Integrated Constructed Wetlands (ICWs) for Urban Stormwater Management - Dodder and Griffeen Park Biodiversity Showcases

AILA CARTY

VESI ENVIRONMENTAL LTD

DUBLIN URBAN RIVERS LIFE (DURL) PROJECT

WATER QUALITY IN URBAN RIVERS CONFERENCE

Dublin Urban Rivers Life

Three Integrated Constructed Wetlands (ICW) developed to treat stormwater and misconnections within Griffeen Valley Park (1 No.) and Dodder Valley Park (2 No.)

A joint venture between VESI Environmental Ltd. and Killeen Civil Engineering to design and build the Dodder and Griffeen ICWs.

Life

Comhairle Contae Átha Cliath Theas
South Dublin County Council

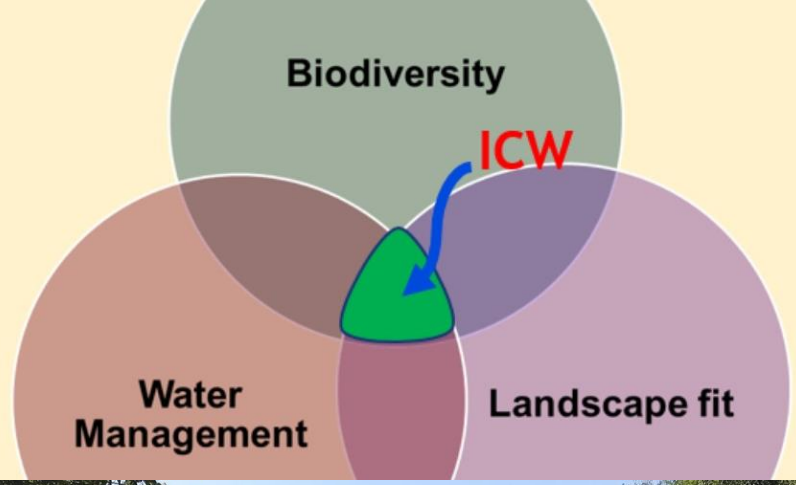
VESI ENVIRONMENTAL
Integrating our water back into nature

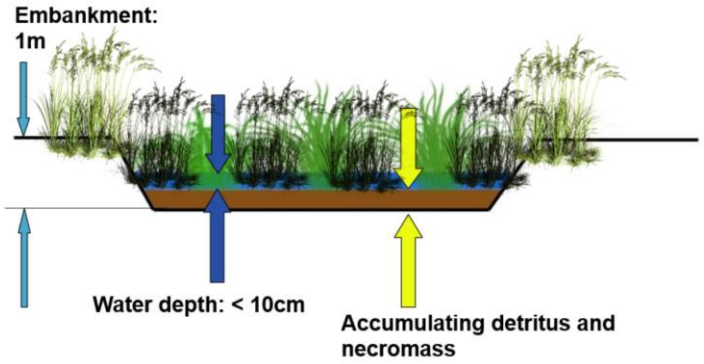
Killeen Civil Engineering

dlr Comhairle Contae County Council

Integrated Constructed Wetlands (ICWs)

- ICWs are a series of shallow, surface-flow, vegetated wetland cells, constructed in a manner which mimics naturally occurring wetlands.
- The wetland treat and cleanse through-flowing waters of their contaminants - facilitated by naturally occurring biological, chemical, and physical processes.
- ICWs strive for passive operation, integration with the surrounding environment, increasing the biodiversity and achieving the broadest socioeconomic outcomes.
- ICWs in development over 25 years





ICW PROJECT AIM :

- DELIVER IMPROVED WATER QUALITY TO RECEIVING WATERS
- BIODIVERSITY ENHANCEMENT WITHIN PARK LANDSCAPE
- PUBLIC AMENITY FEATURE –(PARK SETTING)
- MINIMAL OPERATIONAL AND MAINTENANCE REQUIREMENTS

Griffeen Valley Park 2021

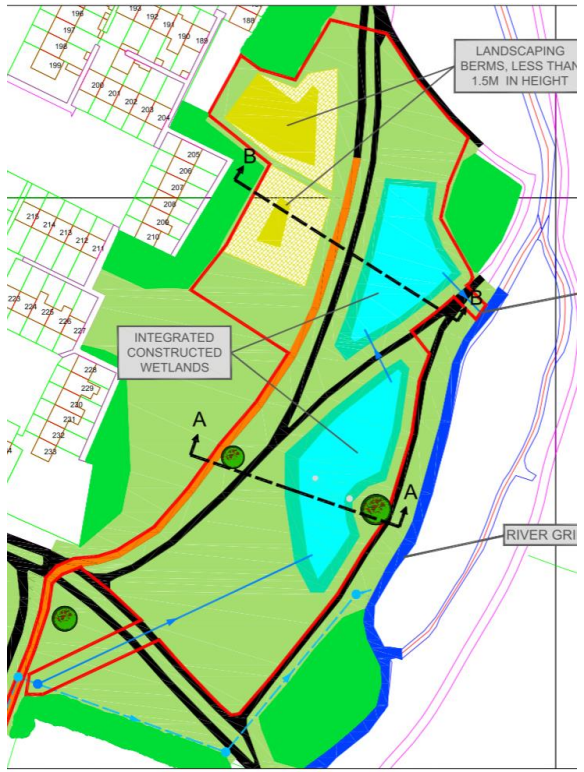
Dodder Valley Park 2021

DESIGN & CONSTRUCTION PROCESS

- Evaluation of design parameters, flows, water quality, site characteristics and planning conditions
- Designing hydraulics at the inlet and connection to existing infrastructure and outlet design
- Detailed design of ICWs including layout, features (operational and aesthetic), species selection etc.
- Liaising and communications with SDCC, each site had its own landscaping and biodiversity requirements
- Design between the projects to allow for quick succession-coordinating logistics, planting carried out behind construction works allowing for commissioning straight after
- Community engagement(Information and planting events)

