



# fluid



the newsletter from KGAL **Spring 2018**



## New look for 2018!

Welcome to the first issue of our new-look 'fluid' e-magazine, filled with interesting project updates, video footage and news from KGAL.

We hope that you enjoy this first 'Fluid' of 2018 and we look forward to keeping you up-dated about - and working together on - some exceptional projects throughout the coming year.

## KGAL awarded another hydro project on Nam Kong

The Whessoe/KGAL team has been appointed by Chinese civil contractor CGGC as the Hydro Mechanical Contractor for the Nam Kong 3 hydropower project (NK3) in Laos, SE Asia.

Chaleun Sekong Energy Co Ltd (CSE) is building the NK3 scheme in Southern Lao PDR, about 10km from Nam Kong 2 (pictured), where bottom outlet works were recently completed by Whessoe/KGAL.

NK 3 HPP consists of a 60m high RCC dam with a gated spillway on top and a river diversion bottom outlet integrated into the dam body. The intake for the power waterway is in a different location on the reservoir to minimise the length of the power waterway, which consists of a headrace tunnel, part concrete-lined and part steel-lined. The powerhouse has three turbine units with a combined installed capacity of 54MW.

KGAL will design all the Hydro-Mechanical Equipment, including:

- spillway radial gates
- bottom outlet slide gates and radial gates with liners
- power intake gate and trashracks
- draft tube gates
- power intake penstock liner and 2 bifurcations

## Ipswich Flood Barrier crosses the North Sea to the UK

A tidal gate weighing 192 tonnes has arrived in Suffolk, ready to be installed in the new flood barrier at Ipswich.

Ipswich has a long history of flooding, with more than 1,500 residential and 400 commercial properties currently within the risk area. The new tidal barrier is designed to protect Ipswich from flooding during a tidal surge. Located across the mouth of the River Gipping, the barrier will also control fluvial velocity exiting the river after extreme fluvial events, and will consist of a rising sector gate spanning 23m wide and 9m deep.

KGAL has been retained by Ch2m, on behalf of the Environment Agency, as specialist sub-consultants to the Independent Technical Advisor for the new barrier gate, land-based flood gate and associated M&E systems on the Ipswich Barrier Project. Our role includes:

- Preparing an outline design and tender specification for the gate and M&E equipment

- Reviewing and commenting on design submissions received from the Contractor for all gates and related M&E equipment, coordinating where necessary with specialist engineers within our team

- Responding to Contractor technical queries relating to gates and related M&E equipment

- Attending monthly MEICA liaison meetings and advising the Environment Agency on MEICA related issues

- Attending in person or coordinating attendance by our specialist engineers to act as the Environment Agency Representative at Factory Acceptance Tests for the various items of plant and equipment

- Witnessing and accepting the equipment on behalf of the Environment Agency after the final Site Acceptance Test.

The delivery of the gate from its manufacturing site in Rotterdam is a significant step towards the completion of the Environment Agency's £70m project. The barrier is expected to be operational in the Autumn of 2018.



Image courtesy of Hollandia



The FAT gat being inspected before shipment



## The refurbishment of Storr Lochs

The Isle of Skye's Storr Lochs Power Station can be found on the shores of Berreraig Bay, just off the A855, below Loch Leven Dam, which holds back the waters of Loch Leven and Loch Fada. Access to the station is by winch operated railway or on foot; there are no roads. It is an idyllic location overlooked by the Old Man of Storr and the nearby beach is a treasure trove for fossil hunters

KGAL's involvement with the re-planting and upgrading of Storr Lochs began in late 2011 with an initial scoping visit to look at the possibilities for refurbishing or replacing the original equipment. The initial engineering work looked at the potential for running two units instead of three and retiring one of the two existing penstocks to reduce the onerous maintenance costs of keeping the two pipes in service.

