

Luas Finglas

Environmental Impact Assessment Report 2024

Appendix A10.4: Integrated Constructed Wetland Mitigation and Works Proposal

Tolka Valley Park - Luas Finglas Project

Integrated Constructed Wetland (ICW) mitigation and works proposal

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INTRODUCTION

An extension of the Luas Line through Finglas is proposed by Transport Infrastructure Ireland (TII) and the National Transport Authority (NTA). As part of the 3.9km Luas Finglas project, it is proposed that the new Luas line will travel over a portion of the eastern edge of the Integrated Constructed Wetland (ICW) situated in Tolka Valley Park, adjacent to the Tolka River. Preliminary designs have already been presented to Dublin City Council (DCC) by Barry Transportation. A detailed analysis of how the ICW will be affected was requested by Barry Transportation and DCC, and this has been submitted to Barry Transportation. VESI Environmental Ltd. (VESI) has been subcontracted to provide expert advice on the section of the Luas extension which will impact the Tolka Valley Park ICW, providing mitigations measures and alternatives to works on-site in order to mitigate against the development of the Luas line, and to restore ICW performance.



Figure 1: Aerial image of existing ICW site

1.0 BACKGROUND AND INFORMATION REVIEW

A presentation was delivered by Barry Transportation to DCC on the proposed Finglas Luas extension route. Part of this proposed route will take the Luas through the existing ICW system within Tolka Valley Park. The ICW is located immediately northwest of the footbridge adjacent to the Ballyboggan Road. This presentation and associated drawings have been reviewed by VESI for the purposes of developing mitigation measures with Barry Transportation for works on the Luas extension.

1.1 Tolka Valley Park ICW

The existing ICW was constructed in 2000, and consists of three treatment cells (1, 2a, 2b) in sequence which drain into the open water pond. Cell 1 is approximately 100m long and typically 20-25m wide, providing a total treatment area of approximately 2,450m². Cell 2a is closer to a square layout with a width of approximately 20m (665m²). Cell 2b is slightly larger than 2a, and measures approximately 30m x 25 (860m²). Each of the treatment cells is underlain by a clay liner, with an original permeability of 1x10⁻⁸m/s. This will have become more impermeable since construction as a result of accumulated biomass. The Finglaswood stream culvert is located between Cell 2a and 2b and lies beneath the embankment between the cells, running north to south.



Figure 2: Tolka valley ICW , Cell 1 to the bottom half of image, Cells 2a and 2b north of path.

There have been monitoring programs carried out on the Tolka Valley Park ICW several times, since its construction. These were carried out immediately post-construction by DCC, a Masters study in 2012, and as part of an international research project (JPI) in 2020-2021. These monitoring programmes show that the ICW provides excellent passive treatment to through-flowing waters entering the ICW from the Finglaswood stream. The performance is impacted upon in the open-water pond, due to underlying conditions, due to the park being partially built upon a historical landfill. The most recent study (2020-2021) showed that the ICW achieves an average of 86% reduction in ammonia-N concentrations. However, the open-water pond resulted in an average increase of >132% in ammonia-N concentrations.

The Tolka Valley ICW provides valuable passive treatment of the Finglaswood stream, prior to its discharge to the Tolka river. It has done so for over 20 years, with minimal maintenance of the ICW other than landscape care.

