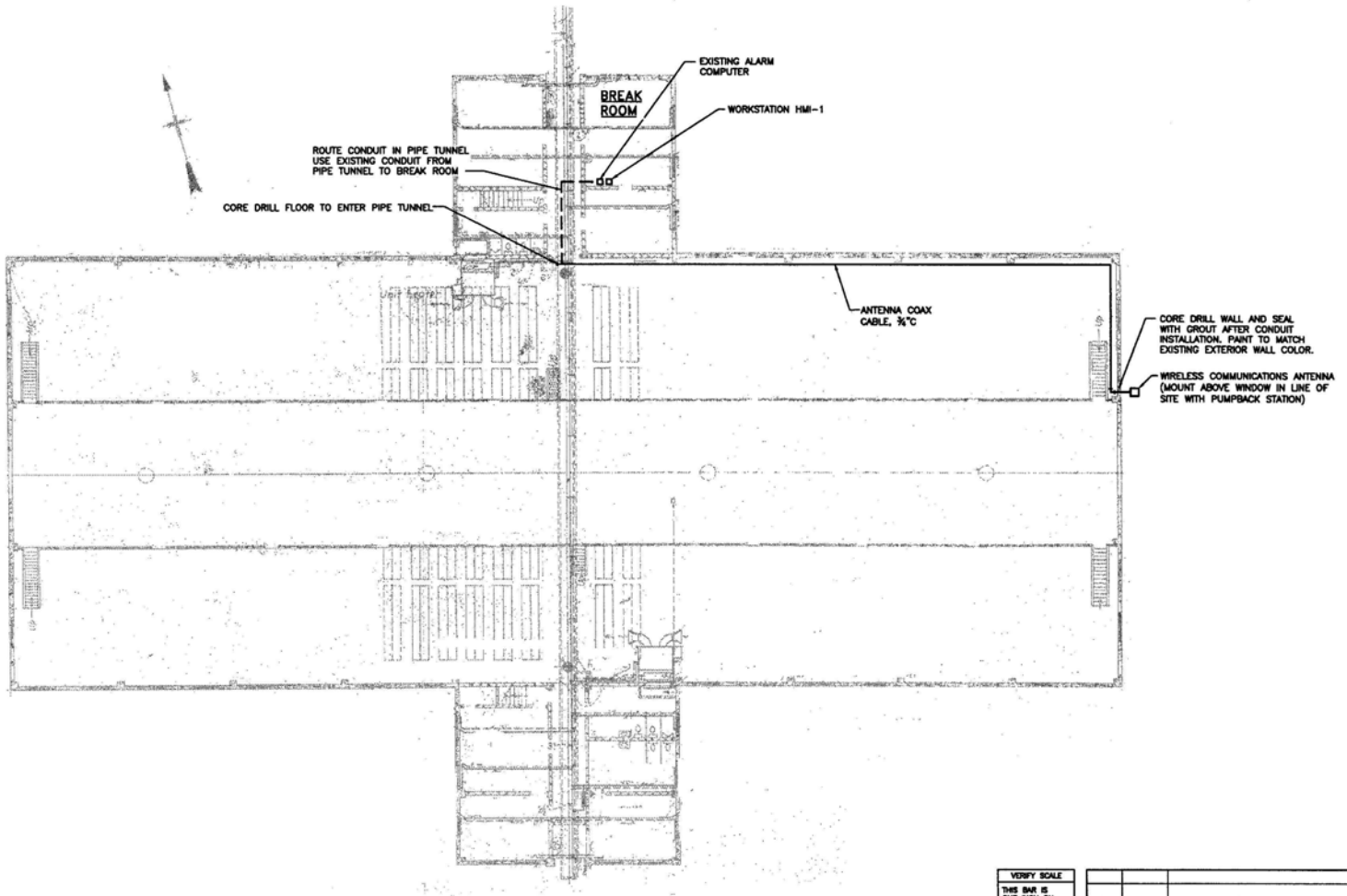


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VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" ——— 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

JACOBS

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | | |

LEAVENWORTH NATIONAL FISH HATCHERY

INTAKE SYSTEM REHABILITATION
HATCHERY BUILDING ELECTRICAL PLAN

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| STH | LN | JHM | 08/04 | 1F-WA-257A-140-55.0 |

SHEET E12 OF 63

## PANEL EP-7 SCHEDULE

LOCATION: SCREENING STRUCTURE INTAKE AREA
MAIN: 2P-80A
FED FROM: CHELAN CO. PUD
MAIN CABLES: 3#2/0
VOLTAGE: 120/240V
BUS RATING: 200A
BUS CONNECTION: 1PH, 3W
PANEL A.I.C. RATING: 14,000
ENCLOSURE TYPE: NEMA 4X STAINLESS STEEL SURFACE

| VOLTAMPS L1 | VOLTAMPS L2 | DESCRIPTION | BREAKER | CODE | CKT NO | CKT NO | CODE | BREAKER | DESCRIPTION | VOLTAMPS L1 | VOLTAMPS L2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1380 | | G-1 SLUICE GATE | 2P-20A | LM | 1 | 2 | L | 1P-20A | LIGHTS - HEAD GATE AREA | 1500 | |
| | 1380 | - | - | LM | 3 | 4 | L | 1P-20A | LIGHTS - OUTDOOR SCREEN BLDG | | 584 |
| 1380 | | G-2 HEAD GATE | 2P-20A | M | 5 | 6 | L | 1P-20A | LIGHTS - INDOOR SCREEN BLDG | 617 | |
| | 1380 | - | - | M | 7 | 8 | L | 1P-20A | LIGHTS - HEAD GATE AREA | | 1500 |
| 667 | | EF-2 EXHAUST FAN | 1P-20A | M | 9 | 10 | | 1P-20A | SPARE | | |
| | 500 | CP-1 SCREEN STRUCT CTRL PNL | 1P-20A | X | 11 | 12 | R | 1P-20A | RECPT - HEAD GATE AREA | | 360 |
| 17 | | INTAKE LEVEL (LIT-1) | 1P-20A | X | 13 | 14 | R | 1P-20A | RECPT - SCREENING BLDG | 540 | |
| | 17 | SCREENED CHAMBER LEVEL (LIT-2) | 1P-20A | X | 15 | 16 | | | SPACE | | |
| | | SPACE | | | 17 | 18 | | | SPACE | | |
| | | SPACE | | | 19 | 20 | | | SPACE | | |
| | | SPACE | | | 21 | 22 | | | SPACE | | |
| | | SPACE | | | 23 | 24 | | | SPACE | | |
| | | SPACE | | | 25 | 26 | | | SPACE | | |
| | | SPACE | | | 27 | 28 | | | SPACE | | |
| | | SPACE | | | 29 | 30 | | | SPACE | | |
| | | SPACE | | | 31 | 32 | | | SPACE | | |
| | | SPACE | | | 33 | 34 | | | SPACE | | |
| | | SPACE | | | 35 | 36 | | | SPACE | | |
| | | SPACE | | | 37 | 38 | | | SPACE | | |
| | | SPACE | | | 39 | 40 | | | SPACE | | |
| | | SPACE | | | 41 | 42 | | | SPACE | | |
| 3444 | 3277 | TOTAL | | | | | | | TOTAL | 2657 | 2424 |