Griffeen Valley Park

- Two cell ICW to manage and treat incoming contaminated stormwater
- Treatment Area: 2,648 m^2
- Flow: 24l/s
- Gently sloped embankments from existing ground to wetland base 1:4
- Planting of over 5,000 wetland plants, 1,500 marginal plants, additional 59 trees and 10,000m^2 grass seeding and wildflower seeding
- Landscaping of adjacent areas, including playing field with excavated soils



Griffeen Valley - Construction

Challenges

- Connecting to existing stormwater pipe
- Ground conditions – soils, elevations
- Changes to design – no boardwalk, inlet and outlet pipes, layout

Griffeen Valley

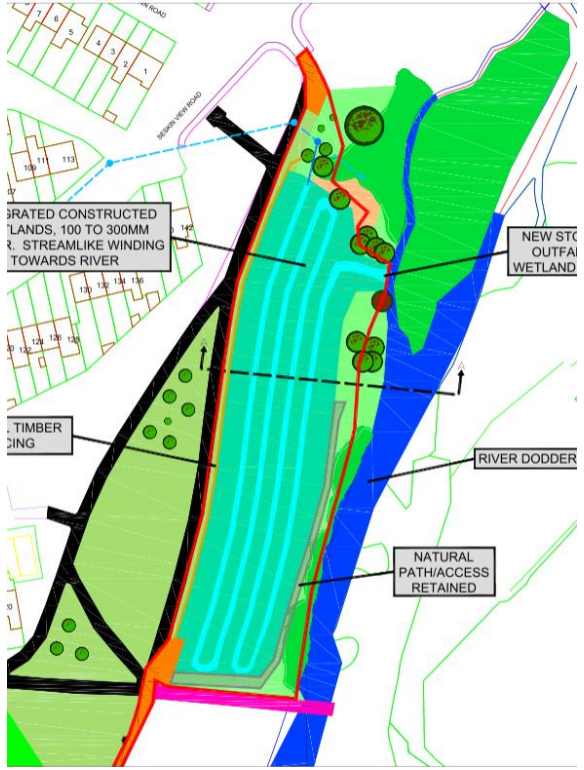
Plant species

- All native species
- Treatment cell area – *Glyceria maxima, Typha latifolia, Typha angustafolia, Carex acutiformus*
- Marginal areas – *Iris pseudoacorus, Lythrum salicaria, Mentha aquatica, Caltha palustris, Alisma plantago-aquatica, Ranunculus spp., Myosotis scorpioides*
- Trees – Rowan, Cherry, Alder and Apple

Table 2: ***Wildflower mix***	
Product Name: Biodiversity Wildflower Meadow Mixture (Tolerates light-shade)	
Product Code: WF02	**Pure wildflower no grass seed**
Annual Mayweed, Birdsfoot Trefoil, Black Meddick, Bladder Campion, Bluebell, Burdock, Cat's Ear, Common Sorrel, Corn Marigold, Corn Poppy, Corn Spurry, Corncockle, Cornflower, Cowslip, Devil's-bit Scabious, Eyebright, Field Scabious, Flag Iris, Fleabane, Foxglove, Garlic Hedge Mustard, Hemp Agrimony, Hoary Plantain, Kidney Vetch, Ladies Ann Lace, Lady's Bedstraw, Common Centaury, Lesser Knapweed, Musk Mallow, Marjoram, Meadow Buttercup, Meadowsweet, Mullein, Ox-Eye Daisy, Pineapple Mayweed, Purple Loosestrife, Ragged Robin, Red Bartsia, Red Campion, Red Clover, Ribwort Plantain, Rough Hawksbit, Selfheal, Shepherd's Purse, Smooth Hawksbit, St. Johnswort, Teasel, Vetch Common, Weld, White Campion, Wild Angelica, Wild Carrot, Wild Valerian, Woundwort, Yarrow, Yellow Agrimony, Yellow Rattle	

Dodder Valley Park, DR33

- Two cell ICW in a serpentine configuration within steep embankment including new outfall to River Dodder
- Treatment area: 600 m^2
- Flow: 20l/s
- The planting of more than 2000 wetland plants, whips as boundary planting and 5,500m^2 grass seeding
- Landscaping of surrounding area including grading of embankment
- Fencing along park path