The scope and extent of the work was developed over the following years until, in April 2015, the contract was placed for the supply of two replacement generating sets. Subsequently, other major orders were placed for new transformers, replacement of the electrical controls, protection and switchgear, refurbishment of the penstocks, misc. civil works, and other minor mechanical and electrical works. KGAL's role was to provide the Project Manager under various NEC3 forms of contract, fulfil the role of Principle Designer

and manage the site works with a resident Site Manager.

In December 2017 the new equipment at Storr Lochs went into full-time commercial service and KGAL is proud to have played a part in renewing the energy production in this beautiful part of Scotland.



Aerial view of the scheme

The original Storr Lochs project was constructed between 1950 and 1952 with an installed capacity of 2.4MW. Through its life the station produced an average 8 million kWh of electricity annually through three Gilkes Francis turbines.



Loch Leven dam



The new generating unit and control suite



The original generating equipment

## State of the art design for aspirational new bridge over the River Clyde

KGAL and Cass Hayward have been working alongside Sweco UK Ltd since late 2015 to provide specialised engineering consultancy services to Renfrew Council in respect of a new movable bridge across the River Clyde in Renfrew, Scotland.

KGAL's role has involved considering, evaluating and designing options for the M&E elements of the Clyde Crossing Bridge, a 184m long, twin leaf cable stayed swing bridge, and associated control buildings.

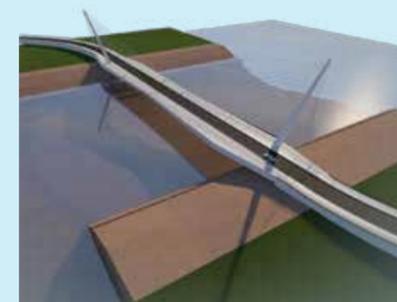
The £92m Clyde Waterfront and Renfrew Riverside Project (CWRR) bridge will have to maintain a clear navigable channel width of 90m across the River Clyde, with two carriageways and two cycle/footpaths. The overall length of each bridge leaf of the twin leaf cable stayed swing bridge will be in the order of 92m, with each leaf weighing approximately 3,100 tonnes.

A number of options for the type of bridge had been considered by Kettle Collective Architects, with a selection of concept designs put forward for consideration by the Client's selection process, with KGAL playing an important role in advising on the relative viabilities and costs for each option from an

M&E point of view. The final architectural design has been endorsed by Architectural Scotland and the chosen concept has been delivered up to the specimen design stage by KGAL and Cass Haywood, with the bridge team in KGAL's Gloucester office providing mechanical, hydraulic and electrical specimen designs, together with the AIP and functional requirements specifications.

The design posed a number of challenges in order to satisfy the architectural aspirations and the sheer size of the crossing; in particular, the severe skew of the abutments and the nose interface, and issues relating to thermal expansion requiring the development of an active expansion joint. Moment reactions due to live load, dead loads and superimposed loads resulting from differential heating resulted in a 7m dia slewing ring bearing to a Rothe Erde design being used to support the bridge deck.

Commenting on KGAL's involvement in the project, Chris Cardno, Operations Manager at Sweco, said "Since commencing work on the commission, the KGAL team has consistently delivered to a very high standard under a tight programme. They've taken a



Double leaf swing bridge design

very pro-active approach to design rationalisation and value engineering to the benefit of the project. I'm delighted with their valuable and significant contribution to the CWRR project."

The bridge will be going out to tender in the New Year and KGAL has been asked by Sweco to continue supporting the project by being involved in the tender and construction phases.

## The first boat in over 80 years travels through Wallbridge Lower Lock, marked by a royal visit

Wallbridge Lower Lock, which forms the link between the 18th Century Stroudwater Navigation and the Thames and Severn Canals, now known collectively as the Cotswold Canals, has been restored, allowing the two canals to be connected for the first time in more than 80 years.

Having been abandoned in 1933, the lock had fallen into disrepair. The lock wall eventually fractured and twisted due to unstable ground conditions, which caused the wingwall to completely collapse into the canal.

