THE NATURAL HISTORY MUSEUM
WATERHOUSE BUILDING

NEW & REPLACEMENT DRY RISERS

HERITAGE IMPACT ASSESSMENT
for
Listed Building Consent Application to Royal Borough Kensington & Chelsea

R|W|C|J|A ARCHITECTS
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CONTRIBUTORS
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Photograph of Existing Obsolete West Waterhouse Dry Risers
1.0 INTRODUCTION
This Heritage Impact Assessment has been prepared in support of proposals to install enhanced fire-fighting facilities within the Waterhouse Building at the Natural History Museum following a London Fire Brigade notification of deficiency.

2.0 CONTEXT & BACKGROUND

2.1 Regulatory Reform Fire Safety Deficiency
Following a visit from the London Fire and Emergency Planning Authority (LFEPA) relating to the Grounds Development Programme early in 2015 the Notification of Fire Safety Deficiencies under the Regulatory Reform (Fire safety) Order 2005 was issued to the Museum on the 17 July 2015.

An LFEPA and BB7 Fire Safety Engineers’ survey established that the existing firefighting provisions to the front of the Waterhouse Building were not proficient for fighting fire demanding a response (BB7 are the Museum’s Fire Engineering Consultants).

2.2 Heritage Significance of the Proposals
The areas of the Waterhouse Building under consideration are designated of ‘High Significance’ in the Grade 1 Listed Museum. They comprise the Hintze Hall and the 4 principal galleries (Dinosaurs, East Pavilion Gallery and Shop, Origins of Species Gallery and Minerals Gallery) as well as Herbaria and other second floor accommodation above and basement accommodation below.

The implication of the notification and study is that the most important parts of the principal heritage asset, the Grade 1 listed Waterhouse Building, do not presently have viable dry-rising mains to facilitate fire-fighting for preservation of life or this most valuable fabric. In the drawing below the deficient areas are shown un-coloured.

Figure 1. Ground Floor areas of the Waterhouse Building considered deficient by LFEPA in terms of fire-fighting (shown un-coloured). Corresponding areas at basement, first and second are equally exposed.
2.3 Consultation

A Feasibility Study was commissioned from Buro Happold by the Museum’s Estates Department to identify new dry riser options and to assess what level of cover each could provide. Their recommendations were completed in December 2015 and the study was submitted for LFB for comment. [This document is submitted separately].

This heritage impact assessment has been prepared in conjunction with Buro Happold and their Feasibility Study and in accordance with the Natural History Museum Conservation Plan provisions. It follows consultation with:

- The London Fire Brigade
- The Natural History Museum Department of Estates and other relevant Departments at the Museum

3.0 FEASIBILITY STUDY & DESIGN DEVELOPMENT

3.1 Fire Engineering Feasibility Report

To establish fire-fighting coverage of the Museum, the fire engineers identified the positions of 7 locations for evaluation. These were:

- Darwin Centre and West Waterhouse
- West Smoke Stack
- East Smoke Stack [later de-selected]
- East Fire Escape Stair
- Palaeo Building and East Waterhouse
- South East Corner of Hintze Hall [later de-selected]
- South West Corner of Hintze Hall [later de-selected]

Of the seven above, the 3 de-selected were omitted for heritage reasons:

a) In order to mitigate the impact on the Hintze Hall in respect of the risers in the south east and south west corners, and;

b) Because the West Smoke Stack in conjunction with the East Fire Escape Stair riser could be considered to provide sufficient coverage through the Hall to allow the removal of the East Smoke Stack riser.
Figure 2. Basement Floor areas of the Waterhouse Building showing the location of the 7 risers proposed initially; those rejected (shown red) and those selected (shown green). Risers 1, 2, 4, and 5 have been retained and re-named as A, B, C and D.
Figure 3. Showing Hose Coverage at Each Level from Basement to Second Floors. Initial Distance Mapping shows Virtually Complete Coverage Using the proposed 4 Risers.
Three of the remaining four riser positions (A, B and D) already contain obsolete dry rising pipe work runs and only the East Fire Escape Stair would require a completely new pipe installation as below:

- Darwin Centre and West Waterhouse Existing Pipe Route
- West Smoke Stack Existing Pipe Work
- East Fire Escape Stair New Pipe Work
- Palaeo Building and East Waterhouse Existing Pipe Work

Significantly all of the proposed risers circulate within the less heritage sensitive basement area and then rise through back of house or non-original Waterhouse-designed locations in areas that in 3 cases have existing penetrations from earlier installations.

The above non-Waterhouse-designed locations have all been built within the last 50 years in the 1970s, 1980s and 2000s and none of them are themselves considered sensitive.

