3 Assessment

3.1 Location

3.1.1 The Westferry Printworks Development is located on the North Side of Millwall Outer Dock on the Isle of dogs. The location of the development is shown in Figure 3.1 below.

Figure 3.1 Location the Development at Westferry Printworks

3.1.2 The close proximity of the development land to the Millwall Outer Dock means the site has potential direct access to the waterway. However, at this location the dock walkway runs between the development and the waterway.

3.1.3 The existing site is approximately 750mm higher than the dock wall. Besides mooring, the dock wall would need to be adapted for the provision of a new barge loading facility. The public dock walkway would need to be diverted/suspended for the duration of the works. Figure 3-2 shows the footpath on the dock wall.

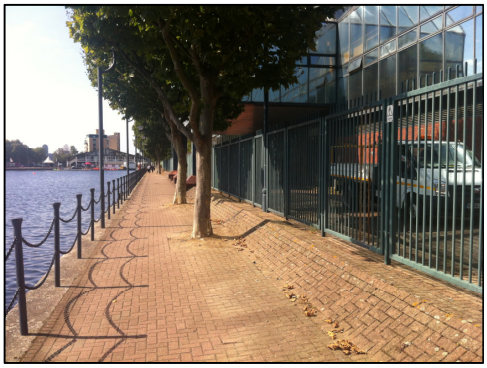

Figure 3-2 Public footpath

3.2 Demolition Waste

3.2.1 Demolition waste will be produced at the development site as the previous buildings have yet to be cleared. However, most of this material will be processed and reused on-site, this is reported in the quantities section below.

Quantities

3.2.2 The demolition of the existing building/s is expected to generate mixed demolition material, comprising concrete/brick, metals, wood, glass, concrete and other potentially re-usable or recyclable materials. This may include asbestos-containing material (see Section 3.2.3) if found to be present following the refurbishment and demolition asbestos survey.

3.2.3 Due to the sensitive and hazardous nature of Asbestos and sensitivities in handling it, should there be asbestos, any asbestos would be surveyed and managed appropriately and to this end, it would be controlled, monitored, transported and disposed of by road by a specialist contractor in line with HSE approved code of practice and duty of care requirements of the Environment Agency in accordance with the Hazardous Waste Regulations 2005.

3.2.4 An estimated breakdown and tonnage of demolition material, is shown on the tables below:

a) Metals: Table 3-1 below shows estimated breakdown of metals. None of the metals will be able to be recycled on site for the works, so all of the material will need to be transported offsite to be recycled. Figure 3.4 shows a motor, an example of metal waste to be removed and recycled off site.

Material	Mass (t)
Steel (Oversize)	2668
Light Iron	671
Cable	5
Electrics	5
Transformers	5
Motors	5
Aluminium	10
Reinforcing Bar (2%)	300
Total Value	3669

Table 3-1: Estimated breakdown of metals

Figure 3-4: Picture of motor at Westferry Printworks

b) Concrete, Brick & Blocks: these are able to be fully recycled and reused on site for hardstandings, pile mats and the like.

Material	Volume (m3)	Mass (t)
Sub-structure and Superstructure	19,315	46,356
Hardstandings	3,700	7,400
Total values	23,015	53,756

Table 3-2: Estimated breakdown of Concrete, bricks and blocks

c) Strip out of interiors / roof coverings / insulation etc: 815t
Due to these materials not being conducive to re-use on site, 90% (734t) of these materials are expected to be sent to landfill and 10% (81t) potentially recycled offsite.

3.2.5 The summary table below identifies quantities of material onsite and offsite together with landfill. It is estimated that 92% of the total mass will be recycled on site.

