HYDROPOWER SERVICES

Fish Passage Engineering Design Review Studies at Cougar Dam (OR)

Expert Services for Operations, Licensing, Relicensing, and Mitigation

Since 1894, Alden has been recognized as the preeminent engineering and environmental services provider by hydropower clients throughout North America. Project owners and developers rely on Alden for services such as feasibility studies, detailed engineering design, construction oversight, economic analyses, energy optimization, hydraulic evaluations, due diligence evaluations, modeling, field measurements, environmental studies, and a variety of other services related to the operation and relicensing of hydropower facilities. Our clients include small independent power producers and large utilities, and our professional staff are well-respected by state and federal resource agencies involved in hydroelectric development, licensing, and compliance.

Alden has specialized expertise in upstream and downstream fish passage issues at hydroelectric facilities and extensive experience with FERC licensing and compliance, including development of preliminary application documents, license and capacity amendment applications, study plans, and exhibit drawings. Alden scientists and engineers also have an extensive track record of successful agency consultations that have resulted in the best outcomes for our clients with respect to science and fact-based mitigation that minimizes impacts to project operation and economics.

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Eel Passage Studies at the Mine Falls Project (NH)

Preliminary Application Document, Study Plan, and License Application Development

Alden can assist project owners with the preparation of FERC licensing documents beginning with the preliminary application document and ending with the submittal of a final license application. In particular, Alden's hydropower professionals have experience with identifying, describing, and assessing affected resources, developing and executing study plans, evaluating alternative mitigation and project operation scenarios to address impacts, and leading agency consultations throughout the licensing process.

Fish Impingement and Turbine Entrainment

Alden's fisheries scientists have conducted numerous desktop evaluations of fish impingement and turbine entrainment for hydropower projects across the US. These studies are performed using agency and FERC-accepted approaches and models, and include the use of EPRI's fish entrainment and turbine survival database that was developed by Alden staff. Alden typically conducts impingement and entrainment studies in consultation with state and federal agencies to ensure the relevancy and acceptance of study results. The outcomes of these analyses have provided Alden's clients with information and data that have alleviated the potential need for expensive field studies and the installation of fish protection measures for reducing turbine entrainment.

Turbine and Total Project Downstream Passage Survival

Alden's hydropower professionals are leaders in the evaluation of turbine and total project downstream passage survival, with unparalleled knowledge of turbine blade strike probability and mortality models and the effects of various turbine passage injury mechanisms on a wide range of fish species. Alden has developed the most reliable blade strike model for determining turbine survival by incorporating empirical blade strike survival data collected during studies conducted at Alden for the Electric Power Research Institute. Alden's fisheries scientists have also developed a turbine survival model specifically for silver American Eel and applied it to numerous projects on the East Coast.

Upstream and Downstream American Eel Passage

Alden's fisheries scientists and engineers are experts in the evaluation and design of upstream and downstream fish passage facilities for juvenile and adult (silver) American Eel, having completed field evaluations of bypass efficiency and alternative design feasibility assessments for several projects on the East Coast. Alden has conducted juvenile eel surveys and eel ladder siting studies, as well as provided designs for eel ramp traps and permanent upstream passage facilities.

Fish Passage Feasibility Assessments

Alden frequently conducts fish passage feasibility assessments to evaluate site-specific conceptual designs of available technologies and approaches (e.g., modified project operations). These assessments are conducted with respect to biological performance, cost-effectiveness, and various site constraints. Feasibility assessments performed by our staff include preliminary engineering and biological screening of all available technologies and methods identified for providing passage of target species and life stages. Alternatives selected as most appropriate for a given project are then carried forward for a more detailed evaluation. For the detailed evaluation, conceptual designs and estimates of biological effectiveness and cost (order-of-magnitude) are developed for each selected alternative. Preferred approaches are typically identified and presented to resource and regulatory agencies for consultation, after which a determination can be made as to the best method(s) to provide safe and effective fish passage while minimizing costs and impacts to operations and power generation.

Conceptual and Detailed Fish Passage Engineering Design

Alden has become a leader in developing innovative and effective upstream and downstream fish passage designs for application at hydropower projects. Our engineering staff is fully capable of providing conceptual and detailed fish passage designs that meet agency and project owner requirements. In addition, our expert fisheries scientists provide design input with respect to target species behavior and swimming capabilities to ensure effective operation.