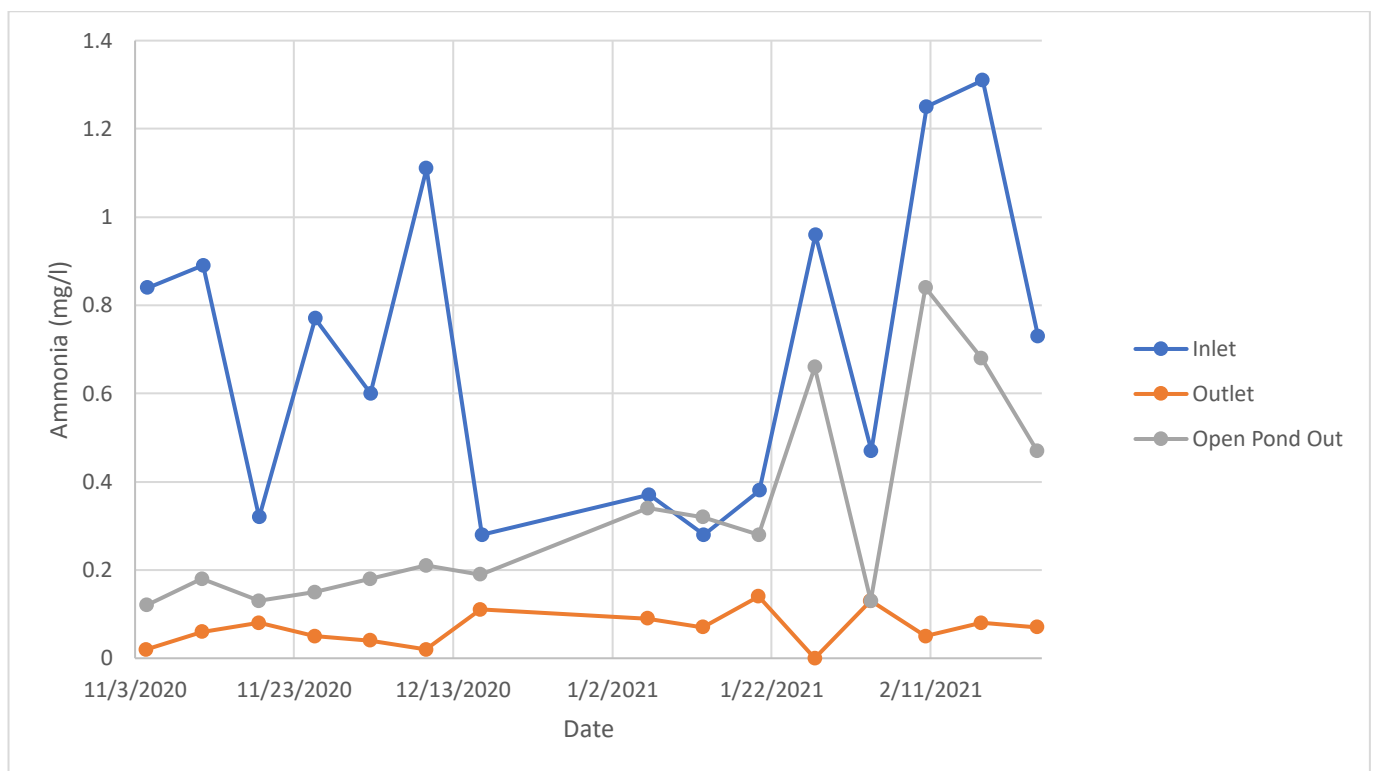


Figure 3: Tolka valley ICW performance for ammonia-N between 2020 and 2021, and impact of open-water pond.

1.2 Finglas Wood Stream

The Finglaswood Stream is a small, culverted stream, which travels through the Tolka Valley Park, connecting to the Tolka River. The stream has a pipe intercepting the main line, which diverts flows to the ICW under normal conditions. This means that during regular flows, Finglaswood stream waters enter the ICW under gravity and receive passive treatment of contamination from misconnections. During heavy rainfall events, flows in the main line increase and circumvent the intercepting pipe and the majority of flow continues to the Tolka untreated, while a proportion still enters the ICW.

The recorded nutrient and pathogen concentrations at the ICW inlet are of generally low concentration. Recent studies have documented the ammonia-N average (n=53) concentrations as 0.58mg/l (12-month study, 2020-2021). This is due to flows the Finglaswood stream, which are the primary source waters to the ICW. It is understood that the Finglaswood stream includes flows from misconnections from the Finglaswood village.

Flows to the ICW are generally continuous, however these can be variable, dependent upon rainfall events. During storm events, storm flows which the feedpipe to the ICW cannot accept, discharge through the original culvert into the Tolka river. In a study carried out in 2007 by DCC, a base flow rate of 9l/s was recorded using a velocity-area method. The same study recorded a flow rate of 100l/s during a 12.4mm/h rainfall event. The original design flow to the ICW was 35l/s. Developments in the Finglas area may have affected flow rates since this study was carried out, potentially through increased misconnection rates, or remediation of misconnections.