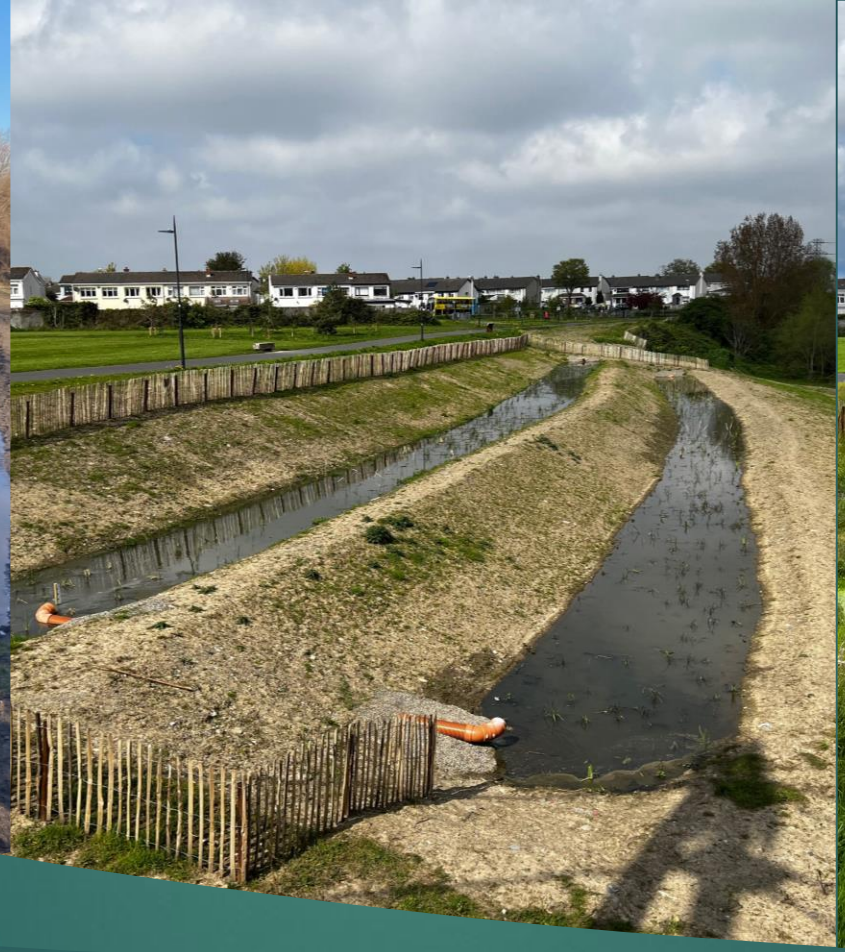


DR33 Construction

Challenges

- Changes to design – configuration
- Ground conditions - topography
- Time of year completing works
- Incoming pipe (deep)
- Set backs - Public use/paths, river, trees

January 2023



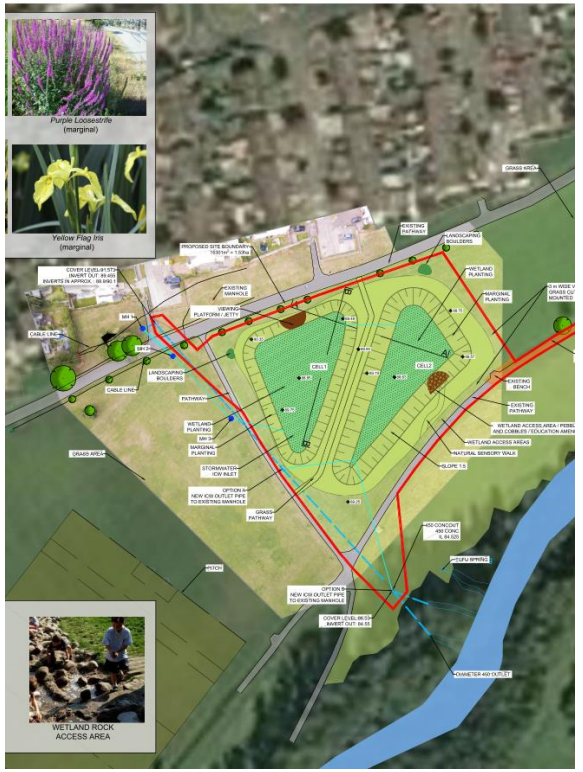
April 2023

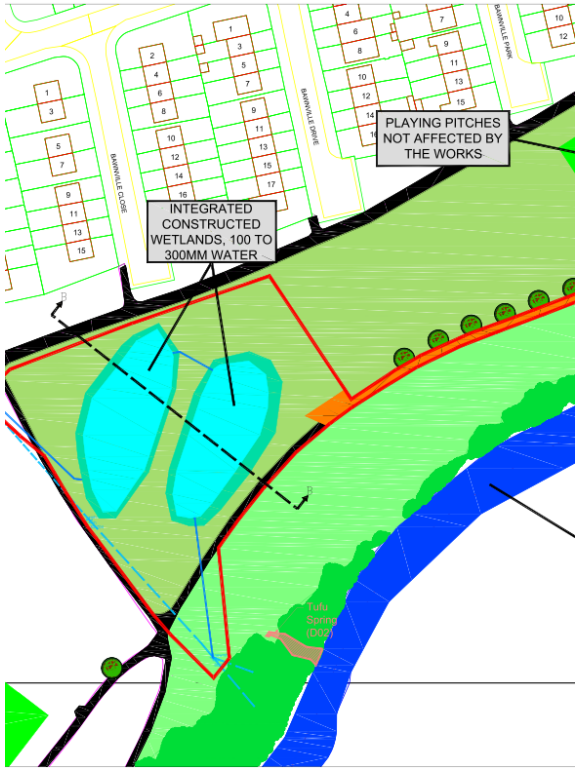
July 2023

DR33 Establishment

Dodder Valley Park, DR35

- Two cell ICW to manage and treat incoming contaminated stormwater
- Area: 1756m^2
- Flow: 23l/s
- Embankments 1:4
- The planting of more than 3,500 wetland plants, 1,000 marginal plants and 5,500m^2 , clover (red & white).





DR35 Construction

Challenges/changes

- Changes in design – reduced plant species, sensory walk, trees, jetty
- Connecting with existing incoming and discharge stormwater network
- Utilities/services

After planting September 2022

10 months after planting

Only wetland cells and margins planted. Construction area landscaped using on site soils, grass sod and seeded with clover. No additional trees, shrubs areas or wildflower

DR35 Planting & Establishment

Community Planting

- Community planting days (Dodder and Griffeen) were organized by VESI, Killeen Civil and South Dublin County Council as an opportunity for the local communities to actively engage with the project directly, but also to inform and educate the local community on the project aims, benefits and services.