SUBFEED: NONE
CONNECTION TO: NA

SUBFEED LOAD (VA)
L1 = 0
L2 = 0

## PANEL EP-7 DEMAND LOAD CALCULATIONS

| CODE | LOAD | CONNECTED (VA) | CODE DEMAND FACTOR | DEMAND LOAD (VA) |
|---|---|---|---|---|
| S | SUB FEED | 0 | 100% | 0 |
| L | LIGHTING | 4181 | 125% | 5226 |
| R | RECPT <10KVA | 900 | 100% | 900 |
| | >10KVA | 0 | 50% | 0 |
| M | MOTORS ALL | 6187 | 100% | 6187 |
| LM | (LARGEST) | 2760 | 25% | 690 |
| DR | DEDICATED RECPT | 0 | 100% | 0 |
| H | HVAC & MECHANICAL | 0 | 100% | 0 |
| K | KITCHEN | 0 | 100% | 0 |
| X | MISC | 534 | 100% | 534 |
| | TOTAL | 11802 | | 13537 |

| PANEL EP-7 TOTALS | |
|---|---|
| L1 CONNECTED VA | 6101 |
| L2 CONNECTED VA | 5701 |
| PANEL TOTAL CONNECTED VA | 11802 |
| HIGH PHASE AMPS | 50.8 |

## PANEL EP-6 (EXISTING) SCHEDULE

LOCATION: HATCHERY OLD INTAKE SCREEN STRUCTURE
MAIN: BRANCH MOUNTED CB
FED FROM: PANEL DP-5
MAIN CABLES: 3#6
VOLTAGE: 120/240V
BUS RATING: EXISTING
BUS CONNECTION: 1PH, 3W
PANEL A.I.C. RATING: EXISTING
ENCLOSURE TYPE: NEMA 3R

| VOLTAMPS L1 | VOLTAMPS L2 | DESCRIPTION | BREAKER | CODE | CKT NO | CKT NO | CODE | BREAKER | DESCRIPTION | VOLTAMPS L1 | VOLTAMPS L2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MAIN | 2P-50A | | 1 | 2 | LM | 2P-20A | MOTORS | 1900 | |
| | | - | - | | 3 | 4 | LM | - | - | | 1900 |
| 0 | | SPARE | 2P-20A | | 5 | 6 | L | 1P-15A | OLD SCREEN LIGHTS | 600 | |
| | 0 | - | - | | 7 | 8 | R | 1P-20A | OUTLETS | | 360 |
| 0 | | SPARE | 2P-20A | | 9 | 10 | L | 1P-20A | NEW SCREEN LIGHTS | 600 | |
| | 0 | - | - | | 11 | 12 | | 1P-20A | SAND BASIN (RELABEL "SPARE") | | 0 |
| 0 | | SPARE | 2P-30A | | 13 | 14 | X | 1P-20A | VALVE HOUSE | 1000 | |
| | 0 | - | - | | 15 | 16 | | 1P-20A | SPARE | | 0 |
| 0 | 0 | TOTAL | | | | | | | TOTAL | 4100 | 2260 |

SUBFEED: NONE
CONNECTION TO: NA

SUBFEED LOAD (VA)
L1 = 0
L2 = 0

## PANEL EP-6 (EXISTING) DEMAND LOAD CALCULATIONS

| CODE | LOAD | CONNECTED (VA) | CODE DEMAND FACTOR | DEMAND LOAD (VA) |
|---|---|---|---|---|
| S | SUB FEED | 0 | 100% | 0 |
| L | LIGHTING | 1200 | 125% | 1500 |
| R | RECPT <10KVA | 360 | 100% | 360 |
| | >10KVA | 0 | 50% | 0 |
| M | MOTORS ALL | 3800 | 100% | 3800 |
| LM | (LARGEST) | 3800 | 25% | 950 |
| DR | DEDICATED RECPT | 0 | 100% | 0 |
| H | HVAC & MECHANICAL | 0 | 100% | 0 |
| K | KITCHEN | 0 | 100% | 0 |
| X | MISC | 1000 | 100% | 1000 |
| | TOTAL | 6360 | | 7610 |

| PANEL EP-6 TOTALS | |
|---|---|
| L1 CONNECTED VA | 4100 |
| L2 CONNECTED VA | 2260 |
| PANEL TOTAL CONNECTED VA | 6360 |
| HIGH PHASE AMPS | 34.2 |

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

JE JACOBS

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | | |

LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
ELECTRICAL DETAILS
PANELBOARD SCHEDULES SHEET 1

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| STH | LN | JHM | 08/04 | 1F-WA-257A-140-56.0 |

SHEET E13 OF 63

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## PANEL EP-8

LOCATION: IRRIGATION DIVERSION

MAIN: 2P/20 A CB
FED FROM: CHELAN CO. PUD
MAIN CABLES: 3#10

VOLTAGE: 120/240V
BUS RATING: 60A
BUS CONNECTION: 1PH,3W
PANEL A.I.C. RATING: 10,000

ENCLOSURE TYPE: NEMA 4X STAINLESS STEEL SURFACE

| VOLTAMPS L1 | VOLTAMPS L2 | DESCRIPTION | BREAKER | CODE | CKT NO | CKT NO | CODE | BREAKER | DESCRIPTION | VOLTAMPS L1 | VOLTAMPS L2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 333 | | BFV-3 IRRIGATION SUPPLY VALVE | 2P-20A | LM | 1 | 2 | X | 1P-20A | CP-2 IRRIGATION CONTROL PANEL | 500 | |
| | 333 | (CREEK WATER) | – | LM | 3 | 4 | | 1P-20A | SPARE | | |
| 333 | | BFV-4 IRRIGATION SUPPLY VALVE | 2P-20A | M | 5 | 6 | | | SPACE | | |
| | 333 | (PUMP BACK WATER) | – | M | 7 | 8 | | | SPACE | | |
| | | SPACE | | | 9 | 10 | | | SPACE | | |
| | | SPACE | | | 11 | 12 | | | SPACE | | |
| 666 | 666 | TOTAL | | | | | | | TOTAL | 500 | 0 |

SUBFEED: NONE
CONNECTION TO: NA

SUBFEED LOAD (VA)

| | |
|---|---|
| L1 = | 0 |
| L2 = | 0 |

## PANEL EP-8 DEMAND LOAD CALCULATIONS

| CODE | LOAD | CONNECTED (VA) | CODE DEMAND FACTOR | DEMAND LOAD (VA) |
|---|---|---|---|---|
| S | SUB FEED | 0 | 100% | 0 |
| L | LIGHTING | 0 | 125% | 0 |
| R | RECPT <10KVA | 0 | 100% | 0 |
| | >10KVA | 0 | 50% | 0 |
| M | MOTORS ALL | 1332 | 100% | 1332 |
| LM | (LARGEST) | 666 | 25% | 166.5 |
| DR | DEDICATED RECPT | 0 | 100% | 0 |
| H | HVAC & MECHANICAL | 0 | 100% | 0 |
| K | KITCHEN | 0 | 100% | 0 |
| X | MISC | 500 | 100% | 500 |
| | TOTAL | 1832 | | 1998.5 |

| PANEL EP-8 TOTALS | |
|---|---|
| L1 CONNECTED VA | 1166 |
| L2 CONNECTED VA | 666 |
| PANEL TOTAL CONNECTED VA | 1832 |
| HIGH PHASE AMPS | 9.7 |