Before further structural damage could be caused, temporary structural props were installed and KGAL was employed as Principal Designer to assist Stroud District Council in managing the permanent solution design process. Tony Gee & Partners provided an optioneering study and subsequent detailed design incorporating vertical columns recessed into both lock walls in a mass concrete surround and a reinforced concrete slab. A new capping beam was cast across the top of both lock walls with horizontal cross beams installed.

As construction work began on site, Stroud District Council identified a requirement for a project management and supervisory role due to the ongoing complexities, and engaged KGAL to undertake these tasks throughout the project life cycle.

As work progressed, construction and design challenges arose which required changes to both the design and method of construction. One such challenge was caused by the lock wall twisting around its fracture line, breaking all contact with its adjoining sections. The design had to be revised to

incorporate large diameter anchors being installed diagonally to stitch the brickwork together. With the added risk of the wall falling into the lock, additional temporary propping systems were used, and although this prevented the wall from moving, it introduced further restrictions in the working area.

Due to environmental constraints, stop planks had to be used to allow the lock to be drained. Unfortunately, due to the condition of the lock wall, water became a constant challenge with large pumps being used to keep the working area dry. At times water would force its way through small fissures above chest height and Health & Safety plans were constantly reviewed with escape plans having to be used on more than one occasion.

"With the combination of tight budgets, a short timescale and an ever-changing complex site, we needed someone who could think on their feet, understand all the issues and manage the contractor," says Dave Marshall, Stroud District Council's Canal Manager. "KGAL's Darryl Rasdell fitted the bill perfectly, often having to juggle several pressures. He also brought the added reassurance for me of having the resources of a large company behind him."

The lock was the final structure for restoration in an ongoing 10-year project funded mainly by the Heritage Lottery Fund and led by Stroud District Council. Works were completed in December 2017, allowing the project to be signed off and a new funding application to the HLF to be submitted for the next phase of works.

A boat carrying HLF representatives travelled the 4.5 miles from Stonehouse to Bowbridge, through the newly restored Wallbridge Lower Lock - the first time in over 80 years that a boat had travelled from the Stroudwater Navigation to the Thames and Severn Canal.

The lock was officially opened on 2nd February by HRH Prince Charles.



image courtesy of Cotswold Canals Trust



Before restoration



After restoration

## Carpenters Road Lock brought back to life

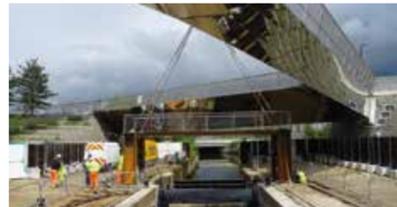
The Canal & River Trust, the charity that cares for 2,000 miles of waterways in England and Wales, realised a long-standing vision in August 2017 by restoring the navigability of Carpenters Road Lock in the Queen Elizabeth II Olympic Park, opening up the last connection to a 6km network of remainder waterways known as the 'Bow Back Rivers'.

Carpenters Road Lock had been abandoned for over 40 years, and when the area was improved for the 2012 Olympics, the original dilapidated radial gates were simply replaced with stoplogs.



Carpenters Road Lock in 2002

Working with the Principal Designer from the Trust, lead engineer Arcadis and Principal Contractor, Kier Construction, KGAL designed the two new counter balanced radial lifting gates (thought to be the only lock in the UK with this kind of mechanism) and associated control gear. The new lock gates were designed to faithfully replicate the original gates, with limited headroom for installation beneath the mirror-clad pedestrian bridge over the lock installed as part of London 2012. The new gates were fabricated and



Installing the new gates

assembled in modules of no more than 1.5 tonnes. The Trust's Principal Designer, Andy Nicholls, said "KGAL were efficient and proactive throughout the design phase and provided excellent support during construction. They were willing to take into account complex historical features that required some innovative lateral thinking, which has helped to give the lock its significant heritage importance and which, in turn, helps make Carpenters Lock a real visitor destination."

The work was successfully completed in late Summer.