- This was graciously attended by many local individuals, groups and families (>100) who joined VESI in planting biodiversity-rich marginal plants around the wetland cells

Design/ Construction experience

- Varying flow and contaminant loading between sites
- Limited site area – treatment area optimsed within each site
- Connecting with existing infrastructure
- Site specific landscape requirements
- Operational management within a public amenity park
- Time of year - ground conditions and plant establishment

Existing Infrastructure

October 2022 (DR33)

December 2022 (DR33)

Commissioning Experience – 12 months

- Time of year (seasonal)-Flows, Vegetation establishment
- Public setting
- Vandalism
- Public perception – seasonal change and information

August 2022 (Griffeen)

February 2023 (DR35)

October 2022 (Griffeen)

May 2023 (DR35)

Public Vandalism

August 2023 (DR35)

Timeline - 2 years

- Tender approval **November 2021**
- Design commenced **Q1 2022**
- Construction works began on site in Griffeen Valley Park in **July 2022**.
- Works began in Dodder Valley Park in **August 2022 at DR35**
- Works began in DR 33 Dodder Valley Park in **Mid September 2022**
- All construction works were **completed** by beginning of **November 2022**
- **12-month maintenance (defects) period**

Dodder Valley Park Integrated Constructed Wetland Sod Turning Event on 23rd August 2022

GRIFFEEN VALLEY PARK INTEGRATED CONSTRUCTED WETLAND SOD TURNING EVENT ON 26TH MAY 2022:

Planting carried out behind earthworks generally allowing commissioning straight after

