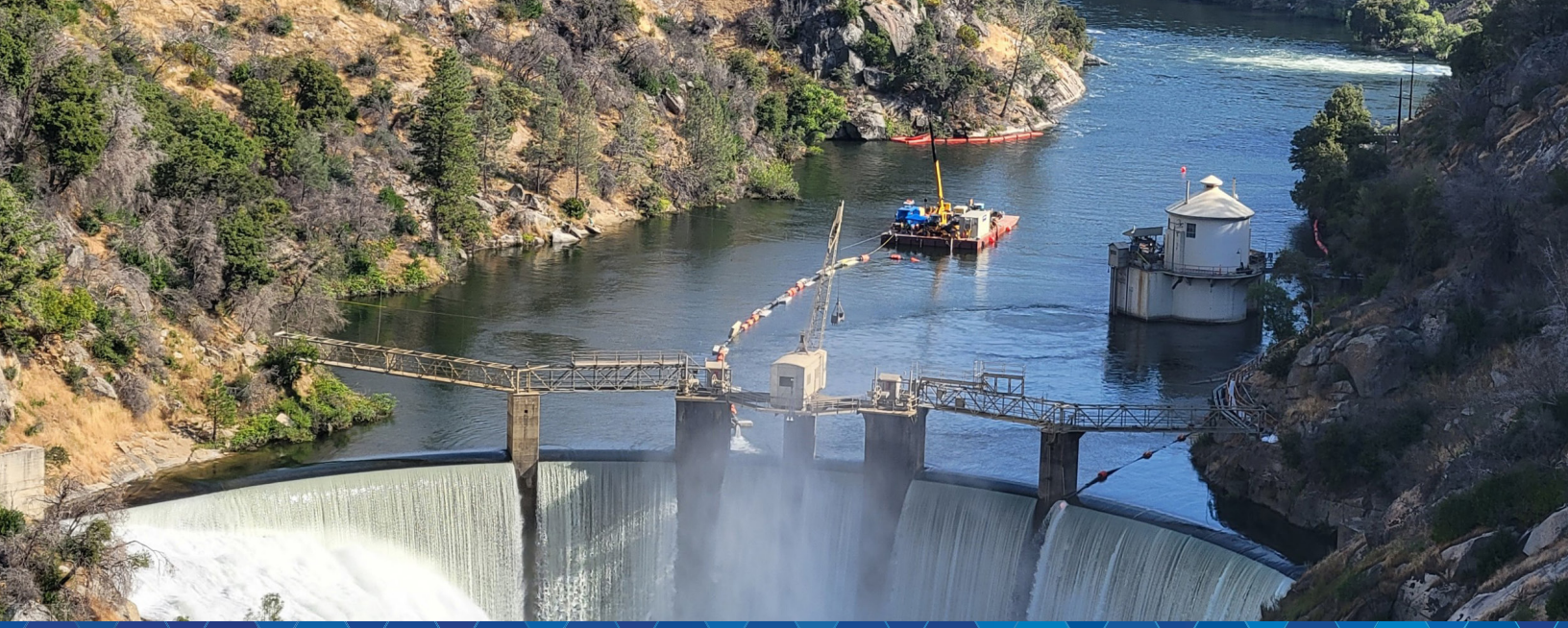
NORTHWEST HYDROELECTRIC ASSOCIATION

2025

TRAYLOR CONSTRUCTION GROUP



BIG CREEK 6 DAM

PROJECT DESCRIPTION

In August of 2023, Ballard successfully completed a large intake structure dredging operation at the Big Creek reservoir on the San Joaquin River in the Big Creek Watershed. Recognizing Ballard's expertise with mobilizing large equipment into challenging and remote locations, and the successful completion of previous dredging projects of similar fashion for other utility providers, SCE initiated an ECI contract with Ballard to develop an executable methodology for the sediment removal from the reservoir and intake tower.

This emergency project involved the mobilization of four vessels, two complete flexi-float barges with 4-point mooring capabilities and crane, three land based support cranes, suction dredging equipment, and diving support equipment. The route for mobilization of equipment was limited to a narrow one-lane mountain road with weight limited bridge capacities of which Ballard had to improve to accommodate for trucking the oversized barges and cranes to the dam/powerhouse. Despite the significant difficulty in trans-loading and hauling of equipment on the mountainous terrain and tight quarters, and the aggressive time frame in which Ballard was given to return the intake tower to generation, the dredging of 23,000 cubic yards of sediment was completed ahead of schedule and within the allotted budget.

The execution of the project required Ballard to implement an aggressive three-month long, 7/12 work schedule to successfully complete the mobilization, sediment removal, and demobilization which was accomplished safely.

SERVICES PROVIDED:

- Caviblaster
- Decompression Chamber
- Diver Assisted Dredging
- Dredging
- Emergency Response
- HIgh Altitude
- High Resolution Multi-Beam Imaging
- Intake Structure Cleaning
- Penetration Diving
- ROV Light Work
- Surface Supplied Air Diving
- Survey
- Underwater Inspection
- Underwater Cutting/Welding

DIVER DEPTH:

85ft.

OWNER/CLIENT NAME:

Southern Company Edison

LOCATION:

Madera County, CA

CONTRACT AMOUNT:

$12M

PERIOD OF PERFORMANCE:

06/2023 - 08/2023

BALLARD MARINE CONSTRUCTION

BLUE HERON DAM IMPROVEMENTS

PROJECT DESCRIPTION

Ballard Marine Construction provided a dive team and marine equipment spread to perform the trash rack demolition and bulkhead installation for the Blue Heron Dam Improvements project.

To gain access to the trash racks, Ballard demolished the catwalk section by rigging the catwalk, cutting the connecting hardware, and hoisting it out with a 90-tom hydraulic crane. Once the trash racks were removed, the bulkheads were installed. The bulkheads consisted of ½" steel plate with I-beam whalers and a neoprene gasket and were secured to the face of the dam using mechanical concrete anchors, hoisted into place using the 90-ton hydro crane. Dewatering of the intake annulus commenced immediately, utilizing a high-volume submersible pump through the gate slot at the top of the dam crest and discharging the water into the forebay, to demolishing the stainless-steel pipe penetrations and the concrete plugs. Prior to concrete placement, dowels were placed, rebar mats were tied into place, and the hydrophilic waterstop was placed. All three of the concrete plugs were poured over a two-day period through the gate slot access at the top of the dam cap.

The concrete apron on the upstream side of the dam, at the penstock invert elevation, was severely deteriorated making it difficult to seal the temporary bulkheads. Various types of sealing methods were used to successfully seal the penetrations. Water infiltration from the surrounding penetrations was constant, so Ballard made low level sump areas and installed pumps on floats to keep the water out. To prevent concrete voids in the tops of the penetrations, core holes were drilled through the dam cap so air could escape. In addition, Ballard's internal engineering developed a tie off apparatus for the workers at height in the basement so they could stay 100% tied off safely and still be able to move freely atop the wall while under construction.

The project was highly successful, completing on time and with no injuries. Ballard was able to provide underwater condition reports of the dam upstream, as well as useful information for future improvements.

SERVICES PROVIDED:

- Bulkhead Construction
- Concrete Coring
- Concrete Repairs
- Demolition
- Heavy Lift Crane Operations
- SSDS Spread
- Surface Supplied Air Diving
- Underwater Cutting/Welding
- Underwater Drilling
- Underwater Excavation
- Underwater Structure Measurements

DIVER DEPTH:

15ft.

