

Happy New Year! It's still business as usual in 2021

We are pleased to announce that despite the ongoing restrictions, we continue to operate in line with government guidelines and remain Covid-compliant at all times. There has been no interruption to our services and it is business as usual here at KGAL.

Holding Back The Flood

As the UK's "go-to experts" for design and specification of Water Control Gates and associated equipment, our portfolio of flood defence projects continues to grow. Looking back over the past 10 years, even we are impressed with the significant flood defence assets in which we have been able to assist with the design, development and construction, as well as the major upgrade and refurbishment on existing assets, many of which our engineers designed when they were first constructed. We're proud to summarise a few of the highlights.

UK Flood Defences

The Hull Tidal Barrier

When the Environment Agency was preparing to overhaul and improve the Hull Tidal Surge Barrier, KGAL was part of the Halcrow (now Jacobs) bid team for the role of Client's Engineer. The bid was successful and the team was tasked with delivering the Environment Agency's preferred option to improve reliability of the gate and associated operating systems. Work started in 2007 with thorough inspections of the gate structure, along with design and specification for the refurbishment of the gate and associated structures, and replacement of the complete operating and control systems. In addition to design services, we provided ECC PM and Supervisor services throughout the works contract, extending our role to the end of the contractor maintenance period in 2014.

Andrew J Newton BEng (Hons) CEng MICE, Humber Programme Manager, National Capital Programme Management Service, Environment Agency, said *"I have had the pleasure of working with many members of the KGAL team down the years and it has been just that - a pleasure. I worked with KGAL on the Hull Tidal Barrier refurbishment project, which was a particularly challenging project given the complexities of the design, fabrication, testing and construction, and KGAL's specialist team just made it happen."*

"KGAL was instrumental in making this exceedingly complex project such a success. KGAL understands what their client wants and always deliver in an extremely professional manner. They understand the importance of strong commercial control, and feel comfortable to challenge any member of the team. They operate the contract fairly but efficiently, enabling the Agency to control their budgets and manage the cashflow. KGAL was a key member of the team, engendering the partnering ethos which was required to complete this project to time and on budget. They are a pleasure to work with and will be the first name of my shortlist for future commissions."



The Hull Barrier at night

Foss Barrier

KGAL's involvement with the Foss Barrier upgrade stretches back to 2015 when we were appointed by CH2M Hill (now Jacobs) to carry out a full inspection and evaluation of the flood gate and its associated M&E operating machinery. Plans to upgrade the flood gate were overtaken by flood events over the Christmas period of 2015. Subsequently, KGAL's role was increased to include the design and specification of a replacement gate and operating machinery.

"I am continually impressed by KGAL's client focus, their willingness to help, and their effective working within an integrated project team. Their experience, could with a detailed theoretical and practical understanding of what is required to design and deliver a successfully functioning barrier gate is world class." Charles Skelpie, Global Technology Leader for Flood Infrastructure Engineering, Jacobs.



The Foss Barrier

Ipswich Barrier

KGAL's role on the Ipswich Barrier started nearly 20 years ago with optioneering studies for a proposed new flood barrier across the mouth of the River Gipping. Subsequently, KGAL was appointed to provide an exemplar design and specification for the new gate, a rising sector gate 23m wide x 9m deep and weighing circa 200 tonnes, and all the associated M&E systems. As the necessary approvals were achieved, KGAL continued to provide independent technical advice throughout the tender, design and construction phases, up to and including final commissioning. This also involved a range of staff at Factory and Site Acceptance Tests.

Andrew Osborne, Project Manager PCM, Environment Agency, said *"Over 10 years ago, I started work on the Ipswich Barrier project. During that period, KGAL has been providing professional, pragmatic advice on all matters relating to gate design and installation. They told it as it is, without fear or favour, to ensure that the Environment Agency was able to consider all the risks and manage them appropriately."*

The project was highly commended by the ICE in the Civil Project of the Year category of the 2019 National Construction Excellence Awards, with an award of Exceptional Merit for Technical Excellence and Innovation, as well as being shortlisted in the Climate Resilience Project of the Year category of the British Construction Industry Awards 2019.