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September 2022

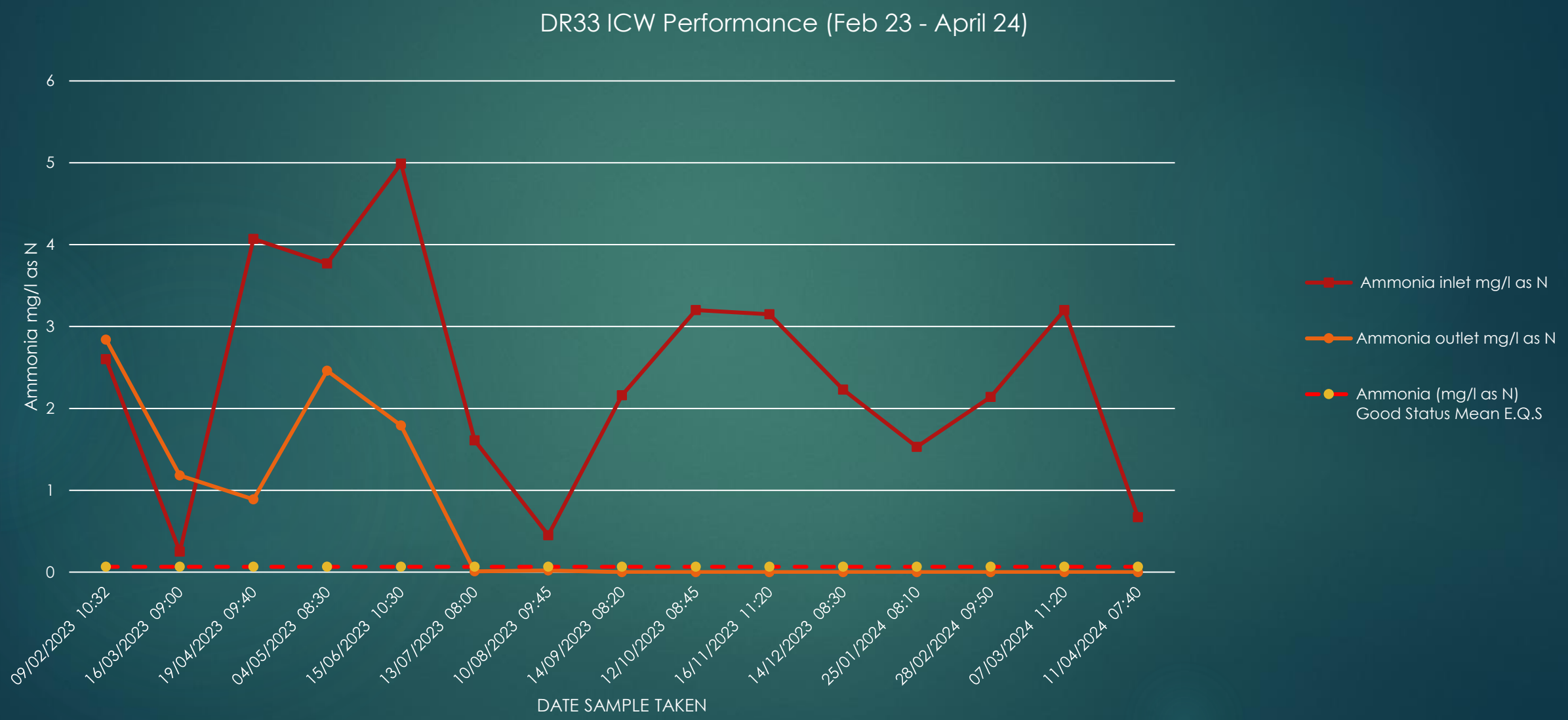
Performance

Ammonia reduction of ~96%

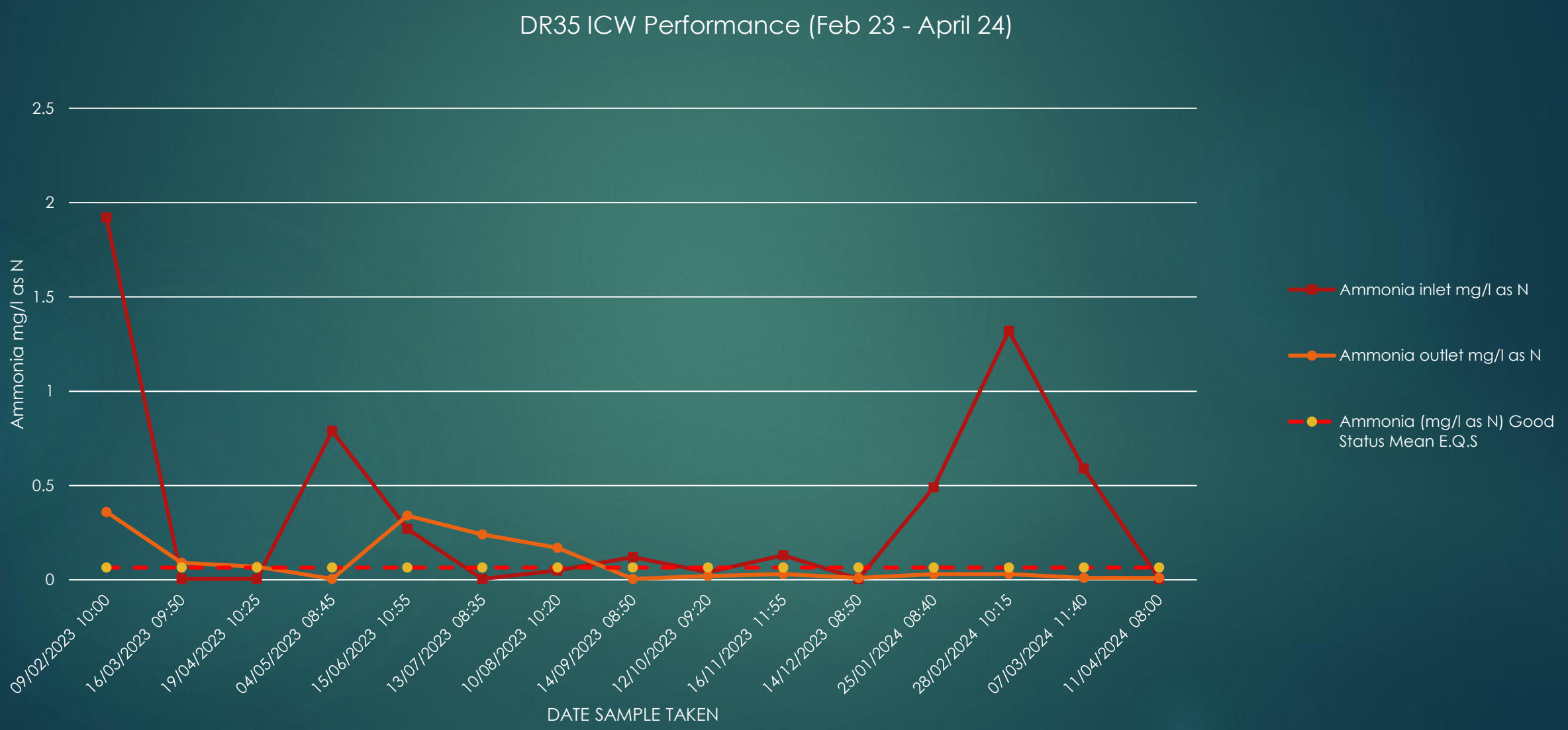
Phosphorus reduction ~70%

E.coli reduction ~99%

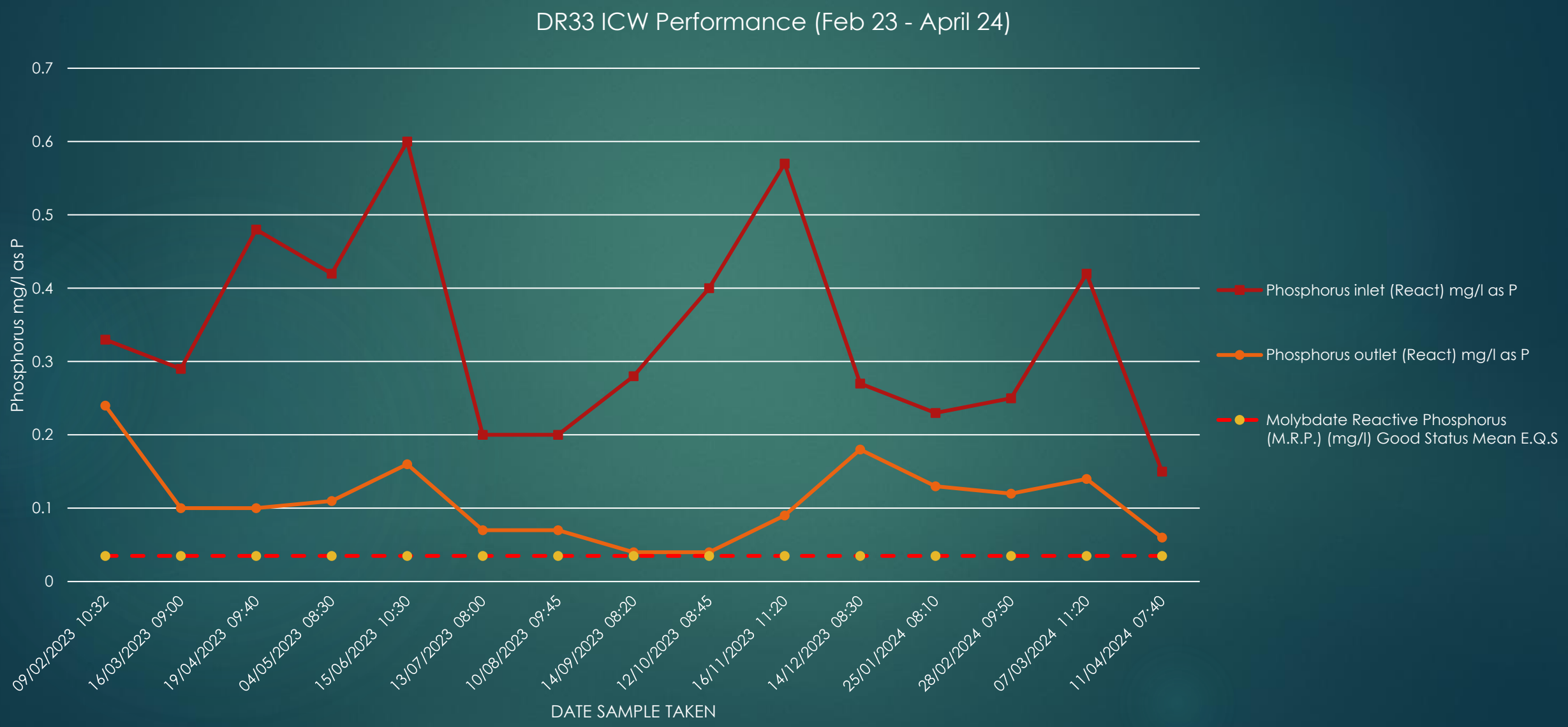
Performance: Ammonia



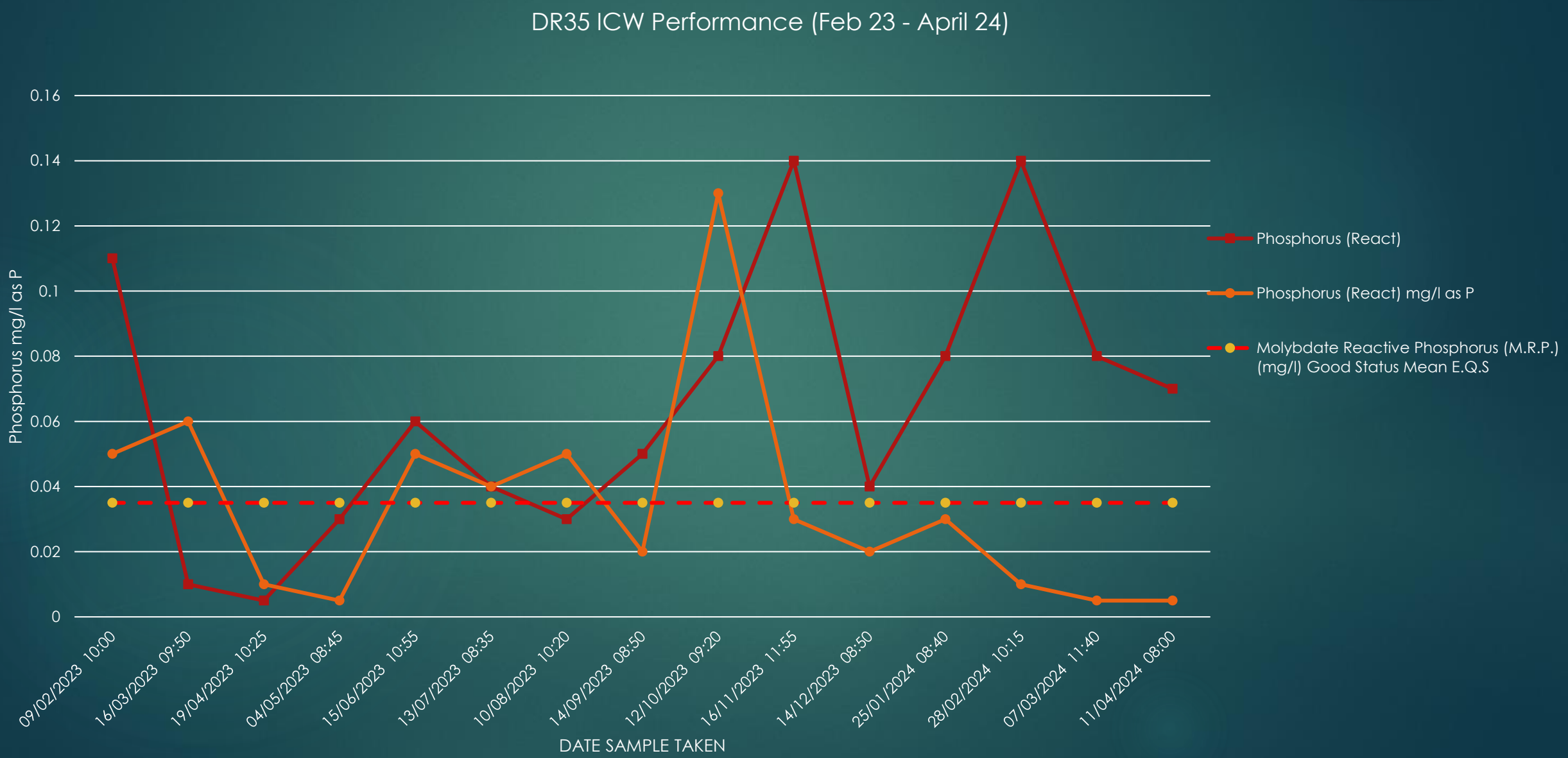
Performance: Ammonia



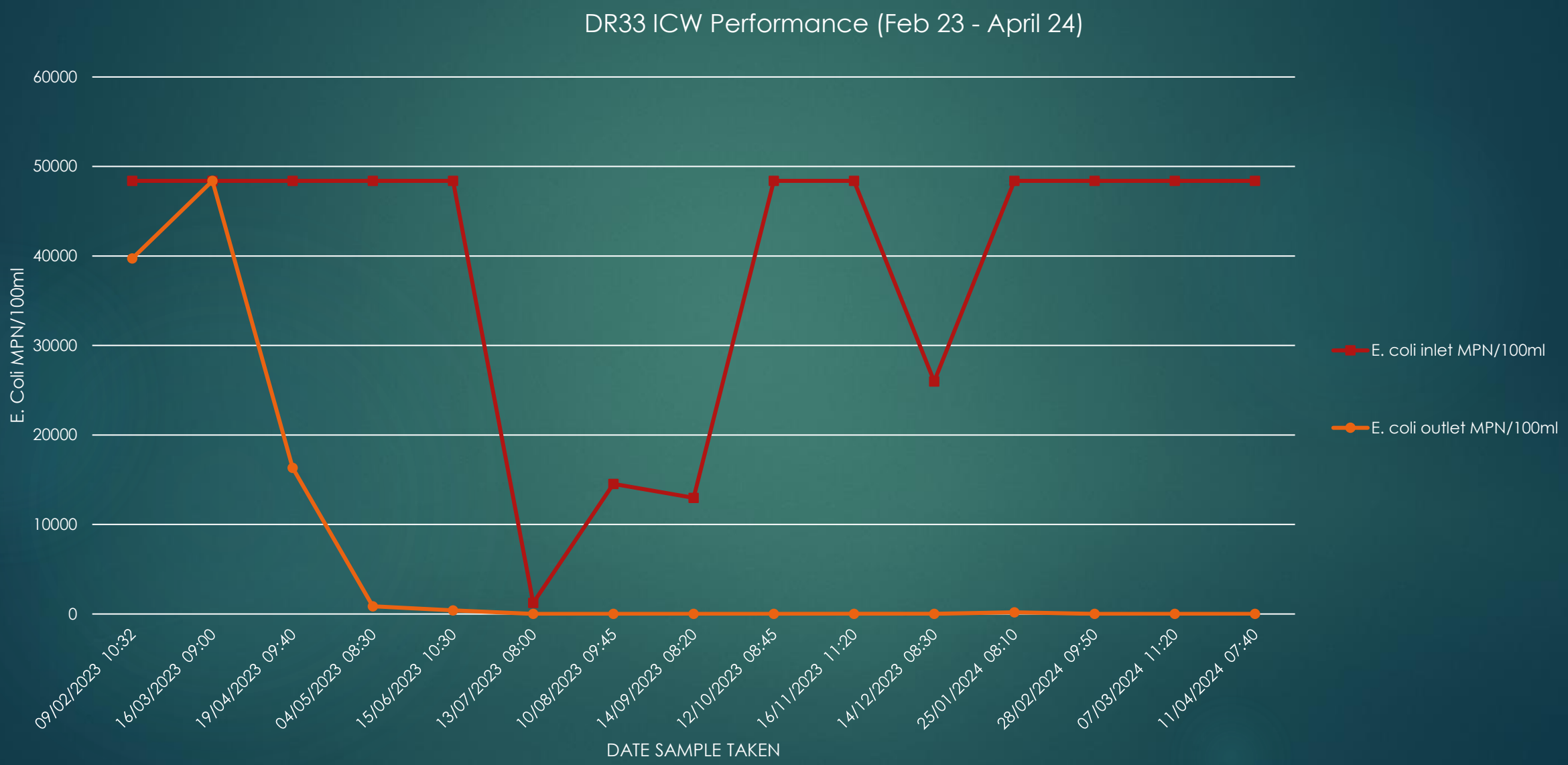
Performance: Phosphorus



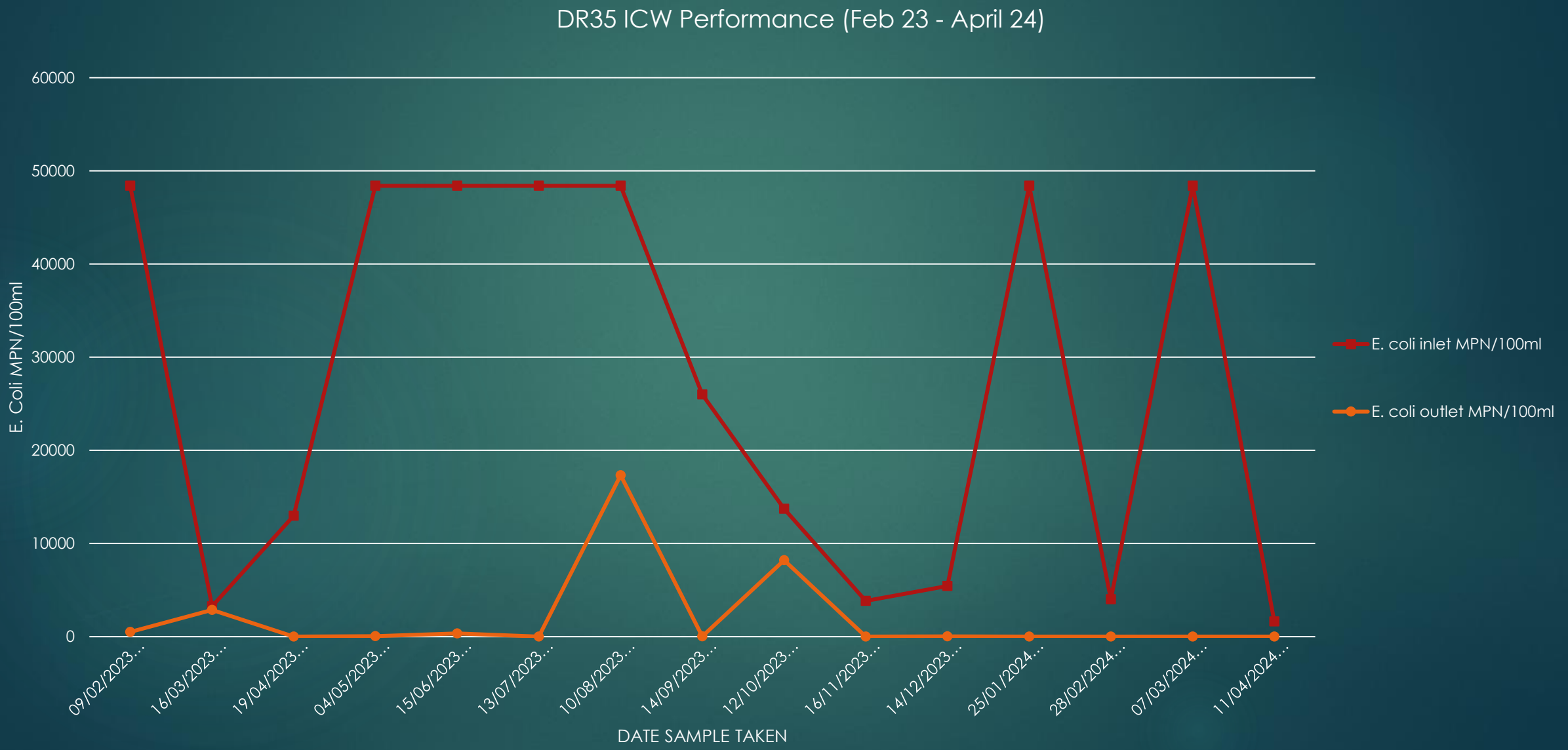
Performance: Phosphorus



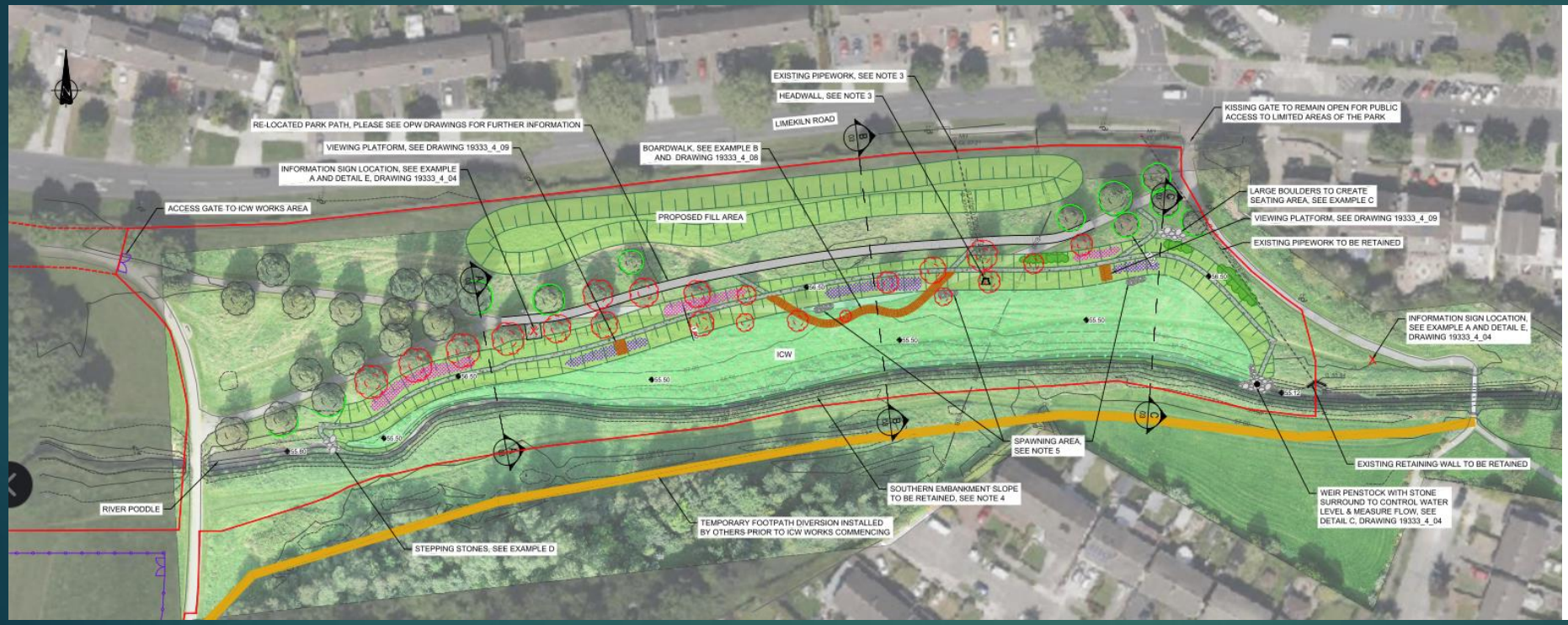
Performance : E.coli