## PANEL EP-9 SCHEDULE

LOCATION: SAND SETTLING BASIN

MAIN: 2P/30 A CB
FED FROM: PANEL DP-6 VIA T-1
MAIN CABLES: 3#10

VOLTAGE: 120/240V
BUS RATING: 60A
BUS CONNECTION: 1PH,3W
PANEL A.I.C. RATING: 10,000

ENCLOSURE TYPE: NEMA 4X STAINLESS STEEL SURFACE

| VOLTAMPS L1 | VOLTAMPS L2 | DESCRIPTION | BREAKER | CODE | CKT NO | CKT NO | CODE | BREAKER | DESCRIPTION | VOLTAMPS L1 | VOLTAMPS L2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | SPARE | 1P-20A | | 1 | 2 | X | 1P-20A | CP-3 CONTROL PANEL | 500 | |
| | 700 | LIGHTS (CENTER) | 1P-20A | L | 3 | 4 | X | 1P-20A | LEVEL TRANSMITTER (LIT-3) | | 17 |
| 500 | | LIGHTS (EAST WALL) | 1P-20A | L | 5 | 6 | | | SPACE | | |
| | | SPACE | – | | 7 | 8 | | | SPACE | | |
| | | SPACE | – | | 9 | 10 | | | SPACE | | |
| | | SPACE | – | | 11 | 12 | | | SPACE | | |
| 500 | 700 | TOTAL | | | | | | | TOTAL | 500 | 17 |

SUBFEED: NONE
CONNECTION TO: NA

SUBFEED LOAD (VA)

| | |
|---|---|
| L1 = | 0 |
| L2 = | 0 |

## PANEL EP-9 DEMAND LOAD CALCULATIONS

| CODE | LOAD | CONNECTED (VA) | CODE DEMAND FACTOR | DEMAND LOAD (VA) |
|---|---|---|---|---|
| S | SUB FEED | 0 | 100% | 0 |
| L | LIGHTING | 1200 | 125% | 1500 |
| R | RECPT <10KVA | 0 | 100% | 0 |
| | >10KVA | 0 | 50% | 0 |
| M | MOTORS ALL | 0 | 100% | 0 |
| LM | (LARGEST) | 0 | 25% | 0 |
| DR | DEDICATED RECPT | 0 | 100% | 0 |
| H | HVAC & MECHANICAL | 0 | 100% | 0 |
| K | KITCHEN | 0 | 100% | 0 |
| X | MISC | 517 | 100% | 517 |
| | TOTAL | 1717 | | 2017 |

| PANEL EP-9 TOTALS | |
|---|---|
| L1 CONNECTED VA | 1000 |
| L2 CONNECTED VA | 717 |
| PANEL TOTAL CONNECTED VA | 1717 |
| HIGH PHASE AMPS | 8.3 |

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

JACOBS

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| △ | | | |

LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
ELECTRICAL DETAILS
PANELBOARD SCHEDULES SHEET 2

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| STH | LN | JMH | 08/04 | 1F-WA-257A-140-57.0 |

SHEET E14 OF 63

P:\WA3503\12000\700CADD\740WORK\LEWSED14.DWG 08-21-04 7:23PM

## PANEL EP-10 SCHEDULE

LOCATION: PUMPBACK STATION
MAIN: 2P-200A CB
FED FROM: TRANSFORMER TX-3
MAIN CABLES: 3#4/0
VOLTAGE: 120/240V
BUS RATING: 200A
BUS CONNECTION: 1PH,3W
PANEL A.I.C. RATING: 14,000
ENCLOSURE TYPE: NEMA 1 SURFACE

| VOLTAMPS L1 | VOLTAMPS L2 | DESCRIPTION | BREAKER | CODE | CKT NO | CKT NO | CODE | BREAKER | DESCRIPTION | VOLTAMPS L1 | VOLTAMPS L2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9500 | | MARKING TRAILER RECEPT | 2P-100A | X | 1 | 2 | L | 1P-20A | LIGHTS - OUTDOOR | 280 | |
| | 9500 | - | - | X | 3 | 4 | L | 1P-20A | LIGHTS-INDOOR | | 1066 |
| 500 | | CP-4 PUMP BACK STA CTRL PNL | 1P-20A | X | 5 | 6 | | 1P-20A | SPARE | | |
| | | SPACE | | | 7 | 8 | | 1P-20A | SPARE | | |
| | | SPACE | | | 9 | 10 | R | 1P-20A | RECPT - INDOOR | 720 | |
| | | SPACE | | | 11 | 12 | | | SPACE | | |
| | | SPACE | | | 13 | 14 | | | SPACE | | |
| | | SPACE | | | 15 | 16 | | | SPACE | | |
| | | SPACE | | | 17 | 18 | | | SPACE | | |
| | | SPACE | | | 19 | 20 | | | SPACE | | |
| | | SPACE | | | 21 | 22 | | | SPACE | | |
| | | SPACE | | | 23 | 24 | | | SPACE | | |
| | | SPACE | | | 25 | 26 | | | SPACE | | |
| | | SPACE | | | 27 | 28 | | | SPACE | | |
| | | SPACE | | | 29 | 30 | | | SPACE | | |
| | | SPACE | | | 31 | 32 | | | SPACE | | |
| | | SPACE | | | 33 | 34 | | | SPACE | | |
| | | SPACE | | | 35 | 36 | | | SPACE | | |
| | | SPACE | | | 37 | 38 | | | SPACE | | |
| | | SPACE | | | 39 | 40 | | | SPACE | | |
| | | SPACE | | | 41 | 42 | | | SPACE | | |
| 10100 | 9600 | TOTAL | | | | | | | TOTAL | 1000 | 1066 |

SUBFEED: NONE
CONNECTION TO: NA

SUBFEED LOAD (VA)
L1 = 0
L2 = 0

## PANEL EP-10 DEMAND LOAD CALCULATIONS

| CODE | LOAD | CONNECTED (VA) | CODE DEMAND FACTOR | DEMAND LOAD (VA) |
|---|---|---|---|---|
| S | SUB FEED | 0 | 100% | 0 |
| L | LIGHTING | 1348 | 125% | 1662.5 |
| R | RECPT <10KVA | 720 | 100% | 720 |
| | >10KVA | 0 | 50% | 0 |
| M | MOTORS ALL | 0 | 100% | 0 |
| LM | (LARGEST) | 0 | 25% | 0 |
| DR | DEDICATED RECPT | 0 | 100% | 0 |
| H | HVAC & MECHANICAL | 0 | 100% | 0 |
| K | KITCHEN | 0 | 100% | 0 |
| X | MISC | 19700 | 100% | 19700 |
| | TOTAL | 21766 | | 22102.5 |

## PANEL EP10 TOTALS

| | |
|---|---|
| L1 CONNECTED VA | 11100 |
| L2 CONNECTED VA | 10666 |
| PANEL TOTAL CONNECTED VA | 21766 |
| | |
| HIGH PHASE AMPS | 92.5 |