Ipswich Barrier dry commissioning
(gate lowered)

Boston Barrier

In May 2016, building on a relationship formed on three previous significant flood barrier projects, KGAL was once again appointed by CH2M (now Jacobs) as independent technical advisors for the new Boston Flood Barrier, comprising a rising sector gate across the Haven and radial sector gates at the entrance to the port facilities. Our role included provision of outline design and specifications for the new barrier gates and associated M&E operating and control systems. We have been retained throughout the tender process and contract works period, up to and including attendance at the site commissioning and acceptance tests on the rising sector gate in November 2020. Works are now ongoing to support the design and construction of the radial sector gates.

Adam Robinson, Project Director the Boston Barrier for the Environment Agency said *“The Environment Agency has been working with KGAL and their experts throughout the tender, design and delivery phases of the Boston Barrier scheme. Their independent input and specialist knowledge have been invaluable in the assessment and assurance of both the primary barrier and the hydraulic control systems for the project.”*

The project recently won the ICE’s prestigious Edmund Hamby Medal award for creative design and sustainability.



Boston Barrier

Bridgwater

KGAL played an important part in the Bridgwater flood defence barrier across the River Parrett by developing the basic mechanical design to enable submission of the Transport Works Act Order (TWAO).

Andy Hohl, Programme & Contract Manager at the Environment Agency said *“building on experience and lessons from Hull, Ipswich and Boston barriers, KGAL collaborated with Jacobs and age Environment Agency to develop the outline design for the Bridgwater gates and MEICA systems and secured end user acceptance from our Operations Team.”*

The Bridgwater tidal barrier scheme will reduce existing and future tidal flood risk to Bridgwater and surrounding areas.



Computer generated image of the Bridgwater Barrier (image courtesy of Jacobs / Fereday Pollard Architects)

Looe

We have been working with WSP on behalf of Cornwall Council to provide a feasibility study on the viable options for a new tidal surge flood defence gate for Looe Harbour in Cornwall.

Working closely with Looe Harbour Commissioners and Arcadis, the development manager, we have examined all available gated options with WSP to provide both the required level of flood

protection and functionality, including mitre gates, sector gates, rising sector gates and vertical lift gates to name but a few.

The report has now been finalised for all stakeholders for review to identify the requirements for the next outline design stage of the project.

Significant gates further afield

Asia

Starting in Korea, back in 2010 KGAL designed a set of five rising sector gates, not dissimilar to those at the Thames Barrier, on the **Nakdong River** in Korea. Forming a moving weir, the gates measured 40m long x 8m high, and weighed in at a massive 2,200 tonnes. This was part of the Four Rivers Regeneration - at the time, was one of the largest gate related schemes in the World.

This was quickly followed by another set of rising sector gates on the **Han River**, this time seven gates, each measuring 45m long x 3m high and weighing 250 tonnes. We subsequently received a further commission to design one pair of floating sector gates, 60m wide x 7.4m deep and weighing 285 tonnes each, at **Yeongsan**. Each design commission was followed up with factory inspections and site attendance during installation.

Staying in Asia, let's move down to Lao PDR. When it comes to designing large gates, KGAL were responsible for the design of all the hydraulic steel structures (gates) for the 1285MW **Xayaburi HEP** on the Mekong river in Southeast Asia.

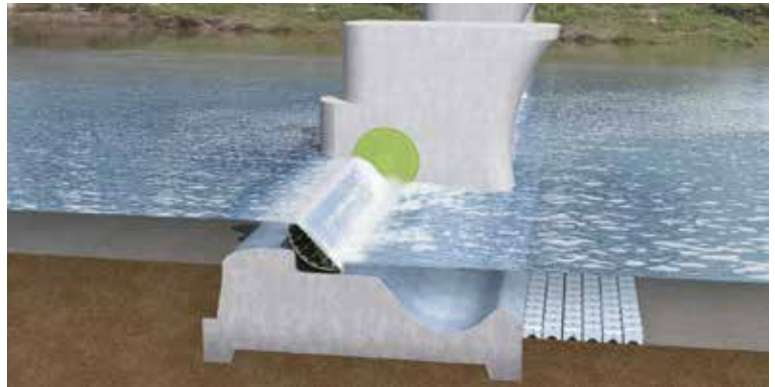
The seven spillway radial gates are amongst the largest of their type in the World at 25m high by 19m span, each weighing in at 465 tonnes.

In addition to the spillway, KGAL designed gates for the navigation lock, powerhouse and the fish pass, which is also amongst the largest in the World.

KGAL's parent company, Whessoe Sdn Bhd, manufactured and installed all the hydraulic steel structures, totalling over 30,000 tonnes. The project reached commercial operation on 29th October 2019.



