



27th May 2016

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Dear Richard

City Quay Water Feature - Trial Aquatic Planting Scheme

Further to the recent report on the City Quay water feature and subsequent City Quay Management Board meeting, I am pleased to provide a proposal for the trial aquatic planting scheme into the City Quay Water Feature.

The purpose of the trial planting scheme is to begin to establish aquatic plants within the water feature which will provide a number of benefits that include:

- Improving visual appearance;
- Utilisation of nutrients in the lake to reduce the potential for phytoplankton blooms; and
- Improve aquatic habitat structural diversity to effect improvements in lake biodiversity.

For the trial planting it is proposed that two types of plants are introduced which are the submerged aquatic plant *Ceratophyllum demersum* and the large robust white flowering water lily *Nymphaea gladstoniana*. The proposed introduction approximate locations of these plants is shown on the enclosed figure.

APPROACH

Submerged Aquatic Plant Introductions

Submerged aquatic plants are not often introduced into shallow nutrient enriched lakes as they can show rapid and excessive growth that can interfere with other amenity uses such as boating or angling. However, these types of aquatic plants can be used on landscape features to reduce the potential for algal bloom development.

Hornwort (*Ceratophyllum demersum*) has been recommended for the following reasons:

- 1) The plant will grow well in low light conditions that may be present during algal blooms.
- 2) The plant does not require a rooting substrate, is free growing and therefore does not require specialist planting substrates for introduction. As such it is ideal for the butyl lined water feature.
- 3) Given that it is a non-rooted species it also easily removed should excess growth develop.
- 4) Hornwort has allelopathic qualities as it excretes substances that inhibit the growth of phytoplankton and cyanobacteria (blue-green algae).

The proposed introductions of this plant will be at the locations shown on the enclosed planting plan. Each of the orange circles marked on the plan represent the introduction of six weighted bunches of hornwort (each bunch being approximately 5 strands of plant). A total of 225 bunches of Hornwort are proposed for introduction. For introductions around the marginal areas, the bunches will be installed by trapping the bunches amongst the existing rocks along the marginal shelf. For those introduced into deeper water, the bunches will be weighted using an engineering brick (or similar) and dropped into position.

It should be stressed and noted that Hornwort in the right conditions may show rapid growth, on giving its non-rooted nature will extend beyond the original introduction areas. As such it may require future on-going periodic maintenance removal of a proportion of the growth. This approach has the benefit that it effectively removes nutrients from the lake and the plant material can be disposed of through composting.

Lily Introductions

The introductions of lilies will improve the visual quality of the water feature and provide flowering interest and also their floating leaves create shade which aids in reducing light availability for phytoplankton growth.

Nymphaea gladstoniana has been selected for use in the water feature as it is robust and vigorous species that can withstand the attentions of waterfowl. It is a hardy species which will grow in water up to 1 metre depth and has a growth spread of around 2.5 to 3 metres per plant.

As there is no planting substrate available in the lake, the introduction will require the use of a custom manufactured geotextile planter. A total of 18 (no) planters will be installed into the lake. Each planter will be fabricated from a robust geotextile with the dimensions of 900mm length, 600mm width and 400mm height. Each planter will be fitted with two lateral geotextile tubes for the temporary insertion of scaffold bars to aid placement within the water feature (see photograph below)



Each planter will be filled to a depth of 300mm with a mixture of Root Zone Mix Soil (70% sand and 30% soil) that will be mixed with 10mm gravel on site to form the planting medium. Each planter will be planted with 2(no.) 10 litre size lily plants.

The planters will be placed in position into the lake using a floating moonpool pontoon with lifting gantry.

The location of lilies at the northern and southern end of the water feature has been undertaken to keep the plants at distance from the water movement associated with the proposed aeration system. Lilies tend to thrive best when they are not located at distance from moving water areas.

Site Management and Security

During the planting works we will designate work areas at each end of the lake for preparing the planters. For health and safety purposes, the public will be restricted from these areas. Works will be undertaken to ensure there is no damage to the existing landscaped areas and any excess materials and delivery packaging will be removed from site for appropriate disposal following the completion of works. As part of the site welfare and risk assessment process we will request if local welfare facilities are available or if these need to be arranged.