## LUMINAIRE SCHEDULE

| FIXTURE TYPE (MARK) | FIXTURE DESCRIPTION / MOUNTING | FIXTURE MOUNTING HEIGHT | LAMP TYPE / DESIGNATION | LAMP NUMBER | LAMP WATTAGE | BALLAST TYPE | BALLAST VOLTAGE | MANUFACTURER/ CATALOG NO. (OR APPROVED EQUAL) | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| A | SEALED REFRACTOR UNIT WITH SYMMETRICAL DISTRIBUTION / RIGID STEEL PENDANT (12" OR LESS) | PER SECTION B ON E18 | COMPACT FLUORESCENT / TRIPLE TUBE: 4 PIN BASE | 4 | 42PL | ELECTRONIC HIGH POWER FACTOR | 120 | WIDELITE / CL5CF-442R120-LMP(27K); IP65; F1; PND-RC-SA | UL 1598 DAMP LOCATION LISTED - CORD CONNECTED - SUITABLE FOR OPERATION AT -10 F |
| B | WALLPACK / SURFACE | 9-FEET ABOVE FLOOR OR GRATING | COMPACT FLUORESCENT / DOUBLE TUBE: 4 PIN BASE | 1 | 26PL | MAGNETIC HIGH POWER FACTOR | 120 | HOLOPHANE / WP2B-26QFL-12 -GR-F1; | UL 1598 WET LOCATION LISTED - SUITABLE FOR OPERATION AT -10 F |
| C | SEALED REFRACTOR UNIT WITH SYMMETRICAL DISTRIBUTION / RIGID STEEL PENDANT (12" OR LESS) | AS NOTED ON PLANS | COMPACT FLUORESCENT / TRIPLE TUBE: 4 PIN BASE | 4 | 42PL | ELECTRONIC HIGH POWER FACTOR | 120 | WIDELITE / CL5CF-442R120-LMP(27K);IP65;F 1; PND-RC-SA | UL 1598 DAMP LOCATION LISTED - SUITABLE FOR OPERATION AT -10 F |
| D | SEALED REFRACTOR UNIT WITH RECTANGULAR DISTRIBUTION / SURFACE | APPROX 7'-6" ABOVE STAIRS OR LANDING | COMPACT FLUORESCENT / TRIPLE TUBE: 4 PIN BASE | 2 | 42PL | ELECTRONIC HIGH POWER FACTOR | 120 | WIDELITE / SPCF-242-R-120 V-LMP;F1;TS-SA | UL 1598 DAMP LOCATION LISTED - SUITABLE FOR OPERATION AT -10 F |
| E | EMERGENCY EGRESS 12-VOLT UNIT / SURFACE | 9'-0" TO CENTER | PAR 36 HALOGEN SEALED BEAM - 12 VOLT | 2 | 18 | N/A | 120 | McPHILBEN / ES12L50W-SD-F1 -PRWE (2 HEADS) | MAINTENANCE FREE LEAD CALCIUM BATTERY |
| F | FLOODLIGHT / POLE | EL 1214.0 | T-3 TUNGSTEN-HALOGEN / Q500T3/CL | 1 | 500 | N/A | 120 | STONCO / EQX500L | UL 1598 WET LOCATION LISTED - DIE-CAST ALUMINUM HOUSING |
| G | WALLPACK / SURFACE | AS NOTED ON PLANS | HIGH PRESSURE SODIUM - CLEAR / S54SB-100 | 1 | 100 | MAGNETIC HIGH POWER FACTOR | 120 | HOLOPHANE / WL2K-100HP-12-BZ-F1;WL2KPR12 | UL 1598 WET LOCATION LISTED - DIE-CAST ALUMINUM HOUSING W/ PHOTOCONTROL |

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" ——— 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

JE JACOBS

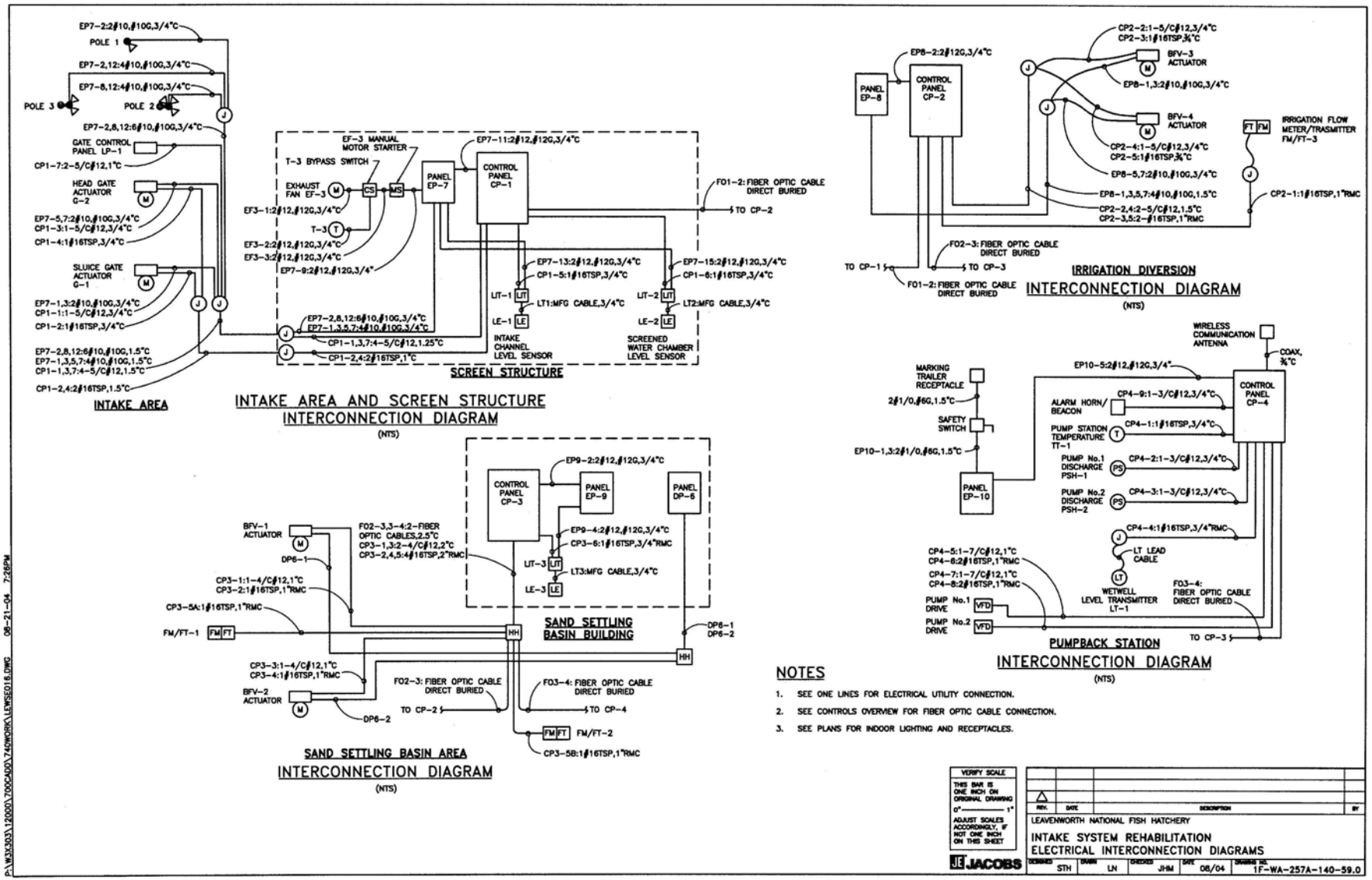
| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|