Nakdong weir with five rising sector gates



Computer generated image of the rising sector gates on the Han River



The floating sector gates at Yeongsan



Xayaburi HEP Spillway

Africa

KGAL was appointed by Stucky to work alongside them and the Contractor on the major rehabilitation project funded by the World Bank and the African development Bank project at **Kariba Dam**, the World's largest man-made reservoir, situated on the Zambezi between Zambia and Zimbabwe.

Our ongoing role involves refining and developing the designs for the hydromechanical and civil works to optimise manufacture and installation. The six new sets of built-in parts designed by KGAL are 33m high with a span of 10m and will withstand the force as the 150-tonne emergency gate closes against a flow of 1,500 tonnes of water per second. The gantry crane

has a capacity of 500 tonnes and the two steel cofferdams weigh in at over 250 tonnes each.

We've been involved for five years since 2016 and the project stretches out to 2024. The main contract was awarded to a consortium of GE and Freyssinet in 2019, with the works officially commencing in November 2019.

The manufacture of the hydromechanical works is currently in progress at factories in Poland and China, with the first items due for delivery to site in early 2021. We will continue to be involved as the works progress to site, especially with the first installation of the 550ft needle cofferdam, designed by KGAL, and the integration of additional works into the site programme.



Kariba Dam rehabilitation

Staying in Africa, we head to **Cahora Bassa** on the Zambezi River in Mozambique, a large hydropower project operated by Hidroeléctrica de Cahora Bassa (HCB). KGAL has been commissioned by Manitoba Hydro International Ltd (MHI) to assist with technical and commercial expertise for the refurbishment of the low-level spillway gates.

There are eight tunnel-style spillway radial gates with a 6m span, 9m depth and 90m head, which are operated by a single hydraulic cylinder. The dam suffers from the effects of AAR. LTU Portugal is contracted to carry out the site work, mainly involving the repair of the side seal and rolling faces by insitu machining.



The Cahorra Bassa Hydropower Plant

Our Flood Defence Team

Our Water Control team combines more man-years of direct water control gate design experience that any other comparable UK consultancy, bringing together a broad range of knowledge, skills and expertise, with each member contributing individual insights and complementary talents - all with shared common values. This feature includes work by and contributions from:



Dave Griffiths,
CEO



Russ Digby,
Regional
Managing
Director



Stewart Wingrove,
Technical
Director



Brent Imlison,
Associate
Director



Rob Pitt,
Associate
Director



Ken Grubb,
Consultant



Jasper Taylor,
Senior
Engineer

Current UK Projects

Novel designs for eel screening

As part of the National Environment Programme, Phase 5 (NEP5) issued by the Environment Agency (EA) to Severn Trent Water Ltd (STWL) back in January 2016, and the Eels (England and Wales) Regulations 2009, STWL identified four river water intake works along the River Severn that required works to reduce the environmental impact of STWL's operations on eel populations.

As a result, a best practice eel screening solution comprising river front travelling belt eel screens, in this case a Hydrolux model, is to be installed at the Mythe Water Treatment Works (MWTW) 1964v intake. This is a follow on contract for the eel screen installed at the 1941 intake.

In combination, Prosteel Engineering, Costain and KGAL have developed a novel design for the eel screen and its support

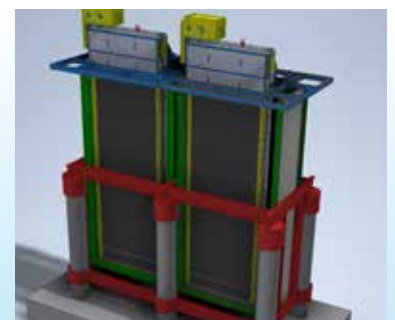
structure to be mounted atop six river driven piles. This unique design allows for all the dimensionally tight tolerances and adjustment works to be accomplished on the shore, and it has removed a significant proportion of any river work, thereby reducing diver involvement to an absolute minimum. It is anticipated that this design will also help to greatly reduce on-site construction time.

KGAL, Prosteel and Costain have entered into an Agreement and contracts to help deliver the structure in an incredible short timeframe, with installation to commence in early 2021.

This is the second eel screen support that KGAL is to design for Prosteel/Costain and it is a partnership that we hope to build on for further similar installations.



