

**Option 3 • Constructability and Constraints**

Where practical, the cost of station enlargement is minimised when the majority of the works can be undertaken from outside the operating station. Final connections and commissioning the new entrances are to the greatest extent possible undertaken before the existing entrances are closed and paved over.

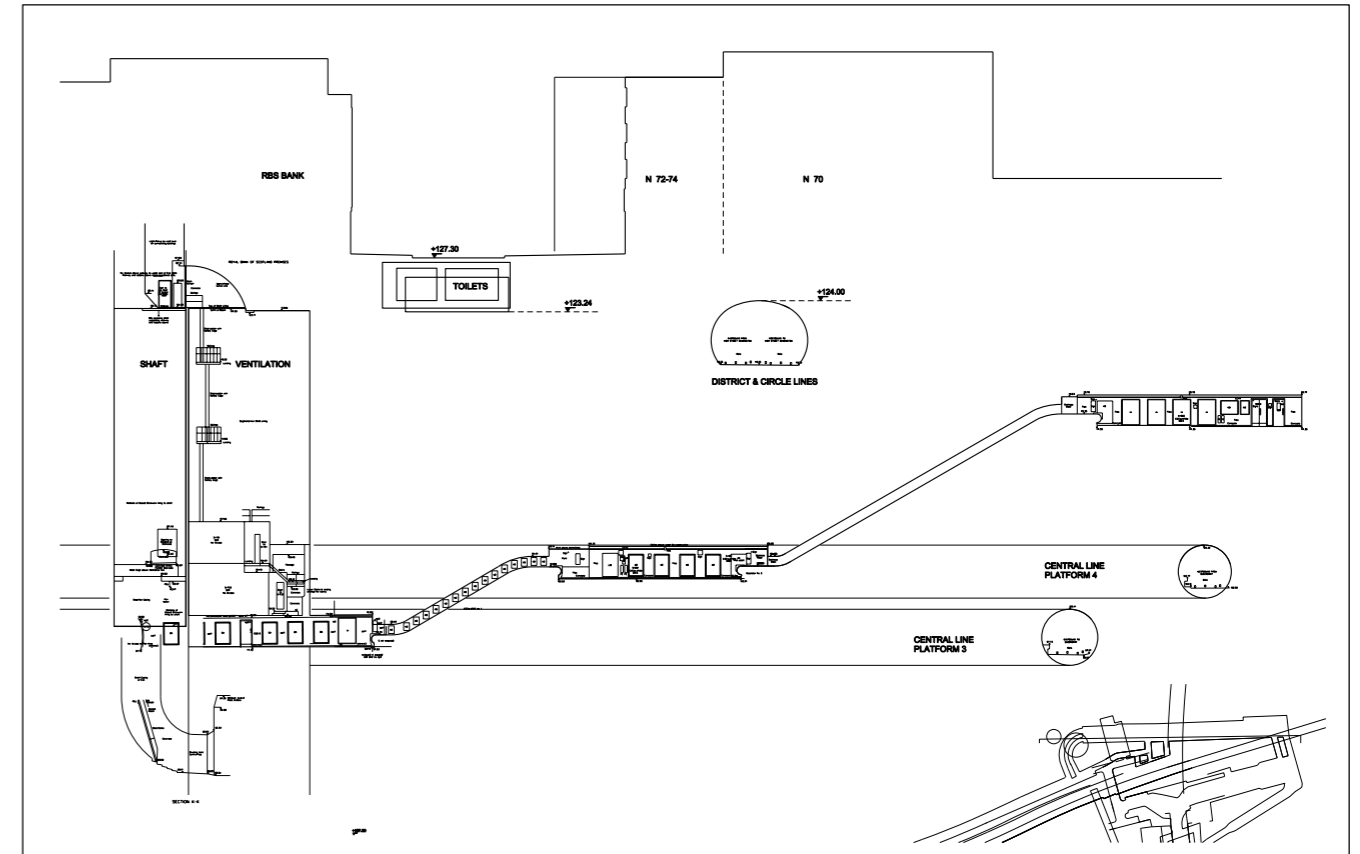
The extensive station record drawings enable a reasonable assessment to be made of the construction method to be employed, and the difficulties and risks to be addressed when so doing.