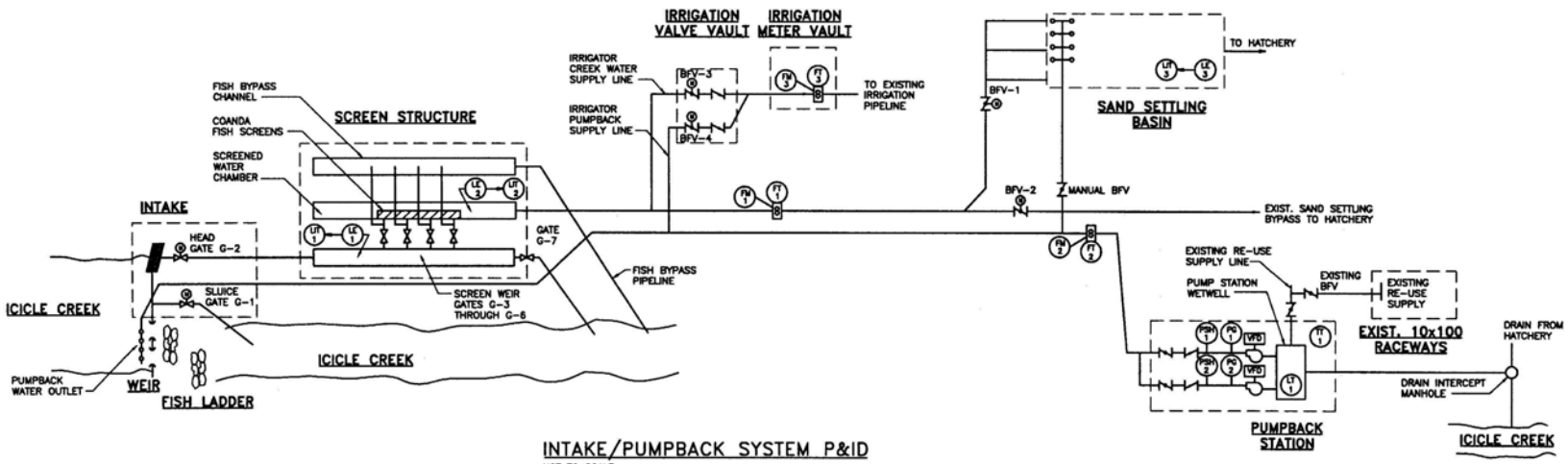
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
ELECTRICAL DETAILS
PANELBOARD AND LUMINAIRE SCHEDULES SHEET 3

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| STH | LN | JHM | 08/04 | 1F-WA-257A-140-58.0 |

SHEET E15 OF 63

P:\W3X303\12000\700CADD\740WORK\LEWSE015.DWG 08-21-04 7:25PM


INTAKE AREA
SCREEN STRUCTURE
INTAKE AREA AND SCREEN STRUCTURE INTERCONNECTION DIAGRAM
(NTS)
SAND SETTLING BASIN AREA
INTERCONNECTION DIAGRAM
(NTS)
IRRIGATION DIVERSION
INTERCONNECTION DIAGRAM
(NTS)
PUMPBACK STATION
INTERCONNECTION DIAGRAM
(NTS)
NOTES
1. SEE ONE LINES FOR ELECTRICAL UTILITY CONNECTION.
2. SEE CONTROLS OVERVIEW FOR FIBER OPTIC CABLE CONNECTION.
3. SEE PLANS FOR INDOOR LIGHTING AND RECEPTACLES.
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
ELECTRICAL INTERCONNECTION DIAGRAMS
1F-WA-257A-140-59.0
JE JACOBS




## INTAKE/PUMPBACK SYSTEM P&ID

NOT TO SCALE

**INSTRUMENT DEVICE SCHEDULE**

| TAG NUMBER | SERVICE | LOCATION | DESCRIPTION | CALIBRATED RANGE OR SCALE | NOTES |
|---|---|---|---|---|---|
| FM-1 | HATCHERY CREEK WATER SUPPLY | VAULT ADJACENT TO SAND SETTLING BASIN | PROPELLER FLOW METER | 0-54 CFS | |
| FM-2 | PUMPBACK STATION DISCHARGE | VAULT ADJACENT TO SAND SETTLING BASIN | PROPELLER FLOW METER | 0-42 CFS | |
| FM-3 | IRRIGATION SUPPLY LINE | IRRIGATION METER VAULT | PROPELLER FLOW METER | 0-15 CFS | |
| FT-1 | HATCHERY CREEK WATER SUPPLY | VAULT ADJACENT TO SAND SETTLING BASIN | PROPELLER FLOW METER TRANSMITTER | 4-20 MA | |
| FT-2 | PUMPBACK STATION DISCHARGE | VAULT ADJACENT TO SAND SETTLING BASIN | PROPELLER FLOW METER TRANSMITTER | 4-20 MA | |
| FT-3 | IRRIGATION SUPPLY LINE | IRRIGATION METER VAULT | PROPELLER FLOW METER TRANSMITTER | 4-20 MA | |
| LE/LIT-1 | SCREEN STRUCTURE INTAKE WATER LEVEL | SCREEN STRUCTURE INTAKE WATER CHANNEL | ULTRASONIC LEVEL TRANSMITTER | 4MA = 0 FT<br>20MA = 8 FT | |
| LE/LIT-2 | SCREENED WATER LEVEL | SCREEN STRUCTURE SCREENED WATER CHAMBER | ULTRASONIC LEVEL TRANSMITTER | 4MA = 0 FT<br>20MA = 11 FT | |
| LE/LIT-3 | SAND SETTLING BASIN WATER LEVEL | SAND SETTLING BASIN BUILDING | ULTRASONIC LEVEL TRANSMITTER | 4MA = 0 FT<br>20MA = 12 FT | |
| LT-1 | PUMPBACK PUMP LOW WETWELL LEVEL SHUTDOWN | PUMPBACK STATION WETWELL | SUBMERSIBLE LEVEL PRESSURE TRANSDUCER/TRANSMITTER | 4MA = 0 FT<br>20MA = 25 FT | |
| PG-1 | PUMP NO. 1 DISCHARGE PRESSURE | PUMP NO. 1 DISCHARGE PIPING | PRESSURE GAUGE | 0-100 PSIG | |
| PG-2 | PUMP NO. 2 DISCHARGE PRESSURE | PUMP NO. 2 DISCHARGE PIPING | PRESSURE GAUGE | 0-100 PSIG | |
| PSH-1 | PUMP NO. 1 HIGH DISCHARGE PRESSURE SHUTDOWN | PUMP NO. 1 DISCHARGE PIPING | PRESSURE SWITCH | CLOSE AT 100 PSI INCREASING | |
| PSH-2 | PUMP NO. 2 HIGH DISCHARGE PRESSURE SHUTDOWN | PUMP NO. 2 DISCHARGE PIPING | PRESSURE SWITCH | CLOSE AT 100 PSI INCREASING | |
| TT-1 | PUMPBACK STATION INSIDE TEMPERATURE | PUMPBACK STATION | TEMPERATURE TRANSMITTER | 4MA = 0 °F<br>20MA = 122 °F | |