Performance: E.coli



River Poddle Flood Alleviation ICW - Tymon Park



EXAMPLE A - INFORMATION SIGN

EXAMPLE B - BOARDWALK

EXAMPLE C - SEATING AREA

EXAMPLE D - STEPPING STONES

EXAMPLE E - WILDFLOWER AREA

Construction planned for summer 2024

Trimbleston Stream – Seamount

- Construction works this summer 2024
- Retain flood attenuation
- Landscaping with diverse wetland species suited to the ground conditions (concrete/shallow soils)
- Integrate with surrounding grounds

Quality and feedback

▶Blue-Green infrastructure for communities is known to provide additional health benefits.

▶ The accessibility to interact with Nature-based Solutions which mimic natural systems provides a reprieve from the stresses of modern day-to-day life.

▶ The project has achieved beyond that of only providing sustainable water management.

▶These ICWs now provide sustainable, passive and effective stormwater treatment in conjunction as an amenity feature, enriched biodiversity for park users, while providing a wealth of ecosystem services that will continue to provide for the community for generations to follow.

▶The overall response to the ICW development has been very positive.

▶Short listed for the Green Awards 2024 (Sustainable water award)

Future

- The success of Dodder and Griffeen ICWs demonstrate how effective water treatment and management can be achieved in an urban environment while also delivering many ecosystem services
- VESI work with a number of private and state agencies to deliver sustainable water treatment and biodiversity projects.
- Examples:
- Biodiversity enhancement of Ballinlough (SPA)
- Tournoure Co. Waterford
- Nutrient Neutrality projects in the UK

Thank you for your attention.