1.3 ICW Ecology

Species found within the ICW include, Yellow Iris, Branched Bur-Reed, Great Mannagrass, Sedges, Bulrush, Common Reed, Marsh Marigold, Duckweed, Water Mint, Water Starwort, Common Nettle, Cleavers, Cuckooflower, Giant Rhubarb, Hairy Sedge, Hard Rush, Meadow Buttercup, Soft Rush, Rosebay Willow, and Silverweed.

There are invasive species noted along the nearby Tolka River, though they are not explicitly within the ICW area. These are of concern in regard to any potential works on-site, as they are easily spread. These include the Japanese knotweed and the Giant hogweed.

1.4 Luas Finglas Impacts

The key potential impacts derived from the proposed Luas extension works are as follows.

- **Treatment Area Extent**

The Luas Finglas project will result in the direct over-shadowing of approximately 260m² of Cell 1 of the ICW. The clearance of the proposed track will be of the order of 2.1m.

- **Flows**

The bridge will likely impact on the current outflow from the Finglaswood Stream. There is a potential for increased surface runoff to enter the ICW cells from increased hard surface areas.

1.5 Preliminary Mitigation Options

Several key items have been identified by VESI and Barry Transportation as possible actions for remediating the scope of works for the Luas extension. These items, listed below, are as per the presentation given to DCC.

1. Extend ICW to the North which would involve cutting and reshaping of existing hill.
2. Extend ICW to the South, into the bank between the ICW and the Tolka River.

3. Adjust the location of the inlet pipe connecting the Finglaswood Stream and ICW, as its current location clashes with the proposed Tolka River Bridge. The new outfall will be as close to the existing outfall as possible to ensure existing flow regimes within the cell are retained.
4. Flows from the Luas Finglas drainage will be directed into the ICW. The runoff from the Luas Drainage System will have passed through several Sustainable Urban Drainage Systems (SuDS) features before it reaches the ICW meaning it will have a reduced sediment load.

The proposals laid out by VESI and Barry Transportation have been examined and considered with the long-term functionality of the ICW as the primary concern and its role in protecting the Tolka River from additional contamination loading.

2.0 INFORMATION REVIEW & SITE VISIT

Following review of the information and proposals, a site visit was carried out by VESI Environmental on December 14th, 2022. This site visit included a thorough site walkover and inspection of the ICW, infrastructure, layout, condition of the ICW and the vegetation species therein, as well as the open-water pond and elements within Tolka Valley Park which relate to underlying conditions of the park.

A walkover of the site was undertaken from the upstream end to the final pond and outfall. Overall, the ICW presented well, water was flowing between cells and vegetation cover was healthy (despite winter dieback). The area to be directly impacted on the ICW as a result of the proposed Luas line was viewed in detail. The option of increasing the area of the ICW, particularly Cell 1 was reviewed as part of the visit. Due to the site constraints and the topography of the site, the expansion of the ICW Cell 1 is limited. At present there are a number of maintenance works and potential for new wetland area to be considered for the project to mitigate impacts.

The proposed Luas Extension across Tolka Valley Park is expected to directly impact on 260m² of ICW treatment area at the inlet zone to Cell 1 of the ICW. The proposed extension will result in a new length of Luas track and associated infrastructure lying directly across the ICW inlet zone. The inlet pipe to the ICW system is to be replaced and moved north of the existing footpath, as it currently lies directly in-line with the proposed Luas extension.

There are several items that are of immediate concern regarding the design and layout of the extension in relation to the ICW.

1. Disturbance of treatment cell floor and its integrity.
2. Removal of treatment area at inlet zone due to overshadowing from the LUAS bridge.
3. Scope of potential damage to the vegetation within the cell, beyond that of final construction.
4. Potential for increased loading of hydrocarbons and other contaminants to the ICW.
5. Impact on, and potential loss, of landscape fit ICW design.
6. Limited land area availability for replacement of lost/ impacted ICW treatment area.



Figure 4: Tolka Valley Park open water pond and discharge point to Tolka River.