As the work will take longer than a day to complete it would be helpful if we could have temporary use of one of the Casemates so materials and equipment can be safely stored overnight.

Timing of Introductions

Ideally plant introductions should be made at the earliest opportunity, to allow the plant the maximum opportunity to become established during the summer of 2016. If commissioned promptly and we would aim to have the work completed by the end of June.

Plant Protection

It is not proposed to provide any protection to the introduced plants. Both plant species are expected to show vigorous growth in the nutrient enriched conditions. Measures are currently being implemented to reduce the attractiveness of the lake to geese. Both the presence of birds and growth and development of the introduced plants should be monitored to determine if additional bird deterrents or protective measures need to be deployed during establishment. The plants species selected and method of introduction should give them a good opportunity for establishment within the water feature but no firm guarantees can be provided on the success of the trial planting, particularly given uncertainties on the future number of waterfowl that may use the site.

Plant Maintenance

As with any planted area, periodic maintenance is required to maintain the plants in the best condition. Typical maintenance requires the removal of dead growth at the end of the summer months to reduce release of nutrients back into the lake. As previously mentioned the development of Hornwort in the lake should be monitored and if excessive growth occurs under nutrient enriched conditions then periodic removal of a proportion of the plant material should be undertaken. Such works would be best undertaken as a series of small removals rather than a large scale single removal exercise. The key is to ensure that any plant removals maintain a good balance of plant growth in the water feature which will aid in inhibiting algae blooms. This waste plant material may be sent to composting.



PERSONNEL

The application will be undertaken by a three personnel team who are experienced in working on lake rehabilitation works and acquainted with the necessary Health and Safety requirements of working on and by water. Risk Assessments will be provided for the work. The installation team will be supervised and assisted by Richard Steel of Laguna Science.

COSTINGS

The costs for undertaking this work inclusive of all materials, equipment, labour and expenses will be **£7440** (ex VAT).

The cost is based on the supply of aquatic plants material from our preferred supplier, who currently have the required plant stock available. If there are delays resulting in having to go to an alternate supplier, then this may create variation in the plant costs included in the above total.

These costs assume the works will be completed in two days. If there are delays due to unforeseen difficulties or issues on site, then the additional daily charge for the team and equipment on site will be £1370 (ex VAT). Any such additional time requirements will be identified during the two day installation period and agreed with you before being undertaken.

For invoice purposes we would request that on commissioning a pro-forma invoice is issued for 50% of the contract value for procurement of materials and payment made prior to the ordering of the planters, plant stock and substrate. The balance of payment for labour costs will be issued on the completion of works with 30 day payment terms.

All costs are exclusive of VAT at the standard rate.

Our standard terms and conditions of business are enclosed.

I trust our costs and approach meet with your approval but should you require any clarifications then please do not hesitate to contact me.