OWNER/CLIENT NAME:

Portland General Electric

LOCATION:

Clackamas County, OR

CONTRACT AMOUNT:

$1,003,300

PERIOD OF PERFORMANCE:

06/2019 - 01/2020

BALLARD MARINE CONSTRUCTION

DALLES DAM EAST FISH LADDER AUXILIARY WATER SUPPLY

PROJECT DESCRIPTION

The Dalles Dam needed a critical back-up auxiliary water system for the overall success of the fish passage migration in the event of a fish turbine outage, requiring an underwater penetration through the Dam. Boring of the 10-foot diameter tunnel, located 80-feet underwater, was completed in two phases. Ballard performed the underwater construction work, as well as provide topside support for both seasons of work.

The first season of work involved saw cutting the face of the dam in four locations to install embedded guide rails for the new cofferdam / bulkhead system and the construction of a 20ft. x 65ft. x 10ft. underwater cast-in-place foundation to support the bulkhead structure. Season 2 began with the removal of the foundation formwork and placement of twelve 114-ton precast concrete blocks placed on the underwater foundation constructed by Ballard the previous year. The stacked pre-cast blocks were set underwater, one at a time, creating two pier noses extending to the crest of the dam. Once in place, the blocks were keyed into the dam and grouted together further securing them to the dam.

During this process Ballard collaborated closely with the Prime Contractor and other key subcontractors to develop custom tool and processes. Safety was paramount due to the risks associated with a very complex underwater civil construction project.

SERVICES PROVIDED:

- Deep Water Diving
- Demolition
- Mechanical Dredging
- Mixed Gas Diving
- Rock Removal
- Survey
- Turbidity Boom
- Underwater Inspection
- Underwater Concrete Pours
- Underwater Cutting/Welding
- Underwater Diamond Wire Sawing
- Underwater Dredging
- Underwater Rebar Installation
- Underwater Structure Measurements

DIVER DEPTH:

80ft.

OWNER/CLIENT NAME:

Kiewit

LOCATION:

Dallesport, WA

CONTRACT AMOUNT:

$2,145,500

PERIOD OF PERFORMANCE:

11/2015 - 02/2018

BALLARD MARINE CONSTRUCTION

DESIGN-BUILD REPAIR FOR PORTIONS OF THE PENNSYLVANIA, SPRINGWELLS, AND NORTH-EAST RAW WATER TUNNELS

PROJECT DESCRIPTION

The project involved inspection and repair of three of the existing underwater tunnel systems which supply raw water from the Detroit River to three different potable water treatment plants in the Detroit/Dearborn, Michigan area. The three work zones under investigation and repair were the Pennsylvania, Springwells and Northeast Tunnels. The tunnels are in plant easements and city/roadway street ROW's at various locations. The Pennsylvania Tunnel system is a 14ft diameter tunnel with subsurface depths of 80 to 100ft of overburden above the top of the tunnel with an area of concern of 225 LF for repair. The Springwells Tunnel system is a 12ft diameter tunnel with subsurface depths of 80 to 100ft of overburden above the top of the tunnel with an area of concern of 800 LF for repair. The Northeast Tunnel system is a 10ft diameter tunnel with subsurface depths of 80 to 100ft of overburden above the top of the tunnel with an area of concern of 400 LF for repair. Both the Pennsylvania and Springwells tunnels are pour in place concrete hand mined tunnels with the Northeast Tunnel constructed with an outer liner of O'Rourke Block, and then an inner poured-in-place concrete liner which was also hand mined. The project included the underwater inspection and evaluation of the damaged tunnels section to assist with the design-build repair options. All three tunnel sections required access into the system through existing vertical down shafts with diameters ranging from 8ft to 20ft. The repair options included non-structural and structural repairs inside the tunnel system while the plants stayed in operation, which required divers working in light- to moderate-flow.

Due to the limited access shaft locations, the inspection portions of the project required long distance diver penetrations to the work zones with tunnel horizontal penetration depth varying from 1,400 ft up to 3,000ft. In order to assist the deployment of the long-distance penetration umbilical's, Ballard's crewing utilized specialized power sheave systems and rotation point sheaves for diver and tooling umbilical management. The crewing was also challenged by limited bottom time due to water depths. In order to maximize diver time, a custom mix breathing medium of NITROX was utilized which greatly extended the divers available underwater time and increase safety along with productivity.

SERVICES PROVIDED:

- 3D Mapping
- Concrete Coring
- Concrete Pipe Repairs
- Confined Space and Diving
- Critical Crane Lifts
- Deep Water Diving
- Light Work and Limited Access ROV
- Mixed Gas Diving
- Penetration Diving
- Piping Repairs
- Potable Water Diving
- Sonar
- Surface Supplied Air Diving
- Underwater Inspection
- Underwater Concrete Pours
- Underwater Drilling
- Underwater Dredging
- Underwater Grout Pour
- Underwater Structure Measurements
- Vehicle Assisted Tooling

DIVER DEPTH:

50ft - 80ft.

OWNER/CLIENT NAME:

Great Lakes Water Authority

LOCATION:

Detroit and Dearborn, MI

CONTRACT AMOUNT:

$10.5M

PERIOD OF PERFORMANCE:

04/2018 - 04/2019

BALLARD MARINE CONSTRUCTION

DIABLO DAM EMERGENCY TRASH RACK REPAIR

PROJECT DESCRIPTION

The Diablo Dam is an arch dam with vertical walls rising 160 feet from the bed of the Skagit River. In February 2022, one of the power generation turbines went offline. After multiple investigations, a large piece of concrete dislodged from the intake structure was discovered and found wedged in between the turbine and the penstock walls. Divers also found that a large debris mat had built up on the outside of the trash racks from 125 feet to 60 feet of depth, and four feet to 60 feet thick from top to bottom.

Divers began by removing the debris mat from the face of the intake structure. Once this had been documented, production clamshell debris removal operations commenced removing 700 yards of woody debris, large rock, and muck from the forebay of the intake structure. Temporary fixes were developed to stabilize the intake structure and prevent further concrete spalling that could damage the turbines. Two of the existing trash rack sections were removed to provide diver access to the interior of the intake structure, as the upland access point required 100 feet of penetration. To mitigate the risk of demoed debris entering the penstocks and turbines, steel debris guards were welded to the trash rack walers. Ballard completed the project by reinstalling the trash racks and installing nine sensors to monitor vibrations at certain flow rates.

As an emergency project, there was no clear scope established. As work progressed and Ballard discovered the extent of the damage, the scope continually evolved, requiring Ballard to adapt to ever changing conditions and operations in short notice at a very remote location. Challenges included an increase in debris from an estimated thirty yards to 700 yards, as well as crane accessibility and stability in the remote location. Ballard worked with SCL to navigate this road block and maintain an aggressive mobilization effort and begin the emergency work on time with no delays.

With 145 dives in approximately 60 days, this was a successful project in terms of schedule, budget, safety, and quality. Ballard demobilized from Diablo Dam with the hydro project at the same operational capacity as it was prior to the damage.

SERVICES PROVIDED:

- Barge Construction
- Condition Assessment Rating
- Deep Water Diving
- Demolition
- Diver Assisted Dredging
- Lift Bags and Specialty Rigging
- Mechanical Dredging
- Mooring System Installation
- Rock Removal
- Surface Supplied Air Diving
- Underwater Inspection
- Underwater Cutting/Welding
- Underwater Drilling
- Underwater Structure Measurements

DIVER DEPTH:

120ft.

OWNER/CLIENT NAME:

Seattle City Light

LOCATION:

Rockport, WA

CONTRACT AMOUNT:

$1.1M

PERIOD OF PERFORMANCE:

02/2022 - 04/2022

BALLARD MARINE CONSTRUCTION

GROSS DAM TRASH RACK INSPECTION

PROJECT DESCRIPTION

Ballard's Robotics and Survey Division (RSD) was contacted by Denver Water to perform a condition assessment of one of their trash rack structures at the Gross Reservoir. The structure was located 100' underwater and was estimated to have large amounts of debris resting on top of it.