2.1 ICW Performance

Dependent upon suitable works being carried out on the ICW and its associated infrastructure, there should be no drop in performance of the ICW. The development presents an opportunity to carry out refurbishment works on elements of the ICW, which have received little to maintenance over the last 23 years.

It should also be noted that there is a possibility to develop additional wetland features within Tolka Valley Park to address nearby sources of contamination from the historical landfill, upon which the park is built.

2.2 ICW Design Principals

The ICW concept incorporates environmental, social and ecology principles in its design. Landscape fit and ecosystem services are at the forefront of design considerations, alongside system performance. As Tolka Valley Park is a public site with increasing public usage, which will in turn increase due to the Luas extension project, landscape fit and consideration for the aesthetics of the site must be taken into account.

Design requirements provide suitable access for operations and maintenance of the ICW and its various elements. Access across the site is one of the key design features that must be examined for the purposes of mitigation actions.

3.0 MITIGATION MEASURES

With reference to Drawing 22532_2_02 Proposed site layout and 22532_2_01 Existing site layout, please consider the following Mitigation measures.

3.1.1 Flows

Flows from the proposed Luas drainage system will be directed to the ICW. These flows are composed of the runoff from pedestrian footpaths, cycleways, grassed areas and the Luas tracks subsurface drainage system, meaning contaminants will mainly be silt and fines. Prior to entering the ICW, the flows will pass through a new attenuation pond. The flow from the new attenuation pond will be restricted to Greenfield Runoff Rates, meaning there will be no additional flows introduced to the pond in the post development condition. The existing connection to the Finglaswood Stream will be retained.

3.1.2 Surface Water Protection

The Tolka River receives a number of additional inputs along its length from drainage networks and surface flows. The ICW is in place to provide protection of the Tolka from additional contaminant loading from the Finglaswood stream and area immediately surrounding the open water pond during normal weather conditions.

Prior to works on the ICW commencing, the condition of the connecting pipe between the Finglaswood Stream and the ICW shall be inspected for cracks or damage. It shall be confirmed that the pipe is adequately functioning, and that the mechanism that transfers DWF flows to the ICW is in working order. The ICW should receive all DWF from the Finglaswood stream and resume using the primary culvert where flows exceed 35l/s, or a maximum flow rate based upon maximum treatment area.

The available area for ICW expansion and mitigation of area to be lost as part of the works is limited on-site, through a combination of topography, health and safety requirements, operation and maintenance, and protection of existing habitats. Areas of interest are given below.

1. Cell 1

- a. The lands surrounding Cell 1 offer limited potential for expanding the treatment area of the ICW. This is based upon the topography of the northern embankment, which is currently set at a 1:2 slope and heavily overgrown with scrub and small trees. There is limited scope to expand the existing treatment area to offset the loss from the proposed Luas project.
- b. The southern embankment between Cell 1 and the Tolka River has little to no scope for excavation of the embankment due to required area for safe operation and maintenance tasks carried out by DCC Parks, Biodiversity and Landscape Services. Typically, the tops of ICW embankments are 2-3m in width to allow for safe access of machinery for the correct and proper maintenance of embankments. These widths also allow for safe pedestrian access around the ICW. This is of particular importance in Tolka Valley Park considering the elevation of the embankments relative to the typical flows in the Tolka River.
- c. The elevated embankments of the ICW are also for the protection of the ICW cells and vegetation during flood events. The ICW has previously been flooded with 1.5m of water

during heavy flood events. The embankments provide attenuation within the cells, providing protection of waters through slowly releasing attenuated waters after flood conditions.

- d. Cell 1 has become dominated by Common Reed (*Phragmites australis*) which is typical of the species. There are also large areas of terrestrial vegetation within the cell, indicating that flow pathways have become blocked due to accumulated sediments. Willow trees are encroaching into the cell base and causing shadowing of vegetation, but also posing a treat through their roots to the integrity of the cell floor.