Yours sincerely



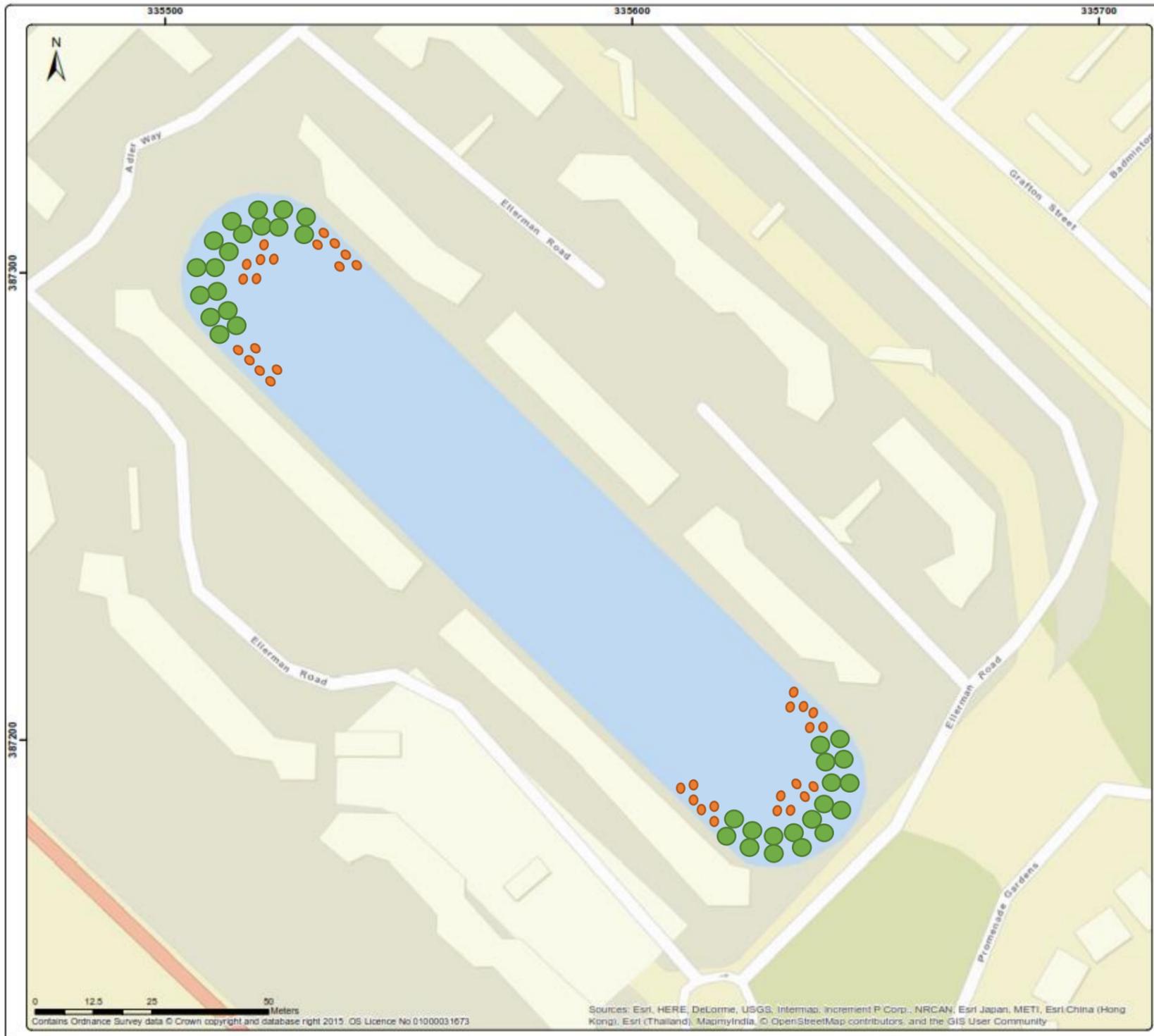
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Enc.
Cc Gerry Procter at City Quay Management Company Ltd.





Key

- Large White Lily - *Nymphaea gladstoniana*
- Submerged Aquatic - Horwort (*Ceratophyllum demersum*)



Project:
City Quay

Title:
Trial Planting Scheme

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LAGUNA SCIENCE LTD - TERMS OF BUSINESS

1 SERVICES

- 1.1 The scope of the Services to be provided to the client ("Client") by Laguna Science will be agreed in writing between them.
- 1.2 If the Client requires any additional services or any change to the agreed Services, Laguna Science will be entitled to an adjustment of the fees and an estimate of the additional fees which may be due will be provided to the Client upon request.

2 COMMENCEMENT / DURATION OF SERVICES

- 2.1 If the commencement date for the Services is not agreed in advance, the Services will be treated as having commenced on the date Laguna Science begins to carry out any of the Services.
- 2.2 The Services will continue until they are completed, unless the appointment between Laguna Science and the Client ("the Appointment") is terminated early in accordance with these Terms.