RSD used a VideoRay Mission Specialist Defender ROV, mounted with a Voyis Discovery Stereo Photogrammetry camera system, to go deep below the water's surface and collect multiple high-definition images of the trash rack structure. These images were then compiled, reconstructed, and post processed to build out a photorealistic 3D model of the trash rack's current condition, highlighting all of the debris collected by the structure. The visual items included multiple tree branches, rocks, and other wooden debris, as well as additional views of the sediment levels surrounding the trash rack itself.

SERVICES PROVIDED:

- Remote Mobilization
- 3D Mapping
- Survey
- Photogrammetry
- Light Work ROV

DIVER/ROV DEPTH:

100ft.

OWNER/CLIENT NAME:

Denver Water

LOCATION:

Boulder County, Colorado

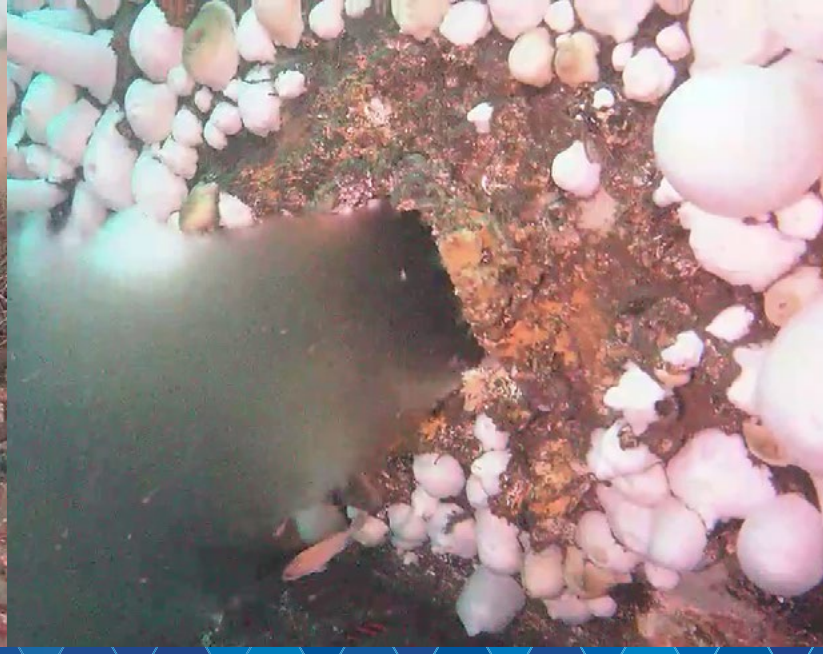
CONTRACT AMOUNT:

$16,000

PERIOD OF PERFORMANCE:

10/2024

BALLARD MARINE CONSTRUCTION



HYPERION 1 & 5 OUTFALL INSPECTIONS

PROJECT DESCRIPTION

Ballard was awarded a multi-year contract to supply diving services, ROV services and vessel services for the Hyperion Waste Water Treatment Plant. The structures consist of a one mile, five mile and seven mile outfall. The work consists of:

- Port Identification and Location
- Plugged and/or Puffing Ports
- Status of Four (4) Special Effluent Ports
- North and South Diffuser End Structure Area
- WYE Structure
- Main Barrel
- North and South Transition Structure
- Offshore Bell Joint Repairs
- Epoxy Bumper Joint Separation
- Main Barrel Re-ballast Stone Levels
- Inshore Bell Joint Repairs

Ballard concludes each service with a draft report for the owners review. Once approved, the video of the inspections and associated findings are presented to the engineering team.

During Ballard's work window, planning around weather to perform all in water activities was crucial. Ballard's Safety Manager worked with the Project Manager to establish a "External Variables and Weather Metrics" table that would assist the field personnel in determining if operations were safe to conduct. Variables considered were vessel traffic, fog, sea state, current, tides, wind, visibility (underwater and topside), etc. Limited visibility also posed a challenge for the project. To mitigate this, Ballard mounted two imaging sonars on the ROV. One in "profiling" view to map areas of scour and spall in section view, and one in "sector" view which is a forward looking sonar used to navigate around the structure and determine ROV location. An underwater position system was also used to monitor the position of the ROV related to the structure.

SERVICES PROVIDED:

- Biological survey
- Cathodic survey
- Light work ROV
- Limited access ROV
- High resolution multi-beam imaging
- Offshore services
- Sonar
- Surface supplied air diving
- Underwater inspection

DIVER DEPTH:

220ft.

OWNER/CLIENT NAME:

City of Los Angeles

LOCATION:

Playa Del Rey, CA

CONTRACT AMOUNT:

$1,000,000

PERIOD OF PERFORMANCE:

2010-2015, 2016, 2017, 2018-Current

BALLARD MARINE CONSTRUCTION

IGNACIO-MARE ISLAND DUTCHMAN SLOUGH DREDGING

PROJECT DESCRIPTION

During a recent study performed as part of the Tower Replacement Program, Pacific Gas & Electric (PG&E) identified multiple electrical transmission towers in need of immediate repair. The San Francisco District U.S. Army Corps of Engineers (USACE) issued an emergency permit to replace three towers at risk of failure. According to the USACE, "A failure of one or more of these towers would lead to an extended outage affecting over 30,000 homes and a variety of schools and medical facilities for upwards of 3 to 6 months, causing an unacceptable hazard to life." The project presented logistical challenges due to the extremely shallow Dutchman Slough with no terrain access. Ballard teamed with Lind Marine to utilize their fleet of specialized equipment to install 595-linear feet of sheet pile and dredge 32,000 cubic yards of sediment, permitting access to the towers for repair.

In the original project scope, the dredge material was to be transported and hydraulically pumped into a containment area located 3 miles downstream from the dredge site. However, a second challenge arose when sediment sampling results revealed the sediment did not meet required material disposal standards. Due to the emergent nature of the project, Ballard and Lind Marine proposed alternative solutions to continue dredging while working with PG&E to source an alternate disposal location. Those efforts resulted in transporting the dredge spoils to Lind Marine's Shipyard on Mare Island and transloading the material into 1800-2400-cubic yard hopper barges for temporary storage. Additionally, the project team completed batch testing to dry and transport the dredge spoils for upland disposal. After many weeks of collaborative planning, PG&E received agency approval to dispose of the material at Montezuma Wetlands, a nearly 30-mile round trip by tugboat.

Upon receiving the final disposal location, Ballard and Lind Marine began 24/7 operations to continue dredging and transporting material, exceeding daily production rates and accelerating the schedule. Daily bathymetric surveys were completed to calculate the dredge quantities, quantify the sediment infill, and calibrate the dredge positioning system. The final result provided correct depth for equipment to access the tower locations for repair.

SERVICES PROVIDED:

- Contaminated material disposal
- Dredge pumping
- Mechanical dredging
- Pile driving
- Survey
- Turbidity Boom
- Underwater Dredging

DIVER DEPTH:

N/A

OWNER/CLIENT NAME:

Pacific Gas & Electric

LOCATION:

Napa River, CA

CONTRACT AMOUNT:

$29.1M

PERIOD OF PERFORMANCE:

11/2020 - 02/21

BALLARD MARINE CONSTRUCTION

MANATEE PLANT COOLING POND SOIL CEMENT REPLACEMENT

PROJECT DESCRIPTION

The Cooling Pond Soil Cement Replacement Project at the Florida Power and Light (FPL) Manatee Plant, located outside of Tampa, Florida, will extend the lifespan of the existing cooling pond and provide additional protection against severe tropical storms and hurricanes. The cooling pond is a key component of the power plant as it circulates and feeds cooling water to the plant's intake structures.

Ballard Marine Construction was awarded the $65M Design-Build Contract in the Fall of 2016 and executed the Purchase Order with FPL in February of 2017 to construct 10,000 lineal feet of soil cement protection system on the west side of the pond dike.