Material	**Recycled/Re-used on site**	**Recycled offsite**	**Landfill**
Metal	-	3669t	-
Concrete/brick/rubble	53,756t	-	-
Other	-	81t	734t
Totals	53,756t	3750t	734t
% of total mass	92.3%	6.4%	1.3%

Table 3-2: Summary of Materials and disposal

3.3 Waste Companies

Waste Companies with access to the road network

3.3.1 For demolition, excavation and construction waste, there are a number of recycling facilities within a 5 mile driving distance. To the north Tower Hamlets Reuse and Recycle Centre; and, to the east at Canning Town (Bywaters) and Silvertown (McGee, Bewsters, GB Macks, and Docklands Waste).

Waste Companies with Access to the waterway network

3.3.2 Whilst it is beneficial to transport construction materials by water where a development has direct access to a waterway, the main difficulty in achieving this approach is identifying suppliers and waste facilities that have similar access or the ability to access a wharf.

3.3.3 There are waste reprocessing facilities that handle demolition waste which receive deliveries transported on the Thames River Thames. The closest of these facilities to the Isle of Dogs is at Silvertown (for hazardous waste) and Rainham (for non-hazardous waste)

Material	**Origin**	**Destination**	**Distance**	**Travel time one way**
Hazardous waste	Millwall Outer Dock	Silvertown	2 miles	75 minutes
Non-Hazardous	Millwall Outer Dock	Rainham -Essex	9 miles	3,5 hours
*Journeys would be tide dependent and therefore could only take place when tidal conditions and bridge opening times are suitable.				

Table 3-3 provides an indication of the distances and times if barges were used for the transport of waste from and to the Development.

Transhipment

3.3.4 Should one of these tips not accept a certain type of demolition waste from the Printworks; and, no other alternative facility can be found, intermediary wharves could be used at which loads could be carried by water to and offloaded at a transhipment wharf and taken to a suitable dumping facility by road. An offloading facility would need to be built to offload the material and transfer it to lorries as operational wharfs are becoming scarce.

Additionally, the logistics involved in double handling the material removes any sustainability and cost advantages of using water freight.

3.3.5 It is expected that the 734t of landfill waste would need to be either taken away by road or transhipped, as there are no landfill sites next to the river.

3.5 Barge resources and Operations

Barge Operators

3.5.1 Whilst there are a number of companies which offer barges or tugs, GPS Marine offer both. As such, they were consulted as part of this feasibility study.
GPS Marine's fleet consists of 10 tugs and 24 barges ranging from "Boxhold Barges to "Splitter Barges".

Barge Requirements

3.5.2 In order to accomplish the works required and to enter the West India Dock to Millwall Outer Dock, conventional barges with a hold between 400t and 700t are appropriate, as the beam is smaller than 11m required to access the Millwall Outer Dock. A range of tugs can be used to manoeuvre the barges to carry out the work. Generally 2 tugs would be needed at on-loading and off-loading facilities to move the barge into place safely.

Table 3-4 shows a return journey for 1 barge to Rainham spoil site.

Activity	Time	Comment
Loading Barge	5 hours	Provided materials are stockpiled close by to load. Should loading be done "piece meal" this time would increase.
Sailing to Thames River	55 mins	Including opening bridges and locks
Sailing to Rainham	2hr 35 mins	Average - Depending on the tide
Unloading barge	4 hours	
Return to West India Docks	2hr 35 mins	Average - Depending on the tide
Sail to Millwall outer Dock and Moor	55 mins	Including opening bridges and locks
Total Cycle per barge	**16 hours**	

Table 3-4 shows an estimated cycle for 1 barge

3.5.4 Should continuous loading and offloading be required, and assuming stockpiling of demolition waste; 3 barges and 2 tugs would be required; 2 tugs travelling with 1 barge and 1 barge loading, 1 barge traveling and 1 barge offloading.

Loading and unloading Barges onto Millwall Dock

3.5.5 As noted earlier, there is a public footpath between the dock wall on Millwall Outer Dock and the Development, which does present load handling challenges. The width of the footpath is between 3 to 4m.

3.5.6 As this is a dock that was opened in 1868 and is 148 years old. Structural and geotechnical surveys will need to be done to verify the strength of the dock wall and that it is adequate to accommodate a loading dock. Should strengthening be required, the costs to carry out these works will be significant. The costs and the environmental impact of strengthening the dock have not been considered in the assessment.

3.6 Comparable Costs

3.6.1 The comparison shows the costs of different modes of removal. This cost covers the Vehicles/Vessels, plant machinery & equipment only. Loading costs and material cost will be similar.

	Qty	Scenario 1: All demolition waste removed offsite by road	Scenario 2: All demolition waste removed offsite by water	Scenario 3: All onsite recyclable waste remain onsite and remainder removed by road	Scenario 4: All onsite recyclable waste remain onsite and remainder removed by water	Scenario 5: All recyclable material remain onsite and remainder removed by water and transhipped by road to final destination.
Removal of crushed concrete and rubble	53,756t	£403,170	£1,075,120	£0.00	£0.00	£0.00
*Removal of Metals	3,669t	£0	£73,380	£0	£73,380	£73,380
Removal of other material for recycling	81t	£1,620	£1,620	£1,620	£1,620	£3,240
Removal of other material to landfill	734t	£14,680	£22,020	£14,680	£22,020	£36,700
Sub-Total	58,240t	£419,470	£805,249	£16,300	£97,020	£113,320
Estimated Cost of building facilities for loading		£0.00	£50,000	£0.00	£50,000	£100,000
Cost for operating bridges and West India lock	£0.90/t	£0.00	£52,416	£0.00	£4,036	£4,036
Totals		**£419,470**	**£907,665**	**£16,300**	**£151,056**	**£217,356**

*Table 3-4: Shows a comparative cost of vehicles/vessels, plant & machinery for removal of demolition waste by different modes. Data provided by GPS Marine and Erith demolitions. *As recycling companies pay to pick up and recycle metal by road, the cost to transport metal by road is £0.*

3.6.2 Based on the analysis in the table, should all material to be disposed of, be transported by water, it is approximately £488,195 more expensive than by road. Should concrete, brick and blocks be recycled on site, as is currently planned by the developer, transport by water is 9 times more expensive than by road. Should transhipment be required, this would potentially go up to 13 times more expensive.

3.7 Social & Environmental Considerations

Docklands Sailing & Watersports Centre

3.7.1 The Docklands Sailing and Watersports Centre (DSWC) located on the West side of Millwall Outer Dock, and are neighbours to the development. The centre has 500 annual members, which are 50% adult and 50% youth; 50% male & female; and 30% are from ethnic minority backgrounds. Including corporate events the Centre has approximately 9,000 visitors over the course of the year.

3.7.2 Currently, the Outer Dock is used for most of DSWC's activities including:

- novice sailing,
- school programmes - sailing
- open sailing (experienced members)
- corporate events – mostly dragon boat racing
- kayaking
- windsurfing

3.7.3 The Centre's activities take place all year round, during the day and on weekends. Although the high season is from March to Mid-September. Figure 3-5 shows current use of the Millwall Outer dock.

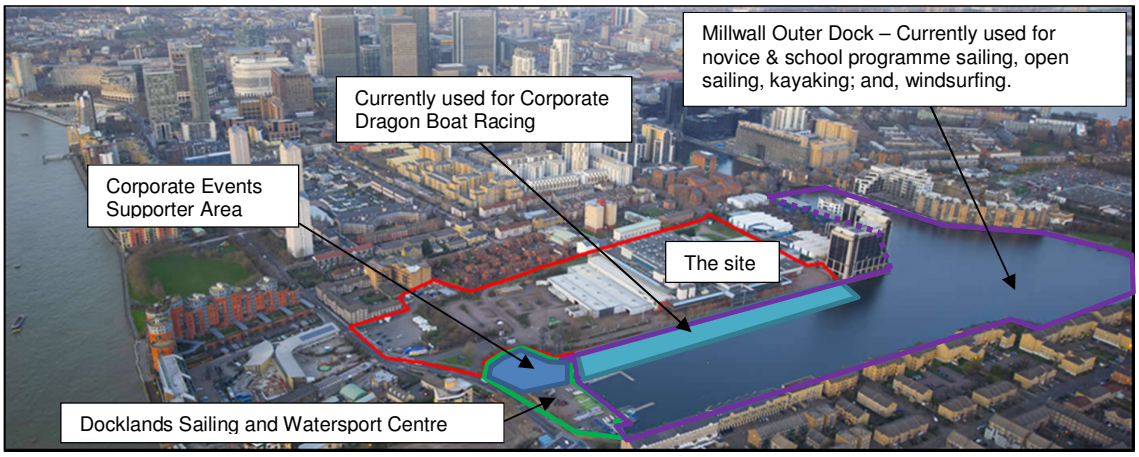

Figure 3-5: Millwall Outer Dock Currently

3.7.4 Novice Sailing and School Programmes: - This takes place Tuesdays to Thursday 9:30 to 15:30 every week all year round. The programme consists of school year 7 to school year 9 classes (youths 11-14 years old). When we consulted DSCW, they said that this group are most vulnerable as they are learning, they often do (and should be expected to) lose control of their boats and bump into the sides of the dock or moored house boats. This would mean a physical barrier on the water would need to be put up between the works area and the sailing area.

3.7.5 Open Sailing: - These are open sailing sessions by experienced (mostly adult) DSWC members. They take place all year round and generally take place Monday, Tuesday and Thursday evenings in the summer, and on weekends during the winter. Additionally in the summer twilight sailing sessions take place.

3.7.6 Corporate Dragon Boat Racing: - The high season for corporate events at DSWC is from July to Mid-September. During the high season, these take place on majority of evenings and Friday afternoons. Each event generally attracts 300 to 600 participants, supporters and spectators, which are generally not experienced in water sports. According to DSWC, these events account for approximately 60% of DSWC revenue. The Centre mostly uses the North side of the dock for corporate activities as it is close to the side, and offers sufficient space for spectators and supporters in the premises and on the dock wall footpath (see fig 3.5). Occasionally, the South side is used for smaller events, but the supporter's space within the premises is reduced.

3.7.7 Should water freight be used, the corporate events would have to use the South side of the dock (see fig 3.6). In the opinion of the DSWC representative consulted with, the use of the Southern dock wall instead of the Northern Dock wall, would significantly reduce the customer experience of corporate events, as there is not enough space for a large number of supporters. In his opinion, this would negatively affect the numbers returning customers and would detrimentally affect the Centre's revenue, as this activity provides a large portion of the DSWC revenue.

3.7.8 Kayaking and Windsurfing: - generally takes place all year round and is generally undertaken by experienced DSWC members. Windsurfers generally use most of the Outer Dock while Kayaking takes place in the Inner and Outer Docks. The Centre's main concern with these activities is mixing very large motorised and non-motorised vessels, with relatively small manually driven and controlled vessels.

3.7.9 Should Water Freight from the development take place at the dock, significant work will need to be done to segregate the loading of the barges from the DSWC activities to protect experienced and inexperienced participants from the moving barges and motorised vessels. The river barges which are able to access the Outer Dock have a beam of 9.6m and length of up to 55m. In order to turn and moor the barges, additional space will be required for tugs. Additionally, when swapping barges to be loaded, space for 2 barges and 2 tugs will be required. Figure 3-6 shows the area needed to load and move the barges and the effect it has on watersport activities.

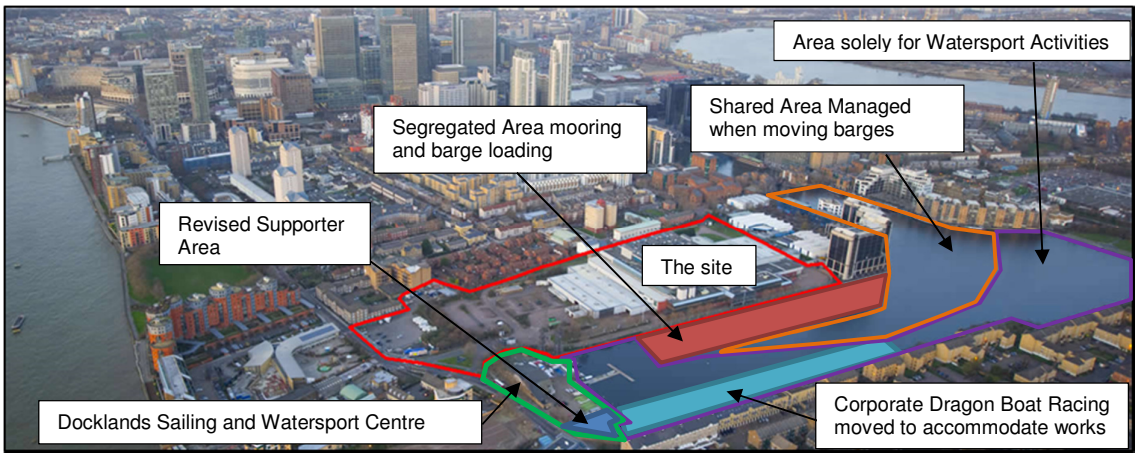

Figure 3-6: Millwall Outer Dock during loading operations

Access to Millwall Outer Dock by water

3.7.10 The Millwall Outer Dock has access to the River Thames via a number of locks and bridges. To access the Millwall Outer Dock from the River Thames, tugs and barges will need to access under Manchester Road Bridge, known as the Blue Bridge (Fig 3-8), through the West India lock (Fig 3-9). Marsh Wall Road Bridge (Fig 3-10) will then need to be opened. Finally Glengall Pedestrian Bridge (Fig 3-11) will need to be opened for access.

A total distance is 0.96 nautical miles to the river. See route to The River Thames on Fig 3-7