Restoration completed



See our e-magazine to view this video  
<https://tinyurl.com/fluid-spring-2018>

Carpenters Road Lock Restoration Video

## Xayaburi eye in the sky

Having previously published a number of progress reports with static photographs of the works we're doing at Xayaburi HEP in Lao PDR, we now have the opportunity to share some video footage of the site shot from our drone. This was filmed in early 2016 and significant progress has been made since then, but it gives a great impression of the scale of the site and works.



See our e-magazine to view this video  
<https://tinyurl.com/fluid-spring-2018>

Xayaburi - Eye in the Sky Video

## KGAL designs meet the needs of Europe's leading hydropower market

Norway is the largest producer of hydropower in Europe; its total output meets over 98% of the country's electricity demand. Helping to maintain that delivery is the Nordic Investment Bank, which is co-financing the refurbishment of three hydropower projects in mid-Norway.

One of these projects is Byafossen; a plant run by NTE Energie AS, one of Norway's largest electrical contractors, and Norwegian energy infrastructure specialist, HMR Husnes, is helping with the refurbishment. KGAL has a long-standing history of partnership with HMR across a number of projects in and around Norway, mostly within the hydropower sector and, on this job, we were contracted to provide the designs for four wheeled / roller vertical shut off gates and associated trash racks, and a bypass flap valve gate.

The roller gates are each approximately 4.8m sq and the trash racks are 4.6m wide and 6.4m tall. Our design work was largely influenced by the environment; the station is located in a national salmon river and, on completion, conditions for salmon will be improved.

KGAL delivered a complete package of detailed manufacturing drawings ready to be issued to the workshop. The components were fabricated by HMR in Riga, Latvia, and installation is now in progress.



The trash rack 'flounder' and wheeled gate embedded track in fabrication in Riga



See our e-magazine to view this video  
<https://tinyurl.com/fluid-spring-2018>

The video shows the gates being installed at Byafossen

## News in brief...

**Buckie Shiplift Project:** KGAL Consulting Engineers Ltd has been retained by Macduff Shipbuilding Ltd to provide mechanical, hydraulic and electrical design services for the design of a new shiplift for their facility at Buckie Harbour, which they wish to fully restore to working order due to a full order book. The Client wishes to utilise some of the existing installations e.g. main hauling winch and main slipway cradles. KGAL and their design partner, Arch Henderson, will assist the client in setting these back to work. Ultimately, KGAL will carry out CE Marking and PUWER Audit of the final installed equipment.

**Port of Tilbury:** The three Port of Tilbury lock gates were originally installed in 1929 and, subject to one gate replacement, have operated successfully for approximately 87 years. These are now due to be replaced with new lock gates, with

the outer lock gate also providing a flood defence barrier. This project is a joint venture (JV) between the Environment Agency and the Port of Tilbury and will eventually lead to the decommissioning of the existing Tilbury Flood Defence Barrier. KGAL has produced the tender specifications for the mechanical, hydraulic, electrical and, in conjunction with Civil Consultant, Hayd Evans, the civil specification. AECOM has been contracted by the JV to provide the contractual documentation and to facilitate the placing of the invitation to tender through the OJEU system in 2018.

**Wakefield hosts PIANC gathering:** We welcomed guests from around Europe, including Belgium, Holland, France and Germany, to Wakefield on 25th January as we hosted the PIANC Inland Waterways Division's Working Group No.197.

Our very own Nick Crosby chaired the meeting, in which we were looking at hydropower associated with inland waterways navigation.



Attendees of the PIANC meeting in KGAL's Wakefield office

## EXPOSURE

We had a busy few weeks in October showcasing KGAL's expertise at major industry events for the UK's ports and harbours and the international hydropower sectors. We exhibited at the BPA conference in Poole and HYDRO 2017 in Seville; both events were well-attended and very useful, giving us the opportunity to build our relationship with a number of key customers, partners and acquaintances, both old and new. We're planning to maintain our presence exhibiting and speaking at these and other events again this year.