The eel screen support structure at MWTW 1941 intake



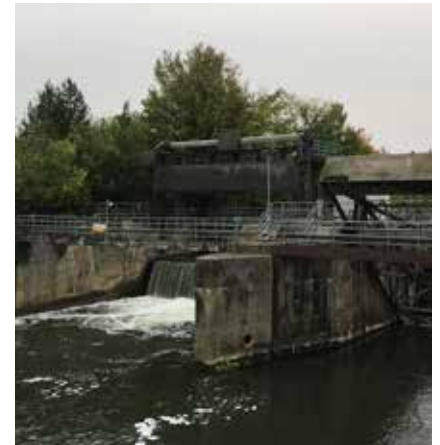
The 1964 intake 3D design

Twerton

KGAL was retained by Mott MacDonald on behalf of the Environment Agency (EA) to prepare designs for the refurbishment of the radial and vertical lift gates installed at Twerton on the River Avon near Bath.

Our scope involved the detailed design of upgrade works to the gates and associated operating gear and control systems. The design of upstream and downstream stop log systems and the provision of a site supervisor for the construction phase have subsequently been added since the project moved into the site works stage.

We remain involved in the recovery plan helping the EA deliver a solution that reduces risk until the capital scheme is implemented.



Twerton on the River Avon

NEWS in brief.....

- **Glenlochar** - We have completed the design of the specialised lifting and transport towers and the fixed gantry necessary to allow access to the 103m-long barrage. The design of the cofferdams for the upstream/downstream closure of the gate is ongoing. Extensive use of 3D modelling of all structures has been used to check operation and speed the design process. Site preparation works by the principal contractor AJT commenced in October. Read more about the £6m investment here: <https://renews.biz/63614/drax-invests-6m-in-scottish-hydro-refurb/>
- **Loch Laith** - We are investigating the testing of a counterbalanced flap gate situated 1,500ft above sea level at Loch Laith in the Scottish Highlands. The gate operates without external power based on water level only. Testing requires high loch levels, which only occur during major storms when access along forest tracks would be difficult, so we're reviewing testing methods that might be applied to allow the gate to be operated under controlled conditions.
- **Mossford** - We have completed hydraulic transient studies associated with the replacement of a 2.44m diameter penstock protection valve.
- **Kayan 1 HPP** - We have been appointed as a member of the Dam safety Panel reviewing the hydromechanical aspects of the dam for a 900MW hydropower project in Kalimantan, Indonesia.
- **Singapore Coastal Reservoirs** - As part of an ongoing initiative to maintain and improve the resilience of fresh water coastal reservoirs in Singapore, KGAL has been appointed by Jacobs on behalf of PUB to evaluate coastal defence and reservoir level regulating gate structures for future-proofing against rising sea levels. The work will involve site inspections and structural assessments to identify improvements to existing gates, and the design of replacement gates within numerous coastal reservoirs. (Await approval DG/ Charles Skelpie approved - awaiting approval from Singapore)
- **Lincoln Washlands** - Jackson Civil Engineering (JCE) appointed KGAL to carry out design checks on the existing stop logs and lifting beam prior to deployment at two sites as part of refurbishment works on the Lincolnshire Washlands Flood Alleviation Scheme. The stoplog structures were evaluated against current Eurocode Standards to withstand a larger design head. We identified the need for minor structural modifications, along with improvements to the sealing/guiding arrangements. The works were carried out by Centregreat Engineering under supervision by JCE. JCE were appointed as the current NGS Framework Contractor for Hub D. (a/w approval from Ivan Nicholls/Darren Blank via DG).

THE KGAL TEAM: Say Hello, Wave Goodbye

We end the year by welcoming **Mohammad Arshad** to the KGAL team. Mo joined us in September as a Graduate Mechanical Engineer after gaining a First Class MEng from Cardiff University. He had previously worked with us as part of our undergraduate placement scheme and now, as a permanent team member, he is working on a number of key projects and extending his knowledge of the detailed design of hydraulic steel structures.



Mohammad Arshad

And we say goodbye to Yong Shi, who has retired after almost 18 years service. Yong was our lead structural analyst specialising in the Finite Element Analysis of a wide range of hydraulic steel structures and drive mechanisms, and she led the way in the application of appropriate design standards to the design of water control gates and moving bridges. Regional MD, Russ Digby, said " *Yong has been an important member of our team, delivering the very highest standard of structural analysis across a wide range of designs. She'll be a very hard act to follow and we'll miss her enthusiasm, professionalism and patience. On behalf of all of us here at KGAL, I wish her a long and happy retirement.*"



Yong Shi