**INSTRUMENT TAG NUMBER IDENTIFICATION LETTER LEGEND**

| LETTER | FIRST LETTER: MEASURED OR INDICATING VARIABLE | SUCCEEDING LETTER(S): FUNCTION |
|---|---|---|
| A | | ALARM |
| C | | CONTROL |
| D | DENSITY, DIFFERENTIAL | |
| E | | ELEMENT |
| F | FLOW | |
| G | | GAUGE |
| H | | HIGH |
| I | | INDICATING |
| L | LEVEL | LOW |
| M | | METER |
| P | PRESSURE | |
| S | | SWITCH, SENSOR |
| T | TEMPERATURE | TRANSMITTER |
| V | VIBRATION | |
| W | WEIGHT | |

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" ——— 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

JACOBS

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|

LEAVENWORTH NATIONAL FISH HATCHERY

INTAKE SYSTEM REHABILITATION — PROCESS AND ELECTRICAL DETAILS — INSTRUMENTATION DIAGRAM

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| SHT | LN | JHM | 08/04 | 1F-WA-257A-140-60.0 |

SHEET E17 OF 63

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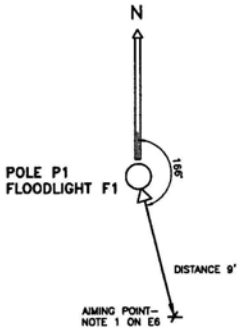
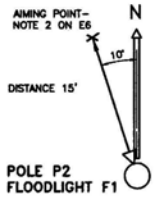



AIMING DIAGRAM P1F1
NTS

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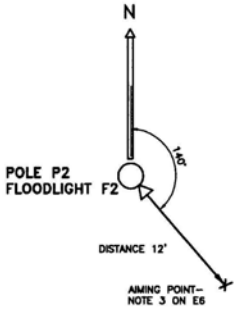


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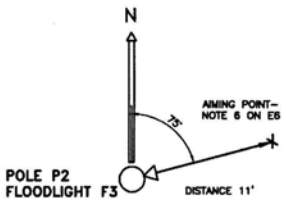


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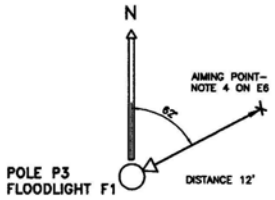


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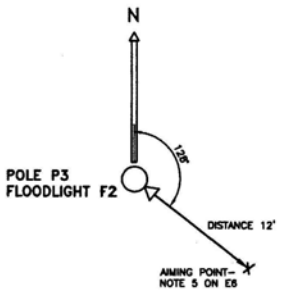


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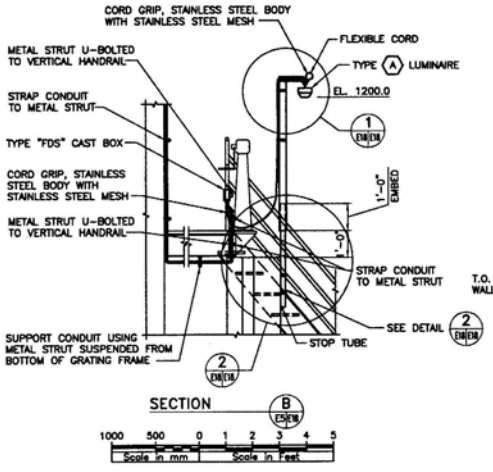


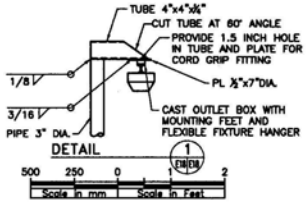


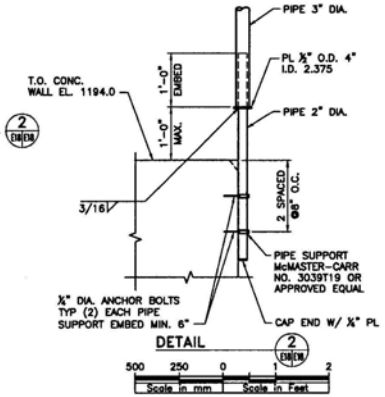


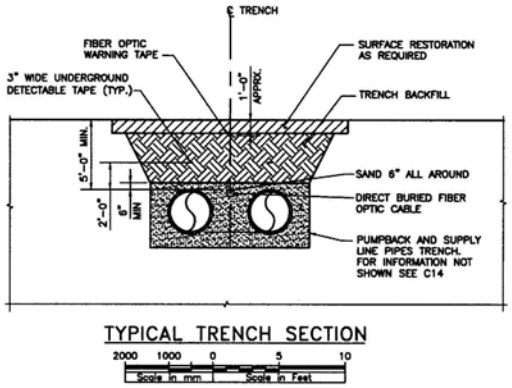


TYPICAL TRENCH SECTION
2000 1000 0 5 10
Scale in mm
Scale in Feet

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|

LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION — DETAILS
ELECTRICAL PLANS

JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| STH/JHM | LN | JHM/STH | 08/04 | 1F-WA-257A140-61.0 |