The soil cement protection system, including 10,000 lineal feet of soil cement protection system on the west side of the pond dike, is unique consisting of 6" thick precast panels that are placed on the face of the dike and acting as the outer face of the protection system, protecting the soil cement against wind and wave action encountered during storm activities. The precast panel will sit at least 12" off the face of the soil cement. The 12" interstitial space between the face of the soil cement and underside of precast panel will be filled with over 21,000 cubic yards of lightweight cellular concrete fill that had to be placed with precision lifts and extensive quality control to prevent washout and panel lifting.

SERVICES PROVIDED:

- Concrete Coring
- Concrete Repairs
- Critical Crane Lifts
- Diver Assisted Dredging
- HDPE Piping Installation
- Heavy Lift Crane Operations
- Lift Bags and Specialty Rigging
- Survey
- Underwater Inspection
- Underwater Concrete Pours
- Underwater Dredging
- Underwater Excavation
- Underwater Grout Pour

DIVER DEPTH:

27ft.

OWNER/CLIENT NAME:

Florida Power & Light

LOCATION:

Parrish, FL

CONTRACT AMOUNT:

$65.9M

PERIOD OF PERFORMANCE:

02/2017-09/2019

BALLARD MARINE CONSTRUCTION

MORMON FLAT DAM
TRASH RACK BAY 3 REPAIRS DESIGN-BUILD

PROJECT DESCRIPTION

Built in 1925 on the Salt River, Mormon Flat Dam forms Canyon Lake, a 10-mile-long reservoir. The concrete, thin arch dam is 380 feet long and 224 feet high, and features two hydroelectric units. A dive inspection revealed extensive damage to the draft tube trash racks and slots. Previous repairs to the system using an in-the-wet construction technique had failed, resulting in continued degradation.

Ballard teamed with a designer on this design-build contract to develop a system to dewater the work area and repair the system under dry conditions. Ballard's services included installing a new cofferdam bulkhead in order to dewater the draft tube and remove old trash rack slot guides to replace with new slot guides. Ballard transported and lifted a 12,000lb bulkhead into place. In order to install the bulkhead safely and successfully, divers removed obstructions in order to facilitate the placement of the bulkhead. Additionally, divers removed, modified with new wedges, replacement of broken anchors with new epoxy anchors, and reinstalled the 15,000lb trash track.

SERVICES PROVIDED:

- Bulkhead construction
- Concrete coring
- Concrete repairs
- Demolition
- Underwater concrete pours
- Underwater drilling
- Underwater grout pour

DIVER DEPTH:

80ft.

OWNER/CLIENT NAME:

Salt River Project

LOCATION:

Apache Junction, AZ

CONTRACT AMOUNT:

$546,013

PERIOD OF PERFORMANCE:

08/2017 - 12/2017

BALLARD
MARINE CONSTRUCTION

STERLING INDUSTRIAL

New Hydroelectric Facility | Hawesville, Kentucky

Client
American Municipal Power

Engineer
MWH Americas Inc.

Delivery Method
Bid-Build

Construction Cost
$16.8 Million

Start Date
October 2010

Completion Date
December 2015

The Cannelton Hydroelectric Dam Project diverts water from the Cannelton Locks and Dam. It has a generating capacity of 88 MW and is one of six run-of-river hydroelectric projects under development by AMP. The site includes an intake approach channel, a reinforced concrete powerhouse and a tailrace channel. Our teams original contract included installation of three 29.3 MW Voith Hydro bulb turbines, associated turbine piping and OFE embeds including draft tube liners and bulb turbine housings. The installation of the Oregon Ironworks bulkhead, emergency gates and trash racks and the Morgan Engineering powerhouse crane were later added to the scope of work.

The sheer size of the turbines and draft tube liners and the location of the work made this a complex job. The installation of the turbines took place within a coffer dam that is approximately 100 feet deep and the runners for the Voith Hydro turbines are over 26 feet in diameter. The turbine and draft tube liners were broken into sections assembled within the coffer dam. Many of these sections weigh well over 100 tons.

Building upon our success on this project, the team began trade work on the AMP Willow Island Hydroelectric Project in September 2012. Similar to Cannelton, the team installed the turbines at Willow Island and was awarded all the mechanical and electrical work associated with the turbine, the installation of the emergency gates and the balance of plant piping and HVAC.

New Hydroelectric Facility | St. Mary's, West Virginia

Client
American Municipal Power

Engineer
MWH Americas Inc.

Delivery Method
Bid-Build

Construction Cost
$26.5 Million

Start Date
September 2012

Completion Date
April 2016

Our team was awarded this $26.5 million contract for the installation of the turbines at the American Municipal Power (AMP) Willow Island Hydroelectric Dam Project. The Willow Island Hydroelectric Dam Project diverts water from the Willow Island Locks and Dam and was constructed adjacent to it. It has a generating capacity of 58 MW and is one of six run-of-river hydroelectric projects developed by AMP.

The site included an intake approach channel, a reinforced concrete powerhouse and a tailrace channel. The contract included installation of two 29.3 Mw Voith Hydro bulb turbines, associated turbine piping, and OFE embeds including draft tube liners and bulb turbine housings.

The sheer size of the turbines and draft tube liners and the location of the work made this a complex job. The installation of the turbines took place within a coffer dam approximately 100' deep with the runners for the Voith Hydro turbines over 26' in diameter. The turbine and draft tube liners were broken into sections assembled within the coffer dam. Many of these sections weighed well over 100 tons.

The team was awarded all the mechanical and electrical work associated with the turbine, the installation of the emergency gates, and the balance of plant piping and HVAC.

Regional Connector Transit Project

Los Angeles County Metropolitan Transportation Authority, Los Angeles, CA

The Regional Connector Project extends from the Metro Gold Line Little Tokyo/Arts District Station to the 7th Street/Metro Center Station in downtown Los Angeles. Now open, passengers are able to transfer to the Blue, Expo, Red, and Purple lines, bypassing Union Station and creating a one-seat ride for travel across Los Angeles County.

Traylor held primary responsibility for the twin tunnels which are 9,450 linear feet long and 18 feet, 10 inches in inner diameter. The project included construction of three underground stations: Central, Broadway, and Hope Stations. The stations are up to 440 feet long, and 110 feet deep. The project also included a connection to 7th and Flower Station. The entire alignment is within potentially gassy conditions.

The joint venture took over the in-progress advance utilities relocation contract as a change order at the outset of the project. Close coordination with local agencies and an extensive re-sequencing of the project was conducted to minimize overall schedule impact. All utilities along the alignment were either relocated or protected in place, particularly along Broadway and Hope, where the utilities were large and numerous.

The cross passages and crossover caverns were constructed using Sequential Excavation Methods (SEM). The track crossover cavern presented its own challenges due to its size (58 feet wide, 36 feet high, and 300 feet long) and proximity to existing historic structures. The excavation was completed in March 2019, two months ahead of schedule and within the acceptable building settlements of 0.65 inches.

The tunnel boring machine (TBM) was a rebuild of one of the Herrenknecht TBMs from Traylor's University Link Light Rail U220 Tunnels project in Seattle. It was modified to navigate the three tight curves along the alignment. Traylor Precast, LLC mobilized our Littlerock, California plant to make the precast concrete tunnel segments. The one machine, Angeli, was used to bore both tunnels. Each of the two launches were extremely challenging due to an abrupt change in cover (from five to 20 feet) and the need to immediately mine downward at a 4.5% grade into a 600-foot horizontal curve. The team created a simulated earth paste to ensure pressure was maintained and relied on the TBM's sophisticated computer system to successfully launch with negligible settlement. The mining was extremely productive, setting multiple records for Metro, and was completed more than three weeks early.