3 FEES AND EXPENSES

- 3.1 The fees payable for the Services will be as agreed in writing between the Client and Laguna Science. Unless otherwise specified, fees will be payable by monthly instalments against Laguna Science invoices (payment to be due 21 days after the invoice date).
- 3.2 Out of pocket expenses (including travel, telecommunications and other costs) will be recoverable in addition to fees and the appropriate amounts will be added to Laguna Science's invoices.
- 3.3 The daily and hourly rates quoted to the Client are subject to review annually on 1st April.
- 3.4 Laguna Science will be entitled to interest on overdue accounts at the rate of 4% above the Base Rate of Yorkshire Bank Plc, calculated on a daily basis from the due date until payment is received by Laguna Science.
- 3.5 The daily and hourly rates of Laguna Science's personnel quoted to the Client will, unless otherwise agreed, apply to any additional services.
- 3.6 Fees are quoted exclusive of VAT. If applicable, this will be added to each invoice and payable by the Client.

4 INFORMATION & APPROVAL

- 4.1 The Client will ensure that Laguna Science is provided in good time with all information needed to enable Laguna Science to perform the Services and Laguna science will be entitled to rely on that information.
- 4.2 The Client will give all decisions and approvals in a timely manner and provide any additional assistance which Laguna Science may reasonably request.



5 STANDARD OF CARE

- 5.1 Laguna Science will exercise reasonable skill, care and diligence in the performance of the Services in accordance with the standards of Laguna Science's profession.
- 5.2 Laguna Science will also use reasonable endeavours to adhere to any programmes agreed with the Client for the provision of the Services, but will not be responsible for any delay which is due to reasons attributable to the Client or otherwise beyond Laguna Science's control.

6 INTELLECTUAL PROPERTY

- 6.1 Copyright in all drawings, reports, documents and computer-generated data prepared by Laguna Science will remain the property of Laguna Science. Subject to the Client paying all fees and expenses which are due, the Client will have a licence to copy and use those documents and data for any purpose related to the project for which the Services are provided, but not for any other purpose.

7 PERSONNEL

- 7.1 Laguna Science will designate an individual to act as the principal representative of Laguna Science in dealings with the Client concerning the Services. Laguna Science reserves the right to change that individual but will not do so without good reason and will inform the Client of any such change.
- 7.2 Laguna Science will provide the Client with details of the professional qualifications and experience of staff engaged on the Services upon request.

8 LIABILITY & INSURANCE

- 8.1 Laguna Science will take appropriate steps to remedy any defect identified in the Services for which it is responsible and which is immediately notified to it by the Client at any time up to 6 months following completion of the Services.
- 8.2 Laguna Science maintains professional indemnity insurance and will use its reasonable endeavours to maintain such insurance for so long as it has any liability under the Appointment. Laguna Science will have no liability to the Client whether in contract or in tort except to the extent that such liability is covered by its professional indemnity insurance and Laguna Science shall, in any event, have no liability to the Client for any indirect or consequential loss suffered by the Client including, but not limited to, loss of profits.

9 TERMINATION

- 9.1 Laguna Science may terminate the Appointment at any time by giving notice to the Client if the Client commits a material breach of any of the terms agreed between them which is not remedied within 14 days. Failure to pay fees and/or expenses on the due date will constitute a material breach.
- 9.2 The Client may terminate the Appointment by notice to Laguna Science if Laguna Science commits a material breach of any of the terms agreed between them and



fails to take steps to remedy the breach within 14 days of notice requiring it to do so from the Client.

9.3 Upon termination the Client will pay Laguna Science all fees and expenses due up to the termination date. In the event of wrongful termination by the Client, the Client will in addition pay Laguna Science an appropriate amount of compensation for any Laguna Science loss of anticipated profit.

9.4 Termination will not prejudice the accrued rights and liabilities of the parties.

10 ASSIGNMENT & SUBCONTRACTING

10.1 Neither party will assign or subcontract its obligations without the consent of the other. In the event of Laguna Science wishing to subcontract any of the Services, the Client will not unreasonably withhold its consent. Laguna Science will not be relieved of any of its liabilities to the Client in the event of any subcontracting.

11 LAW & JURISDICTION

11.1 The agreement between the parties is governed by the law of England and Wales.

11.2 Any disputes which cannot be resolved amicably will be resolved by the courts of England and Wales.

11.3 Each party will give serious consideration to a request by the other that any dispute should be referred to mediation.

Signed: ----- On behalf of Laguna Science Limited

Date:

Signed: ----- On behalf of Client

Date: