

## INTERNATIONAL WORK

### EACOP Groundwater Monitoring Procedure

Continuing work with RSK East Africa for the East African Crude Oil Pipeline, WRA supported by Hafren Water reviewed a project guidelines document for monitoring groundwater, which is used widely along the pipeline route for construction camp water supplies.

Objectives of monitoring are to confirm that EACOP water supply meets permit conditions and project environmental standards, and that increased groundwater abstraction does not adversely affect other users. This was to be achieved by ensuring that robust monitoring and inspection were carried out at locations with sensitive groundwater resources, and that the guidelines have adequate information on boreholes and equipment, with outline of best-practice and procedures for water quality sampling and laboratory analysis.

The pipeline route begins in Kabaale-Hoima in Uganda, passing south of Lake Victoria through Lubeho Camp in Tanzania to a marine terminal in Tanga Bay.



Groundwater monitoring at Lubeho, Tanzania

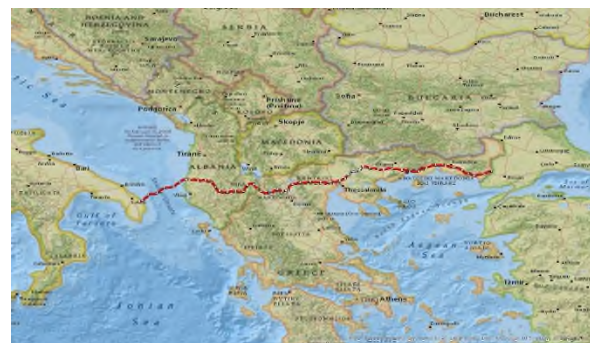
There is currently no national groundwater monitoring programme in Tanzania, but groundwater levels are monitored in several areas of the country, and in some places have been monitored for decades. The Ministry of Water [MAJI] has established groundwater monitoring stations in four basins: Pangani, Wami/Ruvu, and Rufiji. Groundwater level monitoring is also done in observation wells in Arusha by the Arusha Urban Water Supply Authority, and in TPC-Moshi. Most of these measurements are taken manually on a daily basis. Data collected by the Ministry of Water are held by the Water Resources Division (WRD).

The Ministry of Water, through its nine Lake/River Basins, also has a water quality monitoring network. Each Basin is responsible for the management and operation of its respective monitoring network and monitoring is generally carried out on a quarterly basis.

The procedure document reviewed the hydrogeology of each of the 14 groundwater supply sites, and produced pro-formas for data capture, sampling and equipment.

### Climate Change and Trans-Adriatic Pipeline

WRA undertook an assessment of climate change risks associated with the trans Adriatic gas pipeline which has been constructed from Turkey through Greece and Albania, under the Adriatic Sea before emerging at the terminal in southern Italy. The study considered the impact of flooding, wildfires, extreme temperatures, and changes in vegetation along the pipeline route. Flooding was a particular issue in relation to numerous river crossings and above ground facilities which had been constructed.



Route of the Trans Adriatic Pipeline

In relation to flooding, the review found that climate change scenarios projected a decrease in annual rainfalls in the eastern Mediterranean in the period up to 2050, but that the magnitude of extreme rainfall events would increase.

Detailed hydrological and hydraulic modelling undertaken on rivers in Albania to advise on the flood risk for an above ground facility had used rainfall data from 1950 to 1980: a revised assessment of the rainfall return periods at this location was recommended. The south-eastern Mediterranean region will be at increased risk of extreme temperature and wildfires over the same period: however, with the pipeline being sufficiently buried, the risks to its continued operation are low.

## UK WORK

### New Thames Boatyard in Maidenhead

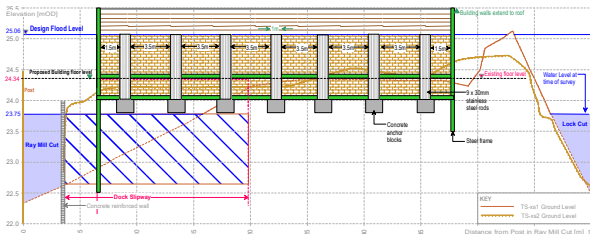
WRA was commissioned by Peter Freebody & Co Ltd, to provide a detailed flood risk assessment for planning, relating to the development of a replacement boatyard workshop, jetty, docks and slipway at Boulters Island. This project followed a disastrous fire in August 2018 which destroyed one of the original wooden buildings.

The site is located on Boulters Island, where the land is 40 to 43 m wide, between Lock Cut and Ray Mill Cut. The new boatyard would flood during events exceeding the 25-yr return period level, with 0.6 to 0.9 m depth of flood water in a 100-yr+CC flood event [equivalent to

1894 flood level]. Consequently, design of the new structures had to consider floodwater velocities across the site and building design that would not obstruct flow or reduce floodplain storage. The building had to be flood-resilient, while allowing floodwater to pass through the building up to design flood level, so that the interior would not be damaged and could be quickly brought back into service without significant refurbishment.



The historical boatyard and workshop building



New Building and Flow-Through Structure

The new building contains openings which are 1 m wide, extending from existing ground level to design flood level, every 5 m around the base of the building walls. The openings are fitted with 30 mm diameter stainless steel vertical rods, fixed in masonry at ground level and bolted to the upper steel structure of the building, at 100 mm intervals across the 1 m opening. This retains a 73% open area for floodwater.

The building structure has also been designed to withstand water pressure and the array of steel rods will prevent damage from floating debris being transported in the flood water.



Workshop interior and slipway

## Property Level Flood Risk Surveys

Over the past year WRA have undertaken more than 20 property level flood risk surveys. This is for domestic and commercial properties which have suffered from flooding, and need independent advice on what flood alleviation and resilience measures can be implemented. Given the prolonged period of extreme rainfalls from October 2023 to the current date, we have responded to properties affected by Storm Henk in January 2024, Storm Bert in November 2024 and other incidents in February, May, August and September 2024. The WRA surveys provide a comprehensive assessment of the nature and risk of flooding at the site using a combination of background environmental information, hydrological modelling and fieldwork at the site. The fieldwork includes measuring ground levels, building floor levels, an inspection of the local drainage and hydrology, and assessments of points of water ingress into the property.

WRA provides recommendation on measures to stop the ingress of water, measures to make the property more resilient if flooding were to occur, non-physical measures such as flood warning, response and insurance, and also can advise wider community level measures which should be implemented through the local authority.



Damaged home interior in one WRA survey

## New Associate



We are happy to report that Jamie Ledingham is now a WRA Associate. He has a strong background in hydrological and water resource modelling and we look forward to working closely together. Jamie is currently providing

HYSIM training to the Pangani Basin Water Board on location in Tanzania for WRA-RSK involvement in the EACOP Sigi River Study.

## Next WRA Board Meeting

25<sup>th</sup> April 2025, Blewbury

The WRA Bulletin is a quarterly publication, and relies on contributions submitted by Partners, Associates and Consultants. The document is circulated by email, and published on the WRA web-site, aiming to keep the WRA network up-to-date with respect to current activities. Please email contributions for future issues to Paul Whitehead: [paul.whitehead@watres.com](mailto:paul.whitehead@watres.com)

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