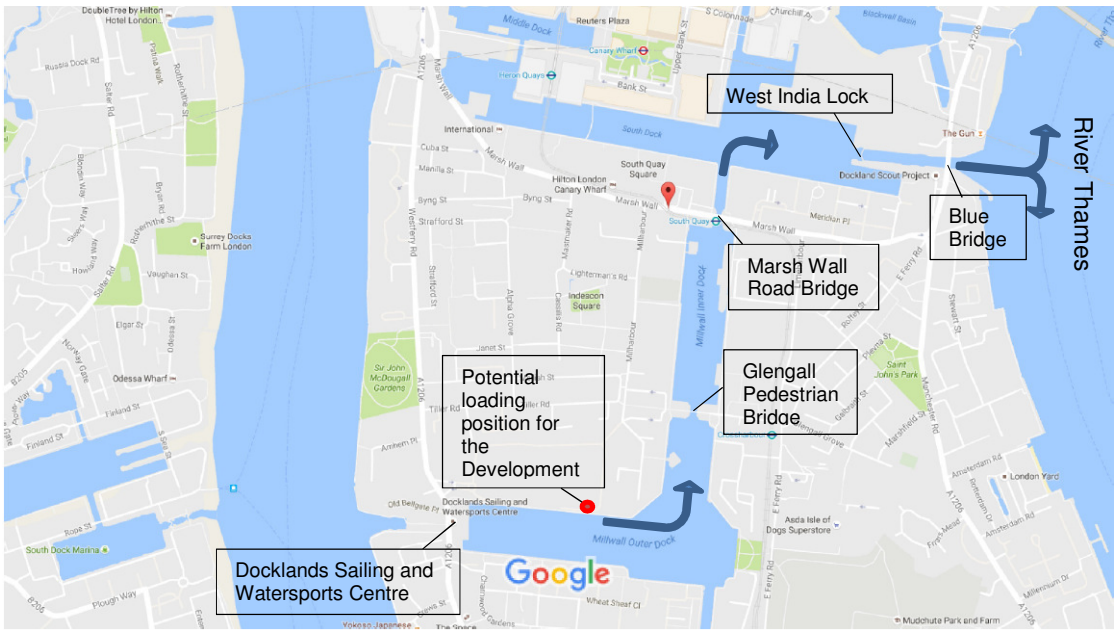

Figure 3-7 Access Route to the River Thames

3.7.11 The docks can be accessed from the Thames 1 hour either side of low tide due to the depth of the access channel. Which means that approximately 2 hours out of every 12 hours the channel is not navigable by the required barges and tugs. The table below, Table 3-5, shows accessibility onto the River Thames at different times of day for various tides.

Tides	8	9	10	11	12	13	14	15	16	17
High Tide at 12:00										
Low Tide at 12:00										
High Tide at 16:00										
Low Tide at 16:00										

Restricted Hours for open bridge | Bridge to be opened | Channel not Navigable

Table 3-5: Restrictions to entering West India Docks from River Thames

3.7.12 The Blue Bridge would need to be opened 2 hours either side of High tide to allow access for tugs and empty barges. In addition there is a restriction to opening this bridge during peak hours. Generally, the bridge may be opened between 9:30am to 4:30pm during working hours. Opening the Blue Bridge means that traffic either side of the bridge is stopped for 15 to 20 minutes, this includes time to open, time for vessels to pass and time to close. Depending on the time of day, this can cause queues back on the A1206 to Aspen Way (A1261) from the North (700m). Diverted traffic would need to go through Canary Wharf to get on to and off of the Isle of Dogs, a detour of approximately 2 miles. Figure 3.8 shows the Blue Bridge.

Figure 3-8: Manchester Road (Blue) Bridge

3.7.13 Once past the bridge the West India Lock will need to be navigated. It is expected that, depending on the tides, some waiting time will be required for filling/emptying the locks, it is reasonable to assume an additional 30 minutes travelling time per entry. Fig 3-9 shows West India Locks.

Figure 3-9: West India Locks

3.7.14 Navigation from South Quay to Millwall Inner Dock will need to access through Marsh Wall. The access is 11m wide and the air draft for the Marsh Wall Bridge is only 1m, this means that the bridge will need to be opened each time entry and exit is required. This will cause delays to traffic on Marsh Wall Road of approximately 10 minutes, which includes time to open, time for vessels to pass and time to close. Figure 3-10 shows Marsh Wall Bridge.

Figure 3-10: Marsh Wall Bridge

3.7.15 To access Millwall Outer Dock from Millwall Inner Dock will require passing under Glengall Pedestrian Bridge. The access is 11m wide with an air draft of 2.1m. The bridge will also need to be opened each time to allow tugs and barges through. Figure 3-11 shows Glengall pedestrian bridge.

Figure 3-11: Glengall Pedestrian Bridge

3.7.16 Once into Millwall Outer Dock the barges would be manoeuvred and pushed onto the dock wall by the tugs.

Dock Wall Footpath

3.7.17 As mentioned in 3.1.4, the footpath that runs on the south of the development would need to be closed for health and safety reasons. Fig 3.12 shows diversion routes for the footpath. The existing footpath route is 0.44 miles, required diversion routes range from 0.47 miles to 1 mile walking distance.