### Building

<table>
<thead>
<tr>
<th>Building</th>
<th>Designer</th>
<th>Date of Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palaeo Building</td>
<td>Pinchheard &amp; Ptnrs</td>
<td>1970-75</td>
</tr>
<tr>
<td>East Fire Escape Stair</td>
<td>D of E PSA</td>
<td>mid 1980s</td>
</tr>
<tr>
<td>Darwin Centre</td>
<td>CF Moller</td>
<td>2006-08</td>
</tr>
</tbody>
</table>

#### 3.2 Design Development Following the Feasibility Study

In-depth analysis of the recommendations of the Feasibility Report by the Design Team identified additional refinements to mitigate heritage impact still further as follows:

- Calculations have established that all proposed installations could be reduced to 100mm internal diameter meaning that existing penetrations through fabric could be re-used widely without modification.
- Only a single new penetration would be required within the Waterhouse Building for the Darwin Centre and West Waterhouse Riser installation.
- Feasibility proposals to rise externally on the West Smoke Stack were found to be avoidable and have been revised to mitigate impact.
- Routing of the East Fire Stair Riser amongst existing basement services followed by a vertical element behind balustrades and adjacent new (mid-1980s) construction minimizes the visual impact of this installation considerably.
- On the Palaeo and East Waterhouse Riser high level routing just under the Principal Floor means that trenching is avoided with only door head and external Palaeo Building penetrations would be required. The proposed inlet would be located in the hidden recessed corner of the Palaeo Building behind the East Tower of the Waterhouse Building.
4.0 PROPOSED SCOPE OF WORKS

4.1 Installation Riser A - Darwin Centre and West Waterhouse (1)

It is proposed that Riser A should be served by a new recessed inlet directly adjacent the existing one currently serving the Darwin Centre (DC). From here it would be routed via plant and storage accommodation within DC before crossing into the link stair between the Waterhouse and DC buildings. After rising to high level in the DC link stair the pipe will be led across the ceiling to penetrate the side of the existing Waterhouse shaft and replace existing pipe work.

On entering the existing Waterhouse shaft the new pipe will connect into new vertical pipe work running top to bottom through existing holes in the Waterhouse Fabric.
4.2 Installation Riser B – West Smoke Stack (2)

It is proposed that Riser B should be served by a new boxed wall-mounted 2-way breaching inlet located in the Colonnade on the north wall of the west stack. Rather than penetrating masonry it is proposed to enter the building by way of the lowest georgian-wired cast plate window opening to the staircase. This window is presently 90% obscured by higher level ducting.

Once within the building pipe work will follow the exact course of the existing pipe work in this location. Existing pipe work will be removed and capped off.

Figure 5 – Riser B

Photograph 1

Photograph 2

Photograph 3

Photograph 4

Photograph 5

Photograph 6

Photograph 7

Figure 6 – 3D Drawing of Existing and Proposed Riser B Pipe Work.
4.3 Installation Riser C – East Fire Stair (4)

It is proposed that Riser C should be served by a new boxed wall-mounted 2-way breaching inlet located in the Colonnade in a corresponding position to Riser B but on the north wall of the east stack. Once again rather than penetrating masonry it is proposed to enter the building by way of the lowest georgian-wired cast plate window opening to the staircase.

Once within the building pipe work will follow a route through the corridor to the west of the Schools Area passing through high level partitions alongside multiple similar existing services. Upon reaching the East Fire Escape Stair the vertical section of the riser pipe work will rise adjacent the mid 1980s lift shaft remote from the sensitive Waterhouse elevations.
4.4 Installation Riser D – Palaeo Building and East Warehouse (5)

It is proposed that Riser D will be served by a new boxed floor-mounted inlet in the corner of the Palaeo Building behind the Waterhouse East Tower.

Moving through the Palaeo Building at high level and through into corridors in the Waterhouse Basement the riser continues into the stair lobby to the position of the existing riser which it enters at the level at the underside of the Principal Floor. Vertical pipe work will be replaced as elsewhere.
4.5 Components

It is proposed that all pipe work shall be galvanized steel self-colour with bronze valves and fittings. Connections will generally be bolted except where other requirements may require welded connections. Fixings are shown in the engineers drawing in the appendix.

All new pipe penetrations will be cored with the exception of Riser A where it passes through the Hub Room immediately prior to entering the link stair – here a block will be removed to facilitate maneuvering the pipe through this room to avoid joints.

Cored holes will be always sealed and made good and fire-proofed where required for compartmentation.