Cell 1 has opportunity for remediation works, even if limited, to restore optimal function within the treatment area. These works should include the removal of existing vegetation, with emphasis on removing the stands of Common Reed and terrestrial vegetation. Accumulated solids should be removed and disposed. The treatment cell shall be levelled, and fresh topsoil applied and fully replanted with appropriate species, allowing for additional species for biodiversity opportunities. Following removal of *Phragmites* and other terrestrial plant species, the same areas should be replanted with *Glyceria maxima* and *Carex riparia* species to optimise treatment efficiency of incoming waters. Additional planting can be used to break up sightlines with such species as *Typha latifolia*. However, *Typha* should not be planted in areas where there will be overshadowing from the proposed Luas line.

The Willow trees along the inside of the southern boundary shall be removed and the stumps/stems appropriately treated to avoid damage to the integrity of the cell embankment.

2. Cell 2a presents limited availability to expand into the lands to the immediate north and south of the cell. Any increase in cell area however is likely to impact on the adjacent access paths and these would likely need adjustment/moving to accommodate any works.
3. Cell 2b requires remediation works to correct issues with the embankments between the ICW and the open water pond. There are fallen trees within the cell, resulting in obstructed flow pathways and reduced treatment area. The interconnecting pipework between the cell and pond is also blocked, forcing through-flowing waters to spill over the embankment into the pond, rather than its designed method.
4. The fallen trees within Cell 2b are to be cut and removed off site. Additional trees within the cell are to be removed while ensuring the integrity to the cell base liner is not damaged. The dividing embankment between Cell 2 and the open water pond is to be rebuilt and widened to provide an access path along the top of the embankment. Pipework between Cell 2b and open water pond is to be extended to accommodate the additional width of the embankment, cleared of debris and fitted with a new elbow bend for water level and flow control.

3.1.3 Habitat protection

The ICW provides a substantial range of habitats to wildfowl, mammals and insects. These are part of the range of ecosystem services that the ICW provides. The ICW concept and design approach ensures the provision of habitat creation within and adjacent to the system. It also provides material for nesting birds for the construction of nests and shelters. The implementation of the ICW approach ensures that there would be no loss, rather a net-gain in habitat within the ICW footprint and within the park as a whole.

The treatment efficacy of the ICW also provides protection to the open water pond, through the reduction of suspended and dissolved contaminants within the through-flowing waters. This aids in the prevention of algal blooms and eutrophication of the waters. The waters within the pond area are directly affected by the treated waters from the ICW, alongside other water streams entering the area. The provision of adequate treatment of waters provides protection of water quality and associated wildlife within those waters, such as macroinvertebrates. These are a direct food source for wildfowl in the park and are key pollinators in their adult form for flowering plants.

3.2 Outline Programme

Mitigation measures implemented for the sustained performance and protection of the Tolka Valley Park ICW would ideally be started ahead of Luas extension works. These include the following:

- Location and repositioning of surface water connection between the Finglaswood Stream and the ICW.
- Overpumping of feed waters from ICW inlet. Waters to be pumped from inlet to open water section of pond which is downstream of ICW cell 2B.
- Expansion of Cell 1 to the North and South, with associated extension of clay liner.
- Removal of unsuitable plant species within the ICW and replanting with appropriate species.
- Removal of accumulated silt within three cells of ICW
- Clearing of pipes connecting Cells 1 to 2A and 2A to 2B, and 2B to open water pond.
- Removal of trees and root networks within cell 2B, together with associated repair of clay liner.
- Reconstruction of embankment and pipe connection between Cell 2B and open water pond.
- Reinstatement of minimal flows to ensure vegetation success. The majority of the flows coming from the Finglaswood stream will continue to be overpumped, meaning only a minimal flow will pass through the ICW.
- Monitoring of ICW establishment.

4.0 ADDITIONAL IMPROVEMENTS

As part of the proposed Luas extension an attenuation pond is proposed to the north of Cell 2A to collect waters from carrier drains and surface runoff from the grassed track, and upgradient slopes. The outfall from this pond is proposed to feed into Cell 1 of the ICW. This pond, in combination with the SuDS measures provided upstream, will provide treatment to surface water runoff from the grassed and paved areas within Tolka Valley Park. This surface water runoff has the potential to contain leachate from the historical landfill. Whilst testing has indicated the landfill material is not hazardous, it may still contain contaminants which the proposed SuDS features and Attenuation pond will help to remove.