SHEET E18 OF 63

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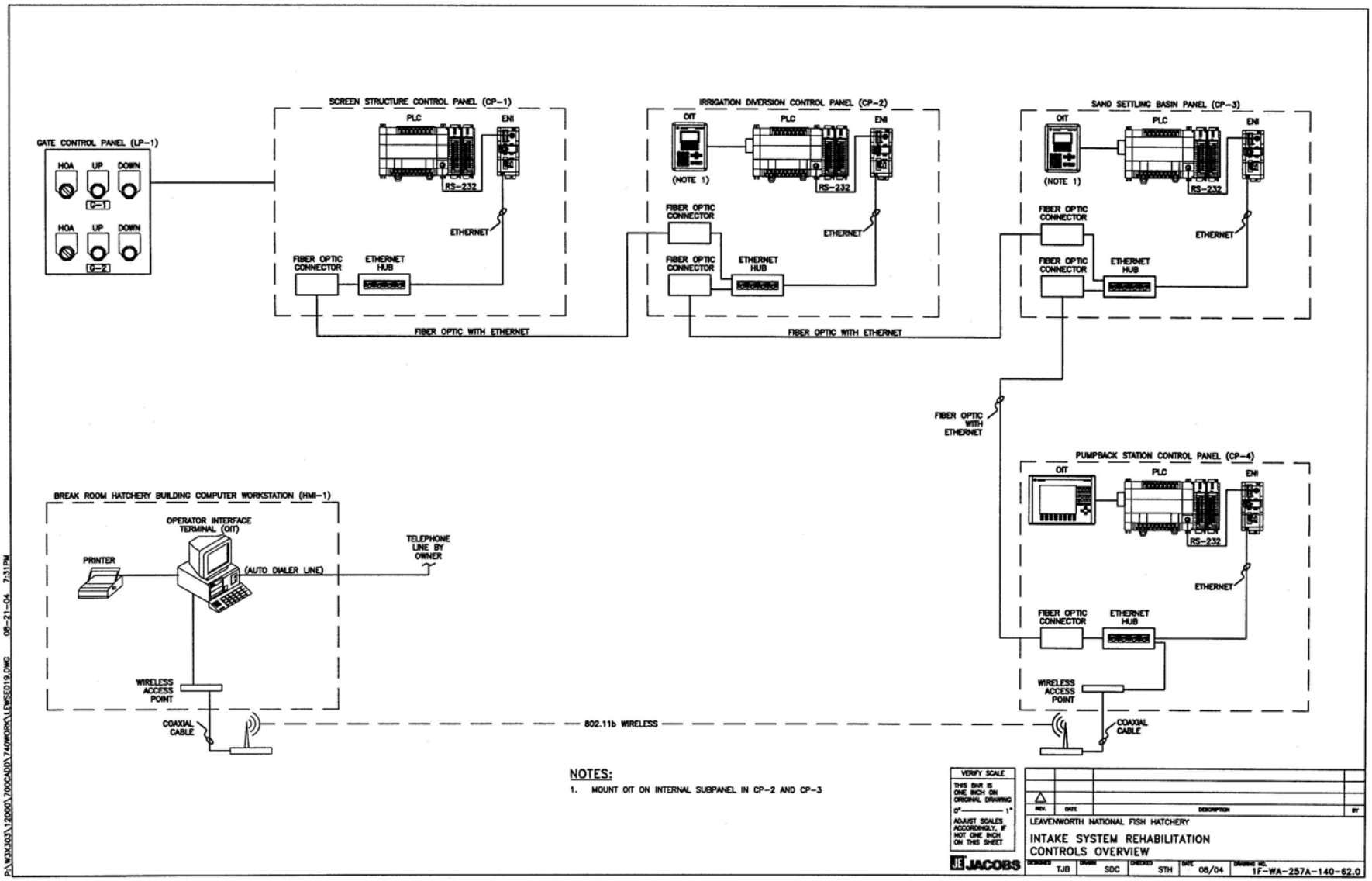
GATE CONTROL PANEL (LP-1)
HOA
UP
DOWN
G-1
HOA
UP
DOWN
G-2
SCREEN STRUCTURE CONTROL PANEL (CP-1)
PLC
ENI
RS-232
ETHERNET
FIBER OPTIC CONNECTOR
ETHERNET HUB
IRRIGATION DIVERSION CONTROL PANEL (CP-2)
OIT
(NOTE 1)
PLC
ENI
RS-232
ETHERNET
FIBER OPTIC CONNECTOR
FIBER OPTIC CONNECTOR
ETHERNET HUB
SAND SETTLING BASIN PANEL (CP-3)
OIT
(NOTE 1)
PLC
ENI
RS-232
ETHERNET
FIBER OPTIC CONNECTOR
FIBER OPTIC CONNECTOR
ETHERNET HUB
FIBER OPTIC WITH ETHERNET
FIBER OPTIC WITH ETHERNET
FIBER OPTIC WITH ETHERNET
PUMPBACK STATION CONTROL PANEL (CP-4)
OIT
PLC
ENI
RS-232
ETHERNET
FIBER OPTIC CONNECTOR
ETHERNET HUB
WIRELESS ACCESS POINT
COAXIAL CABLE
BREAK ROOM HATCHERY BUILDING COMPUTER WORKSTATION (HMI-1)
OPERATOR INTERFACE TERMINAL (OIT)
PRINTER
(AUTO DIALER LINE)
TELEPHONE LINE BY OWNER
WIRELESS ACCESS POINT
COAXIAL CABLE
802.11b WIRELESS
NOTES:
1. MOUNT OIT ON INTERNAL SUBPANEL IN CP-2 AND CP-3
VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET
JE JACOBS
REV. DATE DESCRIPTION BY
LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION
CONTROLS OVERVIEW
DESIGNED TJB
DRAWN SDC
CHECKED STH
DATE 08/04
DRAWING NO. 1F-WA-257A-140-62.0
SHEET E19 OF 63
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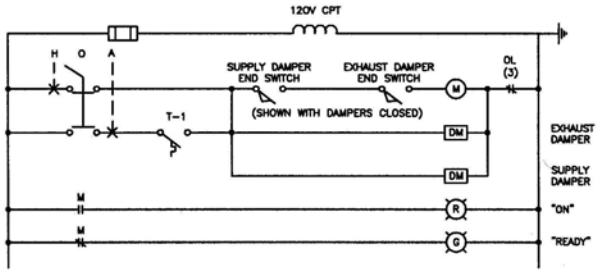
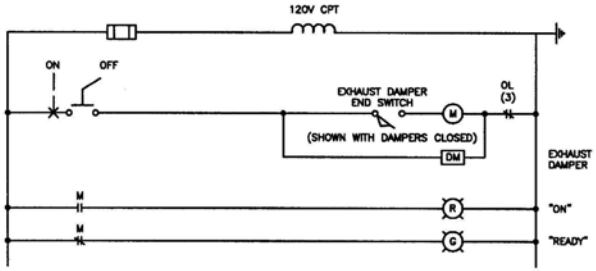
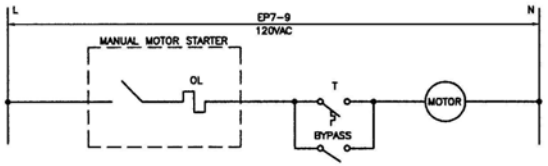


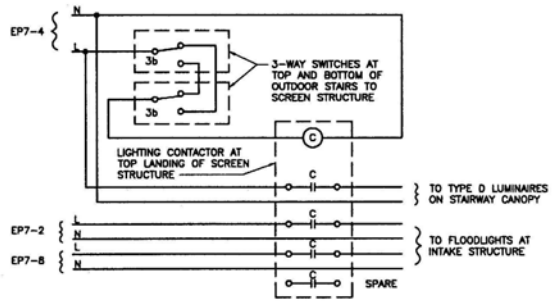

EXHAUST FAN EF-1
(PUMPBACK STATION)




EXHAUST FAN EF-2
(PUMPBACK STATION)




EXHAUST FAN EF-3
(SCREEN STRUCTURE)