In November 2019, the team was awarded the International Tunneling Association's (ITA) Project of the Year (between €50M and €500M). In 2023, ENR announced that the team was awarded the 2022 Project of the Year Award.

VALUE

$1.2 B

DATES

07/07/2014 – 06/15/2023

ROLE

Prime contractor, joint venture

REFERENCE

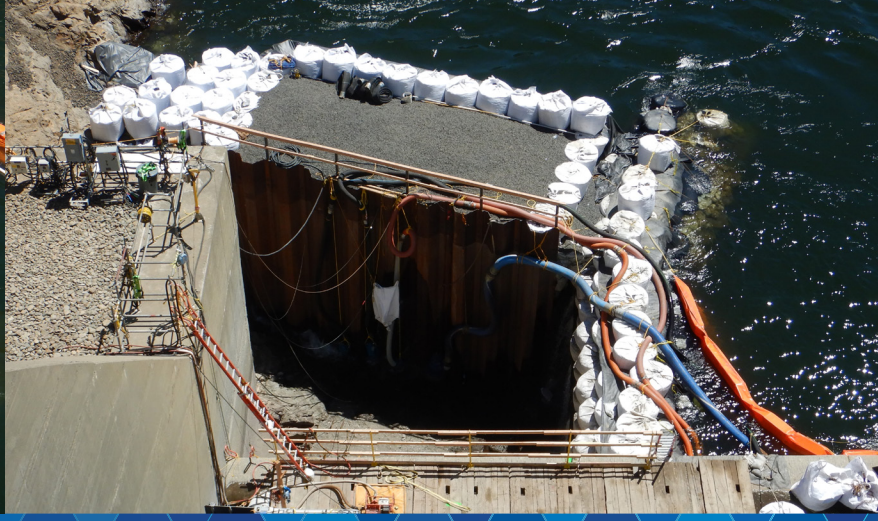
Mat Antonelli, PE
Deputy Chief Program Management Officer
Metro Los Angeles
(916) 215-4873
AntonelliM@metro.net

HIGHLIGHTS

- Design-Build
- 1.9-mile underground light-rail system
- 3 new stations

AWARDS / ACHIEVEMENTS

- 2022 ENR Project of the Year
- 2019 International Tunnel Association's Project of the Year (between €50M and €500M)
- 2020 UCA of SME Project of the Year Award
- 2024 California Transportation Foundation Rail Transit Project of the Year
- 2024 Build America Award



ROCK CREEK TOE VOID REPAIR

PROJECT DESCRIPTION

The Rock Creek Dam is a concrete gravity structure 126 feet high with a crest length of 567 feet. Through dive inspections from another contractor, a depression in the rock backfill behind the left downstream training wall and void under the L-shaped training wall was discovered. If not mitigated, the undermining and void development could potentially progress into a dam safety issue.

The repair occurred in a very remote location with challenging logistics for public road access that did not include access for equipment to the downstream toe. To facilitate construction a temporary access scaffold had to be constructed on the downstream slope of the dam while all cofferdam materials, repair materials, and equipment had to be lifted from a barge in the reservoir on the upstream side of the dam over the crest and lowered to the downstream toe.

Ballard teamed with a local engineering firm to review the provided concept cofferdam mitigation design and found it not feasible. The team hosted an engineering workshop to formulate cofferdam layout options and developed an innovative, viable option. This option, a two-sided sheet pile gravity cofferdam, eliminated the need for walers and struts initially found to impede construction, and decreased the potential leakage over the originally proposed single wall system. Frames or guides, with adjustable support H-Pile spuds, were fabricated and set/leveled on the bottom. The spuds penetrated the sediment layer and were supported on the rock below through the use of a small vibratory hammer fitted with a sheet jaw. This frame was used for construction access and acted as a template for both sides of the sheet piling. The sheets were laced into the template and vibrated with the same small vibratory hammer to ensure they sat on the rock layer. Supersacks and membrane material were then placed at the base and sides of the sheet pile cofferdam to seal any openings. The inside of the system was then filled with rock and sand material. Once filled, the cofferdam became a gravity structure resisting sliding and overturning, similar to a cellular cofferdam. This approach, when combined with a supersack cofferdam system, conformed to the irregular shapes and field conditions, as well as acted as an extension of the existing dam flume extension wall.

During construction, once the cofferdam was dewatered, a post inspection was performed and it was determined that the undermining and void was far less than originally reported. A proper dive inspection, initially, could have potentially resulted in a far less scoped project or postponement of the project. Ballard repaired the existing damage and completed the project safely, on-schedule, and under budget, resulting in a pleased client.

SERVICES PROVIDED:

- Bulkhead Construction
- Concrete Repairs
- Heavy Lift Crane Operations
- Offshore Services
- Rock Removal
- Surface Supplied Air Diving
- Turbidity Boom
- Underwater Cutting/Welding
- Underwater Excavation

DIVER DEPTH:

25ft.

OWNER/CLIENT NAME:

Pacific Gas & Electric

LOCATION:

Auburn, CA

CONTRACT AMOUNT:

$4.2M

PERIOD OF PERFORMANCE:

04/2019 - 11/2019

BALLARD MARINE CONSTRUCTION

Rocky Reach Juvenile Fish Bypass

Public Utility District No. 1 of Chelan County, Wenatchee, WA

The Columbia River is a major highway for migrating fish. Each year, tens of millions of five different species of migrating salmon and steelhead pass through the Rocky Reach Dam. The Juvenile Fish Bypass structure helps young salmon and steelhead quickly and safely pass downstream through the 48-year-old dam. Constructed entirely between migration cycles of these endangered fish species, Traylor employed innovative construction methodologies and aggressive project scheduling to dodge physical constraints and numerous commercial deadlines, completing the facility prior to the arrival of the 2003 migrating season.

The difficulties created by the inordinate pace of construction in such a confined workspace, combined with the enormous startup mobilization effort, presented significant challenges. The contract needed to be complete by May 1, 2003 (395 calendar days after the bid opening) with a limitation that prohibited work on the actual site until September 15, 2003. In essence, the majority of the $40 million price tag was to be spent in the last seven months of the contract. The mobilization and startup activities to meet the schedule were unprecedented. By August 2002—four months after the bid date—the job site had received and assembled four crawler cranes, one ringer crane, a floating dry dock, three crane barges, two dive barges, two floating pile templates, two inland tugboats, and several materials barges. In all, more than 150 truckloads of specialized equipment and supplies were shipped from across the United States over a six-week period.

During construction, the team faced engineering challenges such as the installation of deep water drilled shaft foundations in extremely hard bedrock; off-site fabrication of a floating pump station with subsequent transportation/controlled ballasting of the structure on a prepared site; off-site preassembly and on-site erection of large steel modules with a portable floating derrick barge; and managing the erection of over 2,600 tons of light framed structural steel and mechanical members with a diving team at water depths exceeding 100 feet.