Come to say hello to us in 2018 at:

- Asia 2018 in Danang, Vietnam (13-15 March)
- Bridges 2018 in Coventry, UK (14 March)
- Flood & Coast 2018 in Telford, UK (20-22 March)
- ICOLD 2018 in Vienna, Austria (1-7 July)
- HYDRO 2018 in Gdansk, Poland (15-17 October)
- BPA 2018 in Tyneside, UK (9-12 October)

(L-R) Andy Hughes (independent consultant) with KGAL's CEO, David Griffiths, and Project Director, Tim Doyle, on the KGAL exhibition stand at HYDRO 2017 in Seville



## Grand Prix for KGAL's Andy

KGAL's very own Business Development Manager, Andy Stevens, enjoyed a once in a lifetime experience last Autumn as a guest at the last ever Formula One Grand Prix to be held at the Sepang International Circuit in Kuala Lumpur, Malaysia, .....

Andy Stevens at the F1 Grand Prix in KL (front right)

## KGAL joins the Premier League

KGAL Consulting Engineers is proud to support AFC Bournemouth in the current Premier League football season.

KGAL Regional Managing Director and life-long "Cherries" fan, Russ Digby (right), is pictured here with Brian Benjafield (left), Commercial Executive with AFC Bournemouth.

"We are very pleased that KGAL has chosen to support the Club and look forward to a strong relationship in the future" said Brian.



## And finally...

Some things that we do are not always visible to our clients, partners or sub-contractors. This may be because they do not warrant much attention, they may seem rather mundane, or perhaps we just don't have room for the full story. Occasionally though, these smaller things do deserve attention.

Each year KGAL tries to support a local charity or good cause and last year was no different. In 2017 we selected Caring In Doncaster, a local charity that supports homeless and vulnerable people in the Doncaster area. The effect of the donation made by KGAL is perhaps best described in the words of one of their volunteers:

I would like to thank KGAL Consulting Engineers again for the generous donation that you made and give you an update on what the money has been used for.

"Caring in Doncaster" is a small voluntary group that helps the homeless and vulnerable in Doncaster. Firstly, we run a drop in every Sunday evening, feeding in excess of 60

people each week. Secondly, and more importantly, we try to help people transition from homelessness to a more orderly and structured way of life; helping direct them through local services, assisting them in their quest for employment and housing, and finding them furnishings and equipment once they have somewhere to live. We provide a friendly face to help these people through some very difficult times. We do this because we believe that feeding on its own is not sufficient and risks sustaining their current lifestyle - we don't want to sustain it, we want to change it for the better!

Many homeless people are caught in a set of circle problems that we might find exceptionally easy to solve; obtaining a birth certificate or photo ID to prove who they are, opening a bank account so they can be paid and can pay rent, obtaining tokens to feed utility meters, obtaining a mobile phone so they can communicate with support services and dislocated family members: all minor issues for most of us but major obstacles if you are homeless. KGAL's donation has

significantly helped us to provide solutions to these types of issues and thus support people making the transition away from homelessness.

The work we do would be impossible without the donations we receive; so thank you once again for supporting our group."

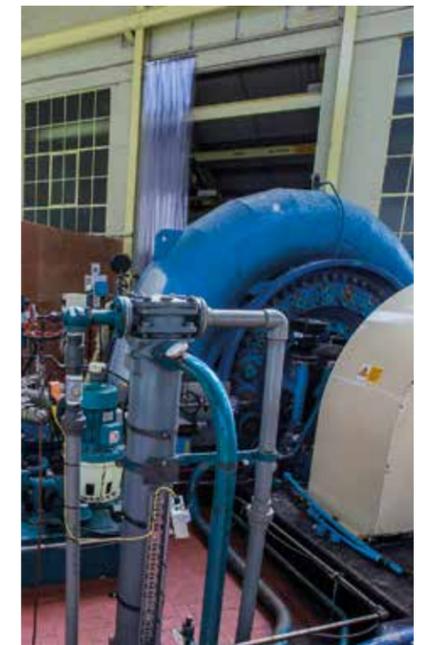
It is not just the engineering we do that makes us proud; sometimes supporting our local community is just as important.



Moving Structures



Water Control



Hydropower



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