FLOODLIGHT CONTROL DIAGRAM

P:\WA3503\120000\700CADD\740WORK\LEWSED20.DWG 08-21-04 7:33PM

VERIFY SCALE
THIS BAR IS ONE INCH ON ORIGINAL DRAWING
0" — 1"
ADJUST SCALES ACCORDINGLY, IF NOT ONE INCH ON THIS SHEET

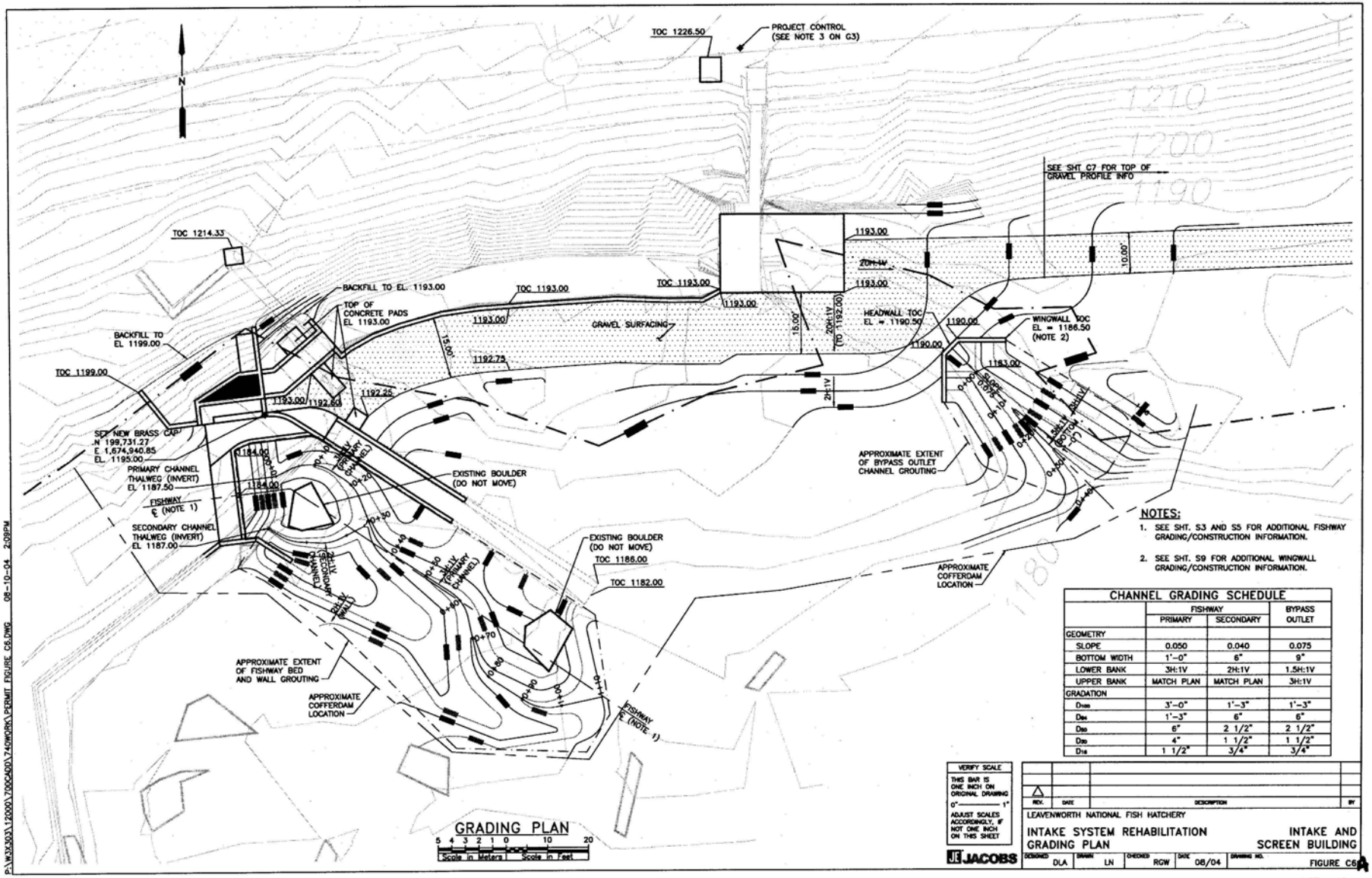
| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| △ | | | |

LEAVENWORTH NATIONAL FISH HATCHERY
INTAKE SYSTEM REHABILITATION SCHEMATIC DIAGRAMS
ELECTRICAL PLANS

JACOBS

| DESIGNED | DRAWN | CHECKED | DATE | DRAWING NO. |
|---|---|---|---|---|
| STH/JHM | LN | JHM/STH | 08/04 | 1F-WA-257A-140-63.0 |

SHEET E20 OF 63




CHANNEL GRADING SCHEDULE

| | FISHWAY | | BYPASS OUTLET |
|---|---|---|---|
| | PRIMARY | SECONDARY | |
| GEOMETRY | | | |
| SLOPE | 0.050 | 0.040 | 0.075 |
| BOTTOM WIDTH | 1'-0" | 6" | 9" |
| LOWER BANK | 3H:1V | 2H:1V | 1.5H:1V |
| UPPER BANK | MATCH PLAN | MATCH PLAN | 3H:1V |
| GRADATION | | | |
| $D_{100}$ | 3'-0" | 1'-3" | 1'-3" |
| $D_{84}$ | 1'-3" | 6" | 6" |
| $D_{50}$ | 6" | 2 1/2" | 2 1/2" |
| $D_{30}$ | 4" | 1 1/2" | 1 1/2" |
| $D_{16}$ | 1 1/2" | 3/4" | 3/4" |

# XVII. APPENDICES

## Appendix A: Upstream Water Withdrawal

The upstream-most diversion dam on Icicle Creek is maintained and operated by the Icicle-Peshastin Irrigation District. Surface waters are withdrawn at this location to supply the City of Leavenworth (City), the Icicle Irrigation District, and the Peshastin Irrigation District. The Icicle Irrigation District and Peshastin Irrigation District (District) share ownership of some canals and water rights to storage lakes and surface waters of Icicle Creek. An agreement between the two irrigation districts governs operations. The District and City divert Icicle Creek surface water from opposite sides of the creek, at a diversion dam (rm 5.7) upstream of the Snow Lakes trailhead. The City has a surface water right of 3 cfs and withdraws water year-round (Valentine pers. comm. 2001). The District holds a combined water right to Icicle Creek flow of nearly 118 cfs. In general, the District diverts creek water from April to October, although operations may begin as early as mid-March and last until mid-October in some years (Teeley pers. comm. 2001 & 2002). Peak irrigation use is from June through August (Leonoff 1992).

The District's water delivery system takes water from behind the diversion dam and conveys it through a gravity-run open canal system. The ability of fish to migrate both upstream and downstream past this diversion dam is unknown. A rotating drum screen is located near the top-end of the irrigation canal and provides for fish screening. The drum screen does not meet current fish screening criteria, however the District is actively researching upgrading options. Any fish or debris encountered at the drum screen is shunted back into Icicle Creek.

The District normally operates with natural flows in Icicle Creek. However, the District may release supplemental water from storage lakes in the upper watershed, now a part of the Alpine Lakes Wilderness Area. The District holds a 1929 adjudicated water right for 2,500 acre feet each on Colchuck, Eight Mile, and Klonaqua Lakes. However, the recharge capacity of the storage lakes may not be as large as the water rights that are assigned to them (Leonoff 1992). Additional water rights were granted to the District for Square Lake (2,000 acre feet) and Snow Lake (600 acre feet) subsequent to the 1929 adjudication (Leonoff 1992). The District typically begins release of water from one upper basin lake (Colchuck, Eight Mile, Klonaqua, or Square Lake) in the beginning of August and releases from a second lake towards the end of August. The District will rotate usage between all four lakes, using no more than two lakes in a single year to ensure sufficient storage for the following year (Teeley pers. comm.). Water released from these upper basin lakes is eventually diverted into the District's water delivery system at the diversion dam or directly into their irrigation canal. Water released from the lakes are used to satisfy the District’s water rights in Icicle Creek and the rights are not in addition to the 118 cfs water right currently held (Leonoff 1992). The District returns excess “carrying” water to the Wenatchee River at several locations.