VALUE

$42,173,610

DATES

04/11/2002 – 05/01/2003

ROLE

Prime contractor, sole venture

REFERENCE

Brett Bickford
Public Utility District
No. 1 of Chelan County
PO Box 1231 (98807-1231)
327 N. Wenatchee Ave.
Wenatchee, WA 98801
509.663.8121
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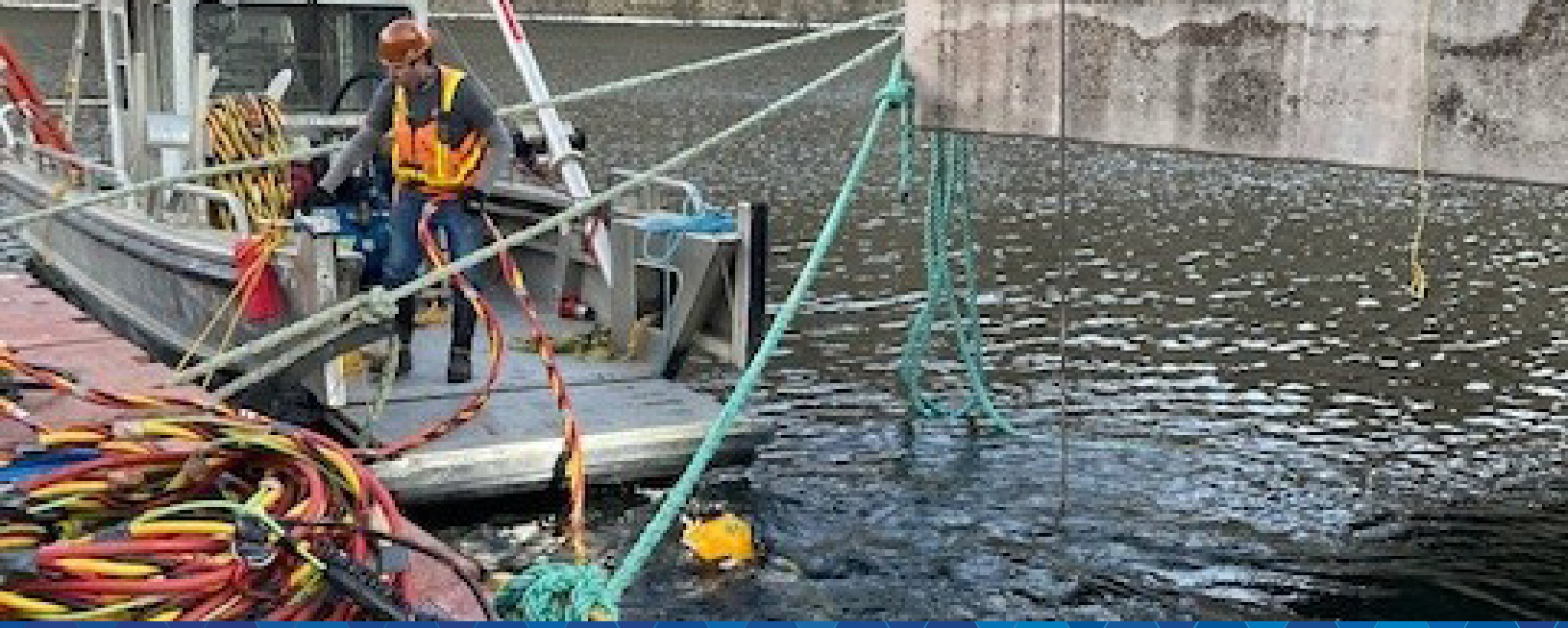
HIGHLIGHTS

- Inland waterway structure
- Steel erection
- Extremely tight schedule
- Deep water drilled shaft foundations in hard bedrock
- Deep water diving
- Floating pump station
- Significant startup mobilization

AWARDS / ACHIEVEMENTS

This project won the 2004 National AGC / AON Build America Award.



ROUND BUTTE DAM

PROJECT DESCRIPTION

The existing Round Butte Dam power tunnel fill valve had not been used since 1972 and was operated by a hydraulic hand pump. To alleviate the risk of the valve not working, Ballard was retained to install two new valves to serve in its place. The existing valve was also removed and the line isolated with a blind flange.

To relocate the existing 12-inch tunnel fill valve, Ballard cored two holes in the Round Butte intake tower at roughly 45 feet of depth. The team then proceeded to a depth of 210 feet to remove the valve, hydraulic fluid and lines, install the upstream blind flange on the existing fill pipe, and install the plumb line up the structure to establish a new center line. The project concluded with installation of the lower fittings, wall supports, and new 12-inch pratt plug valve and seals. The new valve operator shafts were installed to the surface on the outside of the intake tower.

Once the bypass gate was opened to allow water to divert from the intake tunnel to where we were working, a fish net (installed by others) was sucked into the gate. On-site crews were able to pivot from the valve installation and removal to assisting with the net removal. Ballard crews used the barge mounted crane to access the downstream side of the gate with a man basket. While on the downstream side of the gate they were able to cut the net and chain free allowing the bypass gate to close.

The valve relocation, closer to the surface of the intake structure, provided accessibility and ease to actuate the valve from the top deck of the intake structure.

SERVICES PROVIDED:

- Barge Construction
- Concrete Coring
- Confined Space Diving
- Deep Water Diving
- Demolition
- High Altitude Mixed Gas Diving
- Mixed Gas Diving
- Piping Repairs
- Surface Supplied Air Diving
- Underwater Inspection
- Underwater Cutting/Welding
- Underwater Drilling
- Underwater Structure Measurements

DIVER DEPTH:

210ft.

OWNER/CLIENT NAME:

Portland General Electric

LOCATION:

Madras, OR

CONTRACT AMOUNT:

$607,900

PERIOD OF PERFORMANCE:

09/2021 - 12/2021

BALLARD MARINE CONSTRUCTION

San Vicente Pipeline

San Diego County Water Authority, San Diego, CA

This project involved the construction of a pipeline connecting the San Vicente Pump Station and the Rancho Penasquitos Pressure Control and Hydroelectric Facility. The pipeline is part of the San Diego County Water Authority's Emergency Storage Project. Major elements of the San Vicente Pipeline project included construction of approximately 57,228 linear feet of 102-inch ID pipeline between the San Vicente Portal site and the West Shaft site using tunneling methods; construction of access structures and appurtenant facilities at three locations (including 70-to-90-foot-deep shafts); two pipeline connections of approximately 303 feet and 160 feet respectively.

The project included many challenges due to the difficult ground conditions. The tunnel runs through six geological reaches and is one of the most multifaceted tunnels in the U.S. Many excavation methods were required to handle the difficult ground conditions, including drill and blast, NATM, hard rock TBM, and open-faced digger shield.

The drill and blast work on this project included an open-cut portal; a short 14 foot horseshoe-shaped starter tunnel on the east end; drill and blast of two shafts of about 30 feet in diameter and 90 feet deep; approximately 3,970 linear feet of drill and blast through mixed-face conditions in Reach 5; and approximately 500 linear feet of drill and blast through hard granite immediately in front of a digger shield in Reach 3.

VALUE

$248,948,762

DATES

07/14/2005 – 01/13/2011

ROLE

Prime contractor, joint venture

REFERENCE

Gary Bousquet
Senior Engineering Manager
Cell: (858) 335-6831
gbousquet@sdcwa.org

HIGHLIGHTS

- Water pipeline
- 11 miles long
- Extensive excavation methods

AWARDS / ACHIEVEMENTS

- 2016 ENR Global Best Projects Award of Merit in the Water/Wastewater Category

SALUDA DAM INTAKE GATE REPLACEMENT

PROJECT DESCRIPTION

Dominion Energy contracted Ballard to rehabilitate the five intake towers at the Saluda Dam and hydrogenation facility located in Columbia, South Carolina. This rehabilitation extends the service life of the intake towers for 50+ years and maintains FERC dam safety requirements.

Ballard performed extensive and detailed field inspections of all five towers to assess structural integrity, existing conditions of the headgates, and the headgate guide connections. Working with their engineering partner, Schnabel, Ballard was responsible for the design of the headgates and their replacement, supporting Dominion in their permit pursuits, and assisting with FERC documentation submission.

When conducting onsite operations, ROVs were used to mitigate risk and perform underwater inspections and construction operations, reducing the overall amount of manned underwater interventions by 30%. Both ROV and dive operations were performed at depths up to 200ft.

Ballard overcame many challenges on this project, including missing gate documentation and drawings, and the need to develop cost-effective solutions due to embedded gate sealing frames. Ballard used underwater laser scans to confirm measurements to ensure that the gates would seal, and fabricated gates to fit those dimensions.