5.0 SUMMARY AND CONCLUSION

The proposed Luas extension development will introduce a section of Luas line through Tolka Valley Park. The proposed route will directly impact on the existing Integrated Constructed Wetland. The ICW receives dry weather flow from the Finglaswood Stream, a fully culverted stream, which discharges to the Tolka River. The Finglaswood stream is impacted upon by nearby housing in Finglas village, through misconnections and intercepted surface runoff. The ICW provides passive treatment of through-flowing waters through 3 interconnected ICW cells, prior to flow entering a large feature pond.

The proposed Luas extension will result in the loss of 260m² of treatment area (~10% of total area) within the first cell of the ICW. Areas have been identified within Cell 1, Cell 2a and Cell 2b to cater for the loss of treatment area, as well as to provide refurbishment opportunities for the ICW. The proposed works within the ICW will offset the lost treatment area, ensuring that the ICW is capable of providing improved passive treatment of through-flowing waters. These works will also improve access across the ICW for operations, maintenance and sampling works.

The Tolka Valley Park ICW is an important element of the park itself, providing surface water protection to the Tolka river, public amenity areas for those visiting a park, and a range of ecosystem benefits for the area. The Luas Expansion Project provides a much-needed opportunity to refurbish the ICW after over 20 years of passive treatment has been on-going.



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NOTES:

1. DRAWING TO BE READ IN CONJUNCTION WITH ASSOCIATED FEASIBILITY DOCUMENTS.

LEGEND:

- PROPOSED INFRASTRUCTURE SHOWN IN DARK GRAY. PLEASE REFER TO BARRY TRANSPORTATION DRAWINGS FOR FURTHER INFORMATION.
- TOPOGRAPHICAL SURVEY SHOWN IN GRAY
- EXISTING FINGLASWOOD STREAM
- EXISTING PIPEWORK
- CARRIER DRAIN - PLEASE REFER TO BARRY TRANSPORTATION DRAWINGS FOR FURTHER INFORMATION
- PIPEWORK
- 1:2 CUT SLOPE TO EXISTING GROUND (GRASSED)
- TREATMENT CELL BASE - WIDENED (VEGETATED)

CONNECTION FROM LUAS DRAINAGE SYSTEM

ATTENUATION POND - PLEASE REFER TO BARRY TRANSPORTATION DRAWINGS FOR FURTHER INFORMATION

OVERFLOW CONNECTION FROM FINGLASWOOD STREAM

EXISTING SURFACE WATER PIPE

APPROXIMATE COMMENCEMENT OF POND OPEN WATER SECTION

EXISTING OPEN WATER POND

DETAIL A AND B, SEE DRAWING 22532_2_03

EXISTING CELL 2b

EXISTING CELL 2a

EXISTING CELL 1

EXISTING CELL 1 TO BE WIDENED

TOLKA RIVER

EXISTING ESB PYLON

EXISTING OVERHEAD POWER LINES

SEE SECTION 4 OF THE 22532 TOLKA VALLEY PARK LUAS & ICW STAGE 2 REPORT

NEW LUAS LINE

EXISTING ICW DISCHARGE POINT

HEAVILY VEGETATED SECTION WHICH WOULD APPEAR AS THIRD TREATMENT CELL

C	ISSUED FOR FEASIBILITY	JF	14/02/2024
B	ISSUED FOR FEASIBILITY	JF	26/10/2023
A	ISSUED FOR FEASIBILITY	JF	13/06/2023

REV: DESCRIPTION: BY: DATE:

CONSULTANT: BLOCK B, DUNHILL ECO PARK, CO. WATERFORD, IRELAND.

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TIIV
Transport Infrastructure Ireland

SITE: TOLKA VALLEY PARK DUBLIN
PROJECT: TOLKA VALLEY PARK - LUAS FINGLAS PROJECT INTEGRATED CONSTRUCTED WETLAND
DRAWING TITLE: PROPOSED SITE LAYOUT

SCALE AT A1: 1:500	DATE: FEB 2024	DRAWN: JF	CHECKED: AC
PROJECT NO: 22532	DRAWING NUMBER: 22532_2_02	REVISION: C	

SCALE 1:500

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LENGTHS ARE IN METRES