Saccarappa Falls Nature-Like Fishway (ME)

Instream Flow Studies

Alden has the capabilities to perform all aspects of instream flow studies at hydropower projects to determine acceptable minimum flow releases for protecting aquatic resources in spillway bypass reaches. These studies typically involve habitat data collection at several bypass reach flow rates to develop species and life stage specific habitat preference and suitability indices, which are used to identify seasonal minimum flow rates that balance the benefits to impacted aquatic organisms with power generation. Our staff has the experience and capabilities to develop instream flow study plans, conduct field data collection, complete habitat mapping and suitability analyses, provide detailed study reports, and successfully negotiate with state and federal agencies to set reasonable flow requirements that minimize impacts to fish and power generation.

Acoustic and Radio Telemetry Studies

Alden's fisheries scientists have experience with acoustic and radio telemetry techniques used for tracking fish movements and monitoring behavioral responses. Both field and laboratory evaluations have been conducted with these technologies to assess the biological performance of fish passage technologies. Evaluations completed by Alden have included the use of acoustic telemetry to track adult American Shad movements in a tailrace and behavior and passage of silver American Eel approaching turbine intakes equipped with new bypass systems. In addition, Alden has used radio telemetry to evaluate bypass efficiency of trout and acoustic telemetry to determine silver eel responses to behavioral guidance technologies.

Water Quality Monitoring and Assessments

Alden has the capabilities to perform water quality monitoring studies that are often requested by state and federal agencies during the FERC licensing process and to comply with State 401 Water Quality Certification requirements. These studies typically include the deployment of water quality meters in bypass reaches, tailwaters, and/or impoundments to continuously record water temperature and dissolved oxygen during specified times of the year(usually from late spring through early fall). Our scientists process and analyze the collected data and present the results in study reports submitted to FERC and the resource agencies.

Fish Passage Evaluation at the Prospect 3 Project (OR)

Field Services for Hydrographic Surveys and Turbine Performance Testing

Complimenting laboratory studies are numerous field measurements of turbine performance using the various code accepted methods of flow measurement, as well as computational fluid dynamics (CFD) studies. Additionally, our team has completed many dam and spillway evaluations that include hydrology, hydraulics, geotechnical and structural analysis. Along with the technology and skills needed to take these measurements in the field, Alden's engineers and biologists boast extensive experience in the application and utilization of gathered information. By having application-ready data and one-stop shopping for field measurement, analysis, and feasibility studies, clients reap the benefits of convenience and cost-effectiveness.

Numeric and Physical Hydraulic Modeling

Alden provides physical hydraulic and computational fluid dynamics (CFD) modeling in support of hydropower facility design and retrofits, fish passage facilities, total dissolved gas (TDG) abatement, compliance with ESA regulations, dam safety analysis, risk reduction and remedial design, and design of various flood control measures such as levees and barrier structures. Numerous hydraulic model studies of hydroelectric stations and related structures such as intakes, outlets, spillways, stilling basins, fish ladders, and navigation locks have been conducted. Other model studies have been conducted for a variety of phenomena related to low and high head hydro power and pumped storage. The numeric modeling staff at Alden offers decades of combined experience in CFD modeling and simulation of flow-related problems supported and validated by Alden's physical model studies. Our staff has the unique ability to apply both in concert for cost-effective, practical solutions to support our client's hydropower needs.

Structural Engineering Services

A natural extension of Alden's physical and computational fluid dynamics (CFD) modeling is our ability to offer hydraulic design and structural engineering services for hydropower facilities, dam appurtenances, and hydraulic gates. We work with clients to provide full project expertise from conceptual design to engineering services during construction. Whether for fish passage, total dissolved gas abatement, structural evaluation, retrofit, rehabilitation, or modernization of existing structures, our fully integrated hydraulic modeling and structural engineering team works to support a range of detailed design and analysis needs, including: structural analysis, 3D structural modeling, finite element analysis (FEA) modeling, preparation of basis of design reports, design documentation reports, drawings and specifications, potential failure modes analysis (PFMA), scour and stability analysis, spillway and stilling basin design and modification, dam and gate inspections, condition assessments, and design for repair, rehabilitation or replacement, as well as hydraulic structure layout, sizing, and design.

Pepperell Project (NH)

Alden Research Laboratory, LLC is an internationally acclaimed leader in solving flow-related engineering and environmental problems. For over 125 years and counting, Alden has provided engineering, field, and laboratory technical assessments to address regulatory agency compliance and operational requirements. With laboratories in Holden, Massachusetts and Everett, Washington and offices across the country in Fort Collins and Littleton, Colorado and Portland, Oregon, Alden provides engineering services, environmental services, physical and computational flow modeling, flow meter calibration, and field services. Founded in 1894, Alden is the oldest continuously operating hydraulic modeling and testing laboratory in North America.

Contact us for more details about the services listed in this brochure and discover how we can help your hydropower assets.

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