During the investigation phase, a roller chain came off of one of the gates, leading to the chain laying at the bottom of the intake tower at a depth of 200ft. The Ballard team devised a significantly lower-risk recovery plan to recover the chain using an ROV and creative rigging to avoid a costly mobilization of a deep gas diving operation.

SERVICES PROVIDED:

- Remote Mobilization
- Alternative Delivery Contract
- Specialized Barge Spread
- Bulkhead Construction
- Concrete Coring
- Critical Crane Lifts
- Deep Water Diving
- Demolition
- Mooring System Installation
- Bathymetric Survey
- Surface Supplied Air Diving
- Underwater Surveys and Inspections
- Underwater Concrete Pours
- Underwater Cutting/Welding
- Underwater Drilling
- Underwater Laser Scanning
- Underwater Structure Measurements
- Vehicle Assisted Tooling
- Decompression Chamber
- Mixed Gas Diving
- Light Work ROV

DIVER DEPTH:

0ft – 200ft.

OWNER/CLIENT NAME:

Dominion Energy

LOCATION:

Columbia, South Carolina

CONTRACT AMOUNT:

$69M

PERIOD OF PERFORMANCE:

06/2022 – Present

BALLARD MARINE CONSTRUCTION

STRONTIA SPRINGS DAM ERDS REHABILITATION

PROJECT DESCRIPTION

The Strontia Springs Dam reservoir's emergency reservoir drawdown system (ERDS) rapidly releases water in an emergency scenario through a 50ft. long tunnel that runs through the base of the dam. The thrust nut on the ERDS control gate was damaged and required replacement, 200ft. below the reservoir's surface. Denver Water selected Ballard as its CMAR partner to perform the necessary repairs.

Ballard determined that the implementation of an effective dredging plan and careful execution of a massive bulkhead installation was pivotal to the success of the project. Ballard employed a marine barge spread which housed an on-board crane and supported diver-assisted dredging and mixed gas diving operations. Dredging material from in front of the existing trash rack was necessary to gain access to the upstream face of the ERDS. Ballard engineered and fabricated an in-water cofferdam to reduce the volume of material that required removal. Sediment was removed using a hydraulic pump, and disposed of in a topside decanting system.

Ballard removed the trash rack, as well as four 17-ton fixed wheel gates and their support chains. Ballard worked with Denver Water to design, fabricate and install temporary covers to minimize the opening left by the removal of the four fixed wheel gates. After removing the trash rack, divers guided the 44,000lb bulkhead into place. Cold weather and high altitude posed operational challenges when lowering and positioning the bulkhead in front of the ERDS. Working 250ft. beneath the surface placed limitations on working time and visibility. To correct the effects of high altitude, Ballard used mixed-gas diving techniques to maximize time in the water. Once the bulkhead was fully installed, Ballard coordinated with Denver Water to open the downstream gates which created sufficient differential pressure to seal the bulkhead.

In collaboration with Denver Water, Ballard removed the damaged control and maintenance gates, and oversaw the in-place machining of the gate sills and frames. Ballard installed new discs, stems, and thrust nuts for the maintenance and control gates, and reconnected both cylinders to the existing hydraulic power unit. Ballard then removed the temporary bulkhead, reinstalled the trash rack, and removed the in-water cofferdam.

SERVICES PROVIDED:

- Barge Construction
- Bulkhead Construction
- Confined Space Diving
- Critical Crane Lifts
- Deep Water Diving
- Demolition
- Diver Assisted Dredging
- Heavy Lift Crane Operations
- High Altitude Mixed Gas Diving
- Lift Bags and Specialty Rigging
- Mechanical Dredging
- Mixed Gas Diving
- Mooring System Installation
- Penetration Diving
- Rock Removal
- Surface Supplied Air Diving
- Turbidity Boom
- Underwater Inspection
- Underwater Cutting/Welding
- Underwater Drilling
- Underwater Dredging
- Underwater Excavation
- Underwater Structure Measurements

DIVER DEPTH:

250ft.

OWNER/CLIENT NAME:

Denver Water

LOCATION:

Littleton, CO

CONTRACT AMOUNT:

$3,614,193

PERIOD OF PERFORMANCE:

07/2016 - 12/2016

BALLARD MARINE CONSTRUCTION

TIGER CREEK AFTERBAY DAM

PROJECT DESCRIPTION

The Tiger Creek Afterbay Dam is a 120-foot high, 448-foot-long variable radius concrete arch dam 2350' above sea level with a gate overpour spillway. The dam contains a low-level outlet (LLO) discharge pipe at the base of the dam that required inspection, sediment and debris removal, and replacement.

The dam reservoir has limited access via highway, prohibiting easy equipment mobilization by water and required a unique equipment selection to perform deep water sediment removal. Dredging at a depth of 92 feet commenced, filling three barges a day, utilizing a fixed-arm excavator with a 360-degree rotating enclosed environmental bucket and GPS system. Dive inspections concluded the first phase, providing a detailed overlay of the underwater dredged area as well as the LLO.

The new LLO gate and actuator was designed and fabricated offsite based on the as-built dive inspection performed by Ballard. Ballard remobilized to the site and used a single crane barge for this evolution of the project. Ballard had a third party Naval Architect size and design the barge based on the worst case environmental loading criteria and the largest lift possible. An engineered and stamped mooring and stability analysis was provided including the calculation package. The LLO was sealed on the downstream side to allow safe access for the divers and the old LLO gate removed. An adapter plate was anchored to the wall, gate mounted, and actuator stem run to the top of the dam. The gate was tested and commissioned under full head using cameras to watch the successful operation.

Mechanical issues and turbidity spikes, as well as woody and rocky debris, created challenges, but communication with the owner and prompt action allowed for resolutions in a timely manner. Approximately 27,000 cubic yards of sediment and debris was removed from within the dredge prism, which exposed the LLO gate for inspection access.

Ballard worked closely with the owners and engineers through and ECI phase to develop an easily installed design and installation plan for the LLO gate.

SERVICES PROVIDED:

- 3D Mapping
- AUV (multi-beam and side scan)
- Barge Construction
- Concrete Coring
- Critical Crane Lifts
- Demolition
- Heavy Lift Crane Operations
- High Resolution Multi-Beam Imaging
- Mechanical Dredging
- Surface Supplied Air Diving
- Turbidity Boom
- Underwater Inspection
- Underwater Cutting/Welding
- Underwater Drilling
- Underwater Excavation

DIVER DEPTH:

85ft.

OWNER/CLIENT NAME:

Pacific Gas & Electric

LOCATION:

Pioneer, CA

CONTRACT AMOUNT:

$9.6M

PERIOD OF PERFORMANCE:

07/2019 - 12/2019

BALLARD MARINE CONSTRUCTION

VERMILION DAM RADIAL GATE REHABILITATION

PROJECT DESCRIPTION

Lake Vermilion Dam is a high-hazard, water supply dam owned and operated by Aqua Illinois. Built in 1925, the dam consists of: an earth embankment with a concrete core wall; a gated concrete spillway section with ten radial gates; a non-overflow concrete section; and an upper-level trash gate.

Serious gate deficiencies, including fractures in the gate anchors and pervasive section loss and corrosion on the skin plate and secondary gate members, were noted during routine dam safety inspection and evaluation. Replacement of the gates was recommended from Aqua's consultant including a prioritized replacement sequence.

During the Early Contractor Involvement phase, Ballard worked alongside Aqua and the Designer to collaborate on the design and construction sequencing. During this time, Ballard was able to provide all the means and methods to performing the work along with cost details for each phase. Ballard provided solutions during the construction sequencing planning to limit impact to the public and the surrounding homeowners.