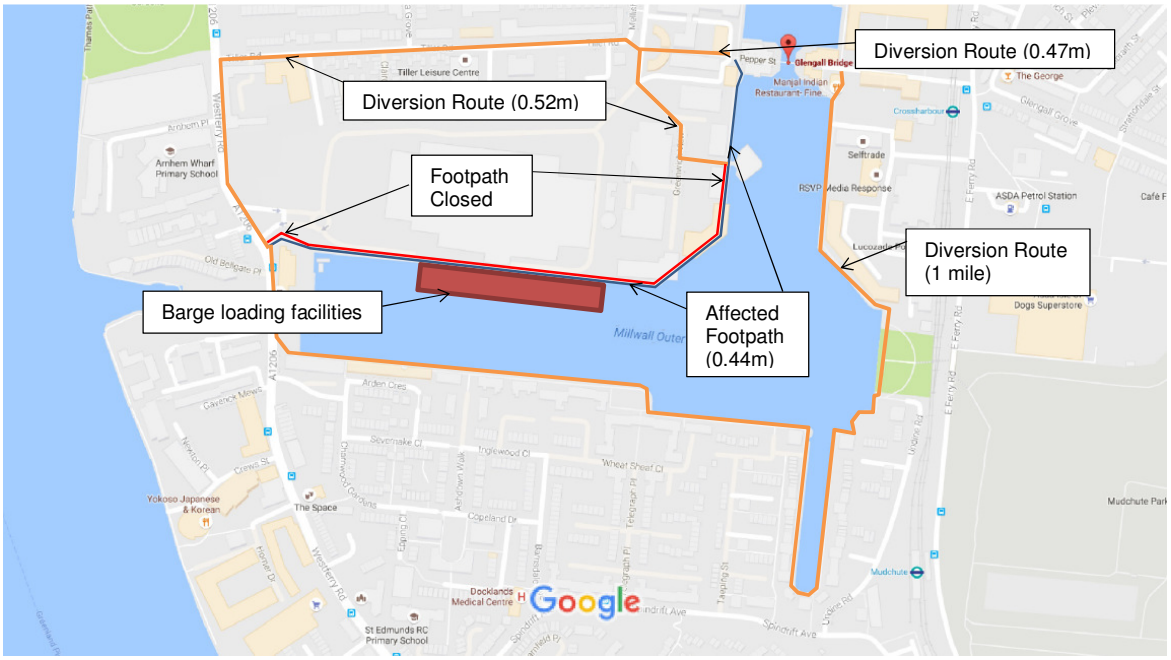

Figure 3-12: Map of affected footpath and diversion routes

Noise

3.7.18 The Millwall Outer & Inner Dock is predominantly surrounded by residential property. The docks naturally create a tranquil and peaceful environment, with very little artificial noise. See Fig 3-12/13 showing residential properties on Millwall Outer Dock.

Figure 3-12/13: Millwall Outer Dock Residential Properties

3.7.19 Whilst, the demolition works will create some noise, this will be contained to the site. Tugs working on the dock, however, will create unexpected moving motor noise, which is not contained by the works, and as water is a reflector of noise this will be heard by residential units on the peripheral of Millwall Outer and Inner Docks. This report was not able to record or calculate the exact extent of the noise, thus the motor noise would need to be monitored and managed in Millwall Outer and Inner Docks should water freight be used.

Emissions

3.7.20 The use of water transport provides advantages over road transport in that it reduces road trips, associated mileage and atmospheric emissions, although where a road transfer is required, these are diminished.

3.7.21 As part of the assessment a comparison between road only deliveries and water transport has been made. It has been assumed that:

- Only the material which would be recycled off site would be transported, the rest will be recycled on site.
- Demolition waste would be transported to the Silvertown area by Road.
- Demolition waste would be transported to Rainham by water.

3.7.22 The comparison measure is gCO2e per TeKm (grams per CO_2 Equivalent per Tonne Kilometre), which for road is taken from the Defra conversion factor tables 2016 and for inland waterways values published by the Transport and Energy Group, European Environment Agency (Defra tables do not include inland waterways transport). The results are set out in table 3.7.7 below.

Vehicle	gCO_2e per Tekm	Trip distance(km)	Tonnage (T)	TeKm	Total $TeCO_2e$
Managed HGV (>17tonnes – based on Average Load)	190,2	5.14	3,750	19,275	3.70
Tugs and Barges	39.5	14.4	3,750	54,000	2.13

Table 3.7.7 Comparison of CO_2e for water and road transport

3.7.23 The estimated quantity of CO_2e when using water transport is lower than if using road, although this should be expected given that water transport emits on average one fifth that of road heavy goods vehicles.