4.6 Conclusion

All risers have been located in non-sensitive, and where possible, non-Waterhouse designed parts of the estate. The most sensitive locations have been omitted and where proposed are located as sensitively as possible with respect to the Waterhouse Building and details often replacing existing installations through existing holes.

If approved protection would be enhanced to this most valuable part of the estate and the residual impact is summarized below.
5.0 SUMMARY OF POTENTIAL HERITAGE IMPACT AND MITIGATION

<table>
<thead>
<tr>
<th>PROPOSED WORK</th>
<th>SIGNIFICANCE OF ELEMENT AFFECTED BY WORK</th>
<th>POSSIBLE IMPACT OF WORK</th>
<th>MITIGATION / BENEFIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation of Riser A</td>
<td>LOW since the pipe work predominantly runs through post-2000 construction only connecting into the 1881 Waterhouse Building in a back of house position at basement level through fabric generally hidden by and previously altered by the construction of the Darwin Centre</td>
<td>NIL visual impact since the replacement system would be similarly located to existing within the Waterhouse Building and run in non-sensitive basement locations in the mid 2000s Darwin Centre Minimum fabric impact relating to the single hole into the existing Waterhouse shaft</td>
<td>POSITIVE since the works would offer enhanced protection to the most important spaces of the Waterhouse Building with minimum impact on fabric and no adverse impact on setting</td>
</tr>
<tr>
<td>Installation of Riser B</td>
<td>LOW because of the discreet proposed back of house location. Pipe work enters through a presently obscured window rather than through masonry and thereafter moves through pre-existing pipe routes through landings</td>
<td>NIL since the replacement system would be similarly located to existing within the Waterhouse Building</td>
<td>POSITIVE since the works would offer enhanced protection to the most important spaces of the Waterhouse Building with minimum new impact on fabric and no adverse impact on setting</td>
</tr>
<tr>
<td>Installation of Riser C</td>
<td>LOW because of the discreet proposed back of house and mainly basement location. Pipe work enters through a window rather than through masonry and then passes through the low significance basement areas before rising within low significance mid 1980s construction in a discreet position behind balustrading and remote from Waterhouse elevations</td>
<td>LOW since the new installation would pass through back of house low significance areas but would require new penetrations to be formed New rising pipe location has VERY LOW effect on the Waterhouse Building</td>
<td>POSITIVE since the works would offer enhanced protection to the most important spaces of the Waterhouse Building with small impact on fabric and little adverse impact on setting since the detailed location of rising services is kept remote from Waterhouse Elevations within mid 1980's construction and the remainder is in the basement which is designated of low significance</td>
</tr>
<tr>
<td>Installation of Riser D</td>
<td>LOW because of the discreet proposed back of house location. Pipe work enters through a glazed screen in the mid 1970s Palaeo Building rather than through masonry and then passes through the low significance basement area corridors before rising within the location of existing riser shafts</td>
<td>LOW since the new installation would enter in a discreet location and pass through back of house low significance areas with few new penetrations and connect into the existing Waterhouse shaft</td>
<td>POSITIVE since the works would offer enhanced protection to the most important spaces of the Waterhouse Building with small impact on fabric and little adverse impact on setting</td>
</tr>
</tbody>
</table>

R|W|C|A Architects August 2016
The Natural History Museum

Job
Waterhouse Dry Risers

Scale 1:1000

Site Plan Showing Waterhouse Risers A, B, C and D
PHOTOGRAPH 1
Looking west towards inlet position with existing DC Riser shown top right

PHOTOGRAPH 2
Looking east towards lobby door with existing DC Riser shown top left. New riser would run parallel crossing head of door from left to right

PHOTOGRAPH 3
Looking west towards lobby door in Photo 2. New riser would run parallel on soffit on left half of ceiling

PHOTOGRAPH 4
Looking south with pipe arriving from right and continuing south requiring adjustment of the conduit

PHOTOGRAPH 5
Looking west with pipe arriving from right and proceeding to left (south) wall

PHOTOGRAPH 6
Looking south with pipe arriving from right at high level and proceeding to left (south) wall before leaving this Hub Room to go south into the stairway

PHOTOGRAPH 7
Existing riser shaft to be reused with new pipework through existing holes

PHOTOGRAPH 8
Existing riser shaft to be reused with new pipework through existing holes

<table>
<thead>
<tr>
<th>REF</th>
<th>LOCATION</th>
<th>HOLE</th>
<th>MATERIAL</th>
<th>HOLE FORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>DARWIN CENTRE</td>
<td>B.A.27</td>
<td>300</td>
<td>CONCRETE</td>
</tr>
<tr>
<td>A2</td>
<td>DARWIN CENTRE</td>
<td>B.A.27</td>
<td>300</td>
<td>CONCRETE</td>
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<tr>
<td>A3</td>
<td>DARWIN CENTRE</td>
<td>B.A.27</td>
<td>140</td>
<td>BLOCK</td>
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<tr>
<td>A4</td>
<td>DARWIN CENTRE</td>
<td>B.C.27</td>
<td>300</td>
<td>CONCRETE</td>
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<tr>
<td>A5</td>
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<td>B.D.27</td>
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<td>BLOCK</td>
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<tr>
<td>A7</td>
<td>DARWIN CENTRE</td>
<td>STAIR</td>
<td>300</td>
<td>CONCRETE</td>
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<tr>
<td>A8</td>
<td>WATERHOUSE</td>
<td>WWB S05</td>
<td>1200</td>
<td>STOCK BRICK</td>
</tr>
</tbody>
</table>
PHOTOGRAPH 1
Looking south west at both iconic Waterhouse Smoke Stacks designed to promote heat-assisted chimney ventilation throughout the Waterhouse Building.

PHOTOGRAPH 2
Looking south at the north elevation of the West Smoke Stack currently covered by extract ventilation ducts.

PHOTOGRAPH 3
Looking south at the hidden slot window obscured by the rising ventilation ducting through which a new entry point would be fitted. A simple inlet valve would be fitted below.

PHOTOGRAPH 4
Looking north towards the head of the slot window in the staircase illustrating existing pipework rising to underside of landing above. Replacement pipework would enter via the window and then follow exactly the same path to up to the half landing before running horizontally to rise again as Photograph 5.

PHOTOGRAPH 5
Looking north with existing pipe rising to the underside of the ground floor landing. New pipework would drop in this corner but also pass upwards through the same hole to serve the First Floor.

PHOTOGRAPH 6
Looking north with existing pipe rising from below as shown in Photograph 5 before passing onwards to serve the Second Floor. New pipework would follow the same route with a valve at this level before passing through the same hole to the Second Floor.

PHOTOGRAPH 7
Looking north with existing pipe rising from below as shown in Photograph 6 before terminating at Second Floor.

Redundant existing supply pipework shown green.

<table>
<thead>
<tr>
<th>HOLE REF</th>
<th>LOCATION</th>
<th>LOCATION REF</th>
<th>HOLE DEPTH</th>
<th>WALL MATERIAL</th>
<th>HOLE FORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>WATERHOUSE</td>
<td>WC B S03</td>
<td>6</td>
<td>GLASS</td>
<td>GLASS REMOVAL &amp; REGLAZE WITH HOLE</td>
</tr>
<tr>
<td>OTHER HOLES</td>
<td>WATERHOUSE</td>
<td>WC B S03</td>
<td>150</td>
<td>CONCRETE FLOOR SLABS</td>
<td>SLIGHT RESIZING OF EXISTING HOLES</td>
</tr>
</tbody>
</table>

The Natural History Museum

Dry Riser B
West Smoke Stack

1:100

Drawing no. 514
Job no. 03
PHOTOGRAPH 1
Looking south east to location of new inlet to the left of the condensers and below the lowest slot window. This corresponds to the position of the inlet for Riser B on the West Smoke Stack.

PHOTOGRAPH 2
Looking north at the slot window shown in Photograph 1. Pipework would enter through the window at low level and run south overhead.

PHOTOGRAPH 3
Looking north through the service corridor. New pipework would be run alongside existing at high level.

PHOTOGRAPH 4
Looking south through the southern end of the service corridor. New pipework would run at high level alongside existing.

PHOTOGRAPH 5
Looking north through the slot window shown in Photograph 1. Pipework would enter through the window at low level and run south overhead.

PHOTOGRAPH 6
Looking north showing the existing ceiling to be replaced with similar. New pipework would pass over this ceiling and realign.

PHOTOGRAPH 7
Looking north at the wall to the north of the lift lobby. A carefully cored hole would be placed on the right beneath the terracotta for new pipework.

PHOTOGRAPH 8
Looking south at the glass screen to the south of the lift lobby. New pipework would pass through at high level on the left side before rising at the end of the lift shaft wall, well away from Waterhouse elevations.

HOLE LOCATION LOCATION REF HOLE DEPTH WALL MATERIAL HOLE FORMATION
C1 WATERHOUSE WC B S02 6 GLASS GLASS REMOVAL & REGLAZE WITH HOLE
C2 WATERHOUSE WC B C03 960 BRICK CORE + 1HR FR SLEEVE
C3 WATERHOUSE WC B C01 960 BRICK CORE + 1HR FR SLEEVE
C4 WATERHOUSE WC B C02 220 BRICK CORE
C5 WATERHOUSE WC B C02 220 BRICK CORE
C6 WATERHOUSE WC B C03 960 STOCK BRICK CORE + 1HR FR SLEEVE
C7 WATERHOUSE WC B C03 960 STOCK BRICK CORE + 1HR FR SLEEVE
C8 WATERHOUSE WE B S01 6 GLASS REGLAZE + 1HR FR SLEEVE
**Photograph 1**
Looking west at the fire exit located in the corner of the Waterhouse East Tower and the Palaeo building. The inlet would be located at bottom right at the head of the ramp and may be extended eastwards upon development of the Grounds Project.

**Photograph 2**
Looking east in the lobby PA B CO2. New pipework emerges from high level left; drops and crosses to the right exiting over the door.

**Photograph 3**
Looking north in WE B CO4 with new pipework approaching from over the door and running down the corridor ahead at high level and turning down the corridor to the left alongside other services also at high level.

**Photograph 4**
Looking west along corridor WE B CO4 from the corner shown in Photograph 3. New pipe work runs at high level above vent ducting.

**Photograph 5**
Looking east along the suspended ceiling at the end of the Mineralogy Corridor WE B 16A. New pipework would run above the ceiling.

**Photograph 6**
Looking east at door between stair lobby and corridor. New pipework would run through the door at high level between other services and fire-sealed to preserve compartmentation.

**Photograph 7**
Looking east at the base of the riser pipe. Incoming pipework reaches the riser shaft at the underside of Principal Floor level dropping to basement level and rising through the building via existing holes through arch heads and floors.
APPENDIX 2  Buro Happold Drawing M501 showing fixings (Detail Y90-04 only would be applicable).
U BOLT
SUSPENDED PIPE CLAMP HANGER
HORIZONTAL OR VERTICAL PIPE CLAMP HANGER
STRAP CLAMP HANGER
CLEVIS HANGER

VERTICAL PIPE RISER SUPPORT
GS ANGLE OR CHANNEL

NOTES:
1. FOR INSULATED PIPEWORK
   USE PHENOLIC INSERTS.
2. USE WHERE IT IS REQUIRED
   TO PERMIT LONGITUDINAL
   MOVEMENT.

LOAD BOLT
LOCK NUT
DISTANCE PIECE
CLIP BOLT
G.S SLING ROD
NOT WELDED

NOTES:
1. FOR SUSPENDING PIPE UP TO
   600mm.
2. CAN BE USED FOR LIGHT OR
   HEAVY LOADS.
3. FOR INSULATED PIPEWORK USE
   PHENOLIC INSERTS (Y30).

NOTES:
1. USE RUBBER LINING FOR
   COPPER/PLASTIC PIPEWORK.
2. FOR INSULATED PIPEWORK USE
   PHENOLIC INSERTS (430).
3. PIPE SIZES UP TO
   50mm (STEEL) 54mm (COPPER).

NOTES:
1. FOR SUSPENDED NON - INSULATED PIPEWORK TO
   ALLOW VERTICAL ADJUSTMENT.
2. FOR LIGHT LOADS.
3. PIPE SIZES UP TO 150mm.

NOTES:
1. ALLOWS FOR VERTICAL
   ADJUSTMENT.
2. FOR HEAVY INSULATED
   PIPEWORK LOADS.
3. FOR PIPE SIZES UP TO 600mm.

NOTES:
1. FOR FIXINGS TO STRUCTURE REFER TO "STANDARD DETAIL - SHEET 8 STRUCTURAL FIXINGS".
2. DO NOT OVER TIGHTEN SERVICES THAT NEED TO EXPAND.
3. FOR INSULATED PIPE HANGERS SUPPORT NEEDS TO BE AT LEAST 100mm.
4. USE GEOMETRICAL NOSE OR SERVICES PIPE SUPPORTS.
5. SLIDING SUPPORTS TO ACCOMMODATE LINEAR MOVEMENTS NEEDS TO BE WELDED.
6. ANCHOR BOLT FIXTURE AT THE BASE WITH DRAWS AT DISTANCE IN THE RISER.
7. PROVIDE WASHERS FOR ALL HEATING & HOT WATER SERVICES.
8. PROVIDE PLASTIC COATING FOR COPPER OR PLASTIC PIPEWORK WHERE NECESSARY TO GIVE SEPARATION BETWEEN SUPPORT AND PIPE TUBE.

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DECOMMISSIONING/DEMOLITION.
HEALTH AND SAFETY INFORMATION