The Ballard-Traylor Joint Venture (comprised of Ballard Marine Construction and Traylor Bros., Inc.) was subsequently contracted to replace the ten tainter gates and replace and install a new dam bridge deck. The main challenge associated with this project is dam safety while rehabilitating the aging infrastructure. While removing the bridge deck, the dam pier heads were vulnerable for seismic shifting or alignment issues. To counter the issue, the team installed forty-ton ballast blocks between each pier head on the upstream side of the dam. Alignment issues were also a concern as the gates share trunnions, leaving little alignment tolerance. Additional challenges include public impact, environmental control in dealing with potable water, weather constraints.

SERVICES PROVIDED:

- Bulkhead Construction
- Concrete Repairs
- Critical Crane Lifts
- Demolition
- Heavy Lift Crane Operations
- Surface Supplied Air Diving
- Survey
- Underwater Inspection
- Underwater Concrete Pours
- Underwater Cutting/Welding
- Underwater Drilling
- Underwater Grout Pour
- Underwater Leak Detection
- Underwater Structure Measurements

DIVER DEPTH:

20ft.

OWNER/CLIENT NAME:

Aqua Illinois

LOCATION:

Danville, IL

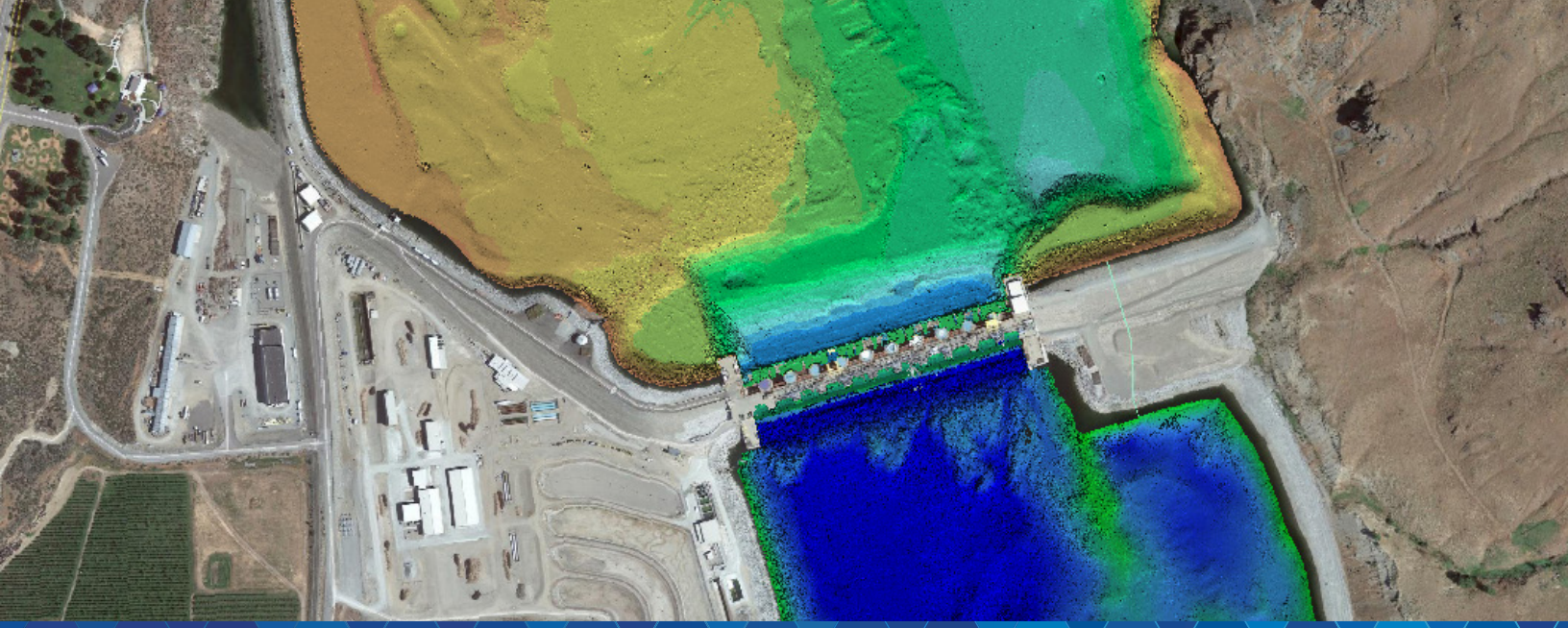
CONTRACT AMOUNT:

$14.4M

PERIOD OF PERFORMANCE:

12/2018 - 07/2020

BALLARD MARINE CONSTRUCTION



WELLS DAM INSPECTION

PROJECT DESCRIPTION

Ballard Marine Construction performed underwater video inspection on at Wells Dam power generation facility in general accordance with the U.S. Coast Guard (USCG)-accepted Association of Diving Contractors International, Inc. (ADCI) Consensus Standards for Commercial Diving and Underwater Operations (6th Ed.), the U.S. Occupational Safety and Health Administration (OSHA) 29 CFR Part 1910, Subpart T – Commercial Diving Operations (Dir. CPL 02-00-151; 2011), and the U.S. Navy Dive Manual, Rev. 6 (April 2008).

Ballard's Remote Sensing Division's (RSD) scope of work consisted of performing a high resolution multi-beam survey of the upstream and downstream toe of the dam, plus 1,000 feet in each direction, as well as bathymetric inspection of the tailraces, fish pump intakes and outfall, trash racks, spillway lips, and draft tubes as directed by an on-site representative. RSD then performed a detailed video inspection of the entire concrete face of the dam and provided a detailed report of the findings.

Ballard utilized a Teledyne Seabotix VLBV 350 ROV launched from RSD's surface vessel Miss Geodesy. Documentation of the inspection was carried out utilizing closed circuit underwater cameras. Work was performed in coordination with the Owner to prevent any unnecessary loss of production to the dam. This included collecting survey data in the operating flow of the upstream and downstream portion of the dam, and coordinating gate closures and opening to allow ROV work to proceed. Work was performed using plant control points providing horizontal and vertical control.

SERVICES PROVIDED:

- 3D Mapping
- Condition Assessment Rating
- Data Acquisition Services
- High Definition Camera
- High Resolution Multi-Beam Imaging
- Limited Access ROV
- RTK Base Station and Rover
- Sonar
- Survey
- Underwater Inspection
- Underwater Structure Measurements

ROV DEPTH:

150ft.

OWNER/CLIENT NAME:

Public Utility District No. 1 of Douglas County

LOCATION:

Chelan, WA

CONTRACT AMOUNT:

$40,000

PERIOD OF PERFORMANCE:

08/2020 - 09/2020

BALLARD MARINE CONSTRUCTION

300’ Arch Dam

The team, led by Traylor with Advanced Construction Techniques (ACT) and Ballard Marine Construction, was selected to reduce seepage occurring in the 300’ Arch Dam. Foundation leakage has progressively removed joint filling from the foundation rock in both of the abutments, resulting in 200 cubic feet per second of water passing through the foundation.

The team will reduce seepage by placing 240 grout holes with three lines along the dam. A work platform following the dam’s arch has been constructed to provide access to the work areas above the water. Data collection will include drilling, water testing, grouting, and QA/QC to update the dam and geological condition models.

Project challenges include having adequate containment on the work platform to protect the environment over protected waters, the unknown factors associated with drilling underwater, and manpower availability in a relatively secluded area. These challenges each have mitigations or plans in place, and once work starts, will be monitored closely.

Currently, the left abutment has been completely reduced, the center and right abutments have been significantly reduced. The current flow on the downstream is 123 cfs. The flow before the commencement of the project was around 180-200 cfs.

VALUE

$248,327,874

DATES

11/01/2021 – 08/05/2025

ROLE

Prime contractor, joint venture

REFERENCE

Classified

HIGHLIGHTS

- Structural steel erection
- Diver operations to maximum depths of 175 feet
- Drilling and grouting