3.7.24 However, a further aspect which has to be taken into account is the quantity of emissions produced as a result of unloading barges. The equipment used for this is normally diesel powered with high fuel consumption rates. Research shows that excavators (used for unloading the barge) produce an average of 86kg/CO_2 per operating hour, which if converted to a per lift rate is 1.7kg/CO_2, assuming a grab achieves 50 lifts per hour.

3.7.25 Based on this rate, if it is assumed a grab moves 1.5t each lift, it would make 2,500 lifts to unload the 3,750t of demolition materials from barges. When multiplied by the CO_2 rate, the unloading at a wharf would result in approximately 4.25t of CO_2. Consequently, overall the amount of CO_2 produced by water transport would be 6.38t, which is almost twice as much as transportation by road. CO_2 emissions for loading barges and lorries is not taken into account as this would apply to both operations.

3.7.26 Additionally, there will be additional emissions from standing vehicles while waiting for the Marsh Wall Bridge and the Blue Bridge every time it is opened to allow vessels in and out of the docks. These are difficult to calculate, but it can reasonably be assumed that these would be a significant consideration.

4. Conclusion

4.1 The overall conclusions from this assessment are set out in the paragraphs below.

4.2 The site can be accessed by water by reasonably substantial tugs and barges of between 400t to 700t in size. There are companies which competitively supply barges and

tugs. Although it seems only GPS Marine have both tugs and barges on a large scale to meet the needs of the project.

4.3 There are water facilities which accept spoil within a reasonable travel distance, although there are some limitations in terms of leaving and entering West India Docks such as tides and restrictions for opening the Blue Bridge.

4.4 A substantial amount of the demolition material (98.7%) will be recycled. 92.3% will be recycled on site for construction works, and 6.4%, mostly metals, will be recycled off-site. Metals are collected by salvage companies by road for free. The remaining 1.3% of material will be sent to landfill. This makes the demolition activity highly sustainable, without using water freight.

4.5 As there are no landfill sites next to the river, material earmarked for landfill would need to be either transported by road or transhipped at a transhipment wharf. Due to double handling and using lorries for this exercise too, transhipment is far less sustainable and environmentally friendly than solely using road transportation.

4.6 Considering the financial implications of using water freight, the comparison for transporting materials not being recycled on site, shows water freight being 9 times more expensive than by road. The cost of new loading facilities, opening bridges and docks, cost of transport (road is free for metal) and economies of scale, make transport by water more expensive in this case.

4.7 Although, as the delivery of construction materials was not analysed, the sheer volume of material to be delivered, the fact that both lorries and water freight will carry a cost in that comparison, the delivery of materials during construction phase may be more feasible financially.

4.8 There will be very large social impacts, including significant disruption to the Docklands Sailing and Watersport Centre's activities, closing of the local dock wall footpath, increase in noise, disruption to traffic due to more regular lifting of the bridges (at least twice daily just for the demolition works).

4.9 Besides disruption to The Docklands Sailing and Watersport Centre's activities, significant risks are introduced in mixing very large motorised and non-motorised work vessels with relatively small, manually driven vessels in a relatively small and confined space.

4.10 As corporate dragon boat racing currently takes place on the Northern side of the dock, and this activity accounts for a significant source of The Docklands Sailing and Watersport Centre's revenue. Moving this activity would potentially be financially detrimental to the centre's operations.

4.11 Although the movement of materials by water transport produces less CO_2 locally when compared with road, once the cargo handling at the destination wharf and local standing traffic waiting for bridges, is taken into account, the overall water activity CO_2 emissions value is at least double, than if using road.

4.12 It is therefore concluded that, overall, the use of water freight transport would not generate a sustainable advantage for the transportation of demolition waste arising from The Development and it's use would not only impose additional transport and operational costs on the demolition works, but would also have financial implications on The Docklands Sailing and Watersport Centre, be a significant disruption to local social and sports activities and to the local community as a whole.