The survey data has been compiled to confirm that existing station infrastructure is sufficiently distant from the entrances to be largely unaffected by the proposals.

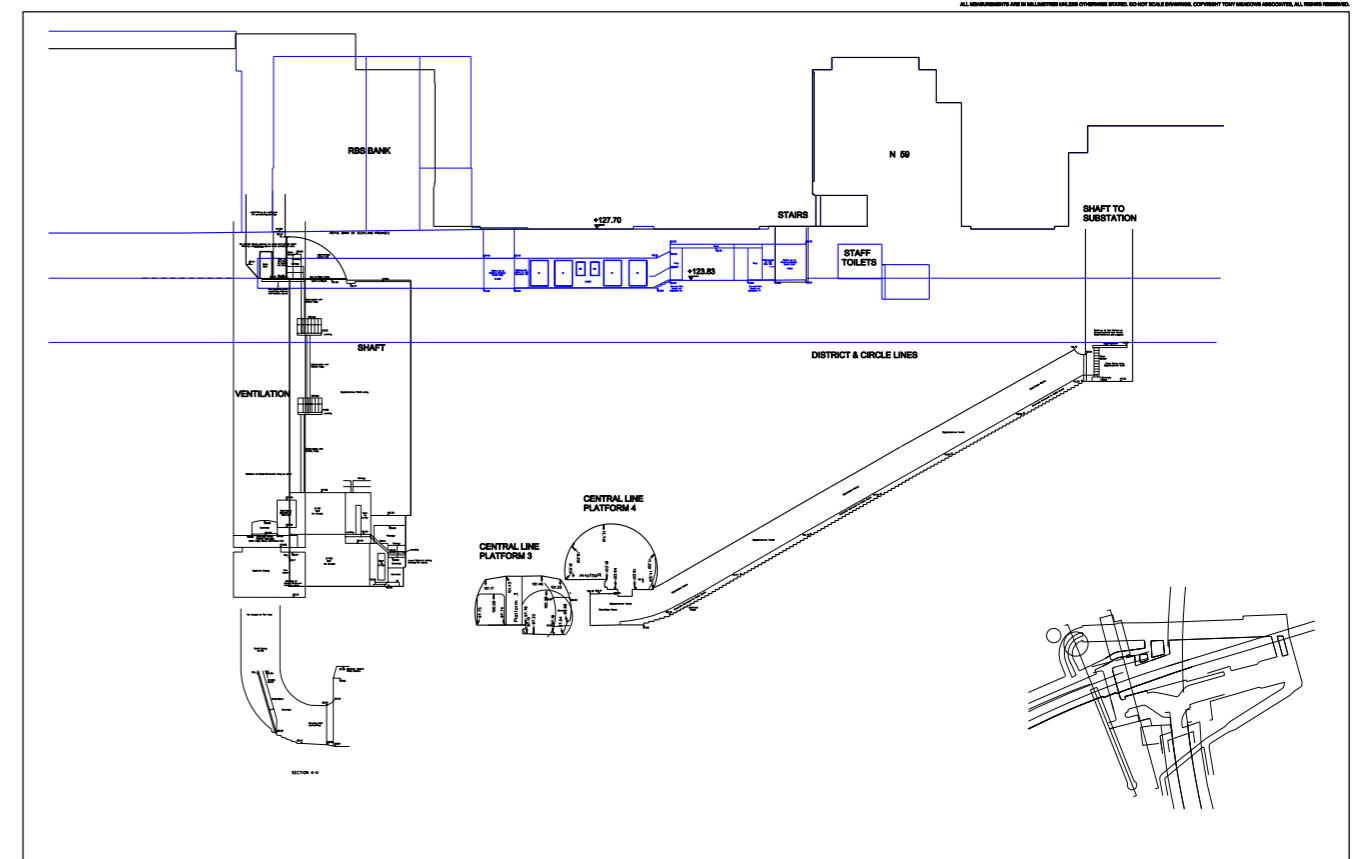
The station asbestos survey has been reviewed and it does not identify asbestos in the areas affected by the new entrance works.

The station heritage register has been reviewed and it identifies the silhouette roundels on the beams over the top of each staircase as worthy or restoration and retention if practical. It also identifies the mosaic compass design set into the floor of the subway linking the staircases as worthy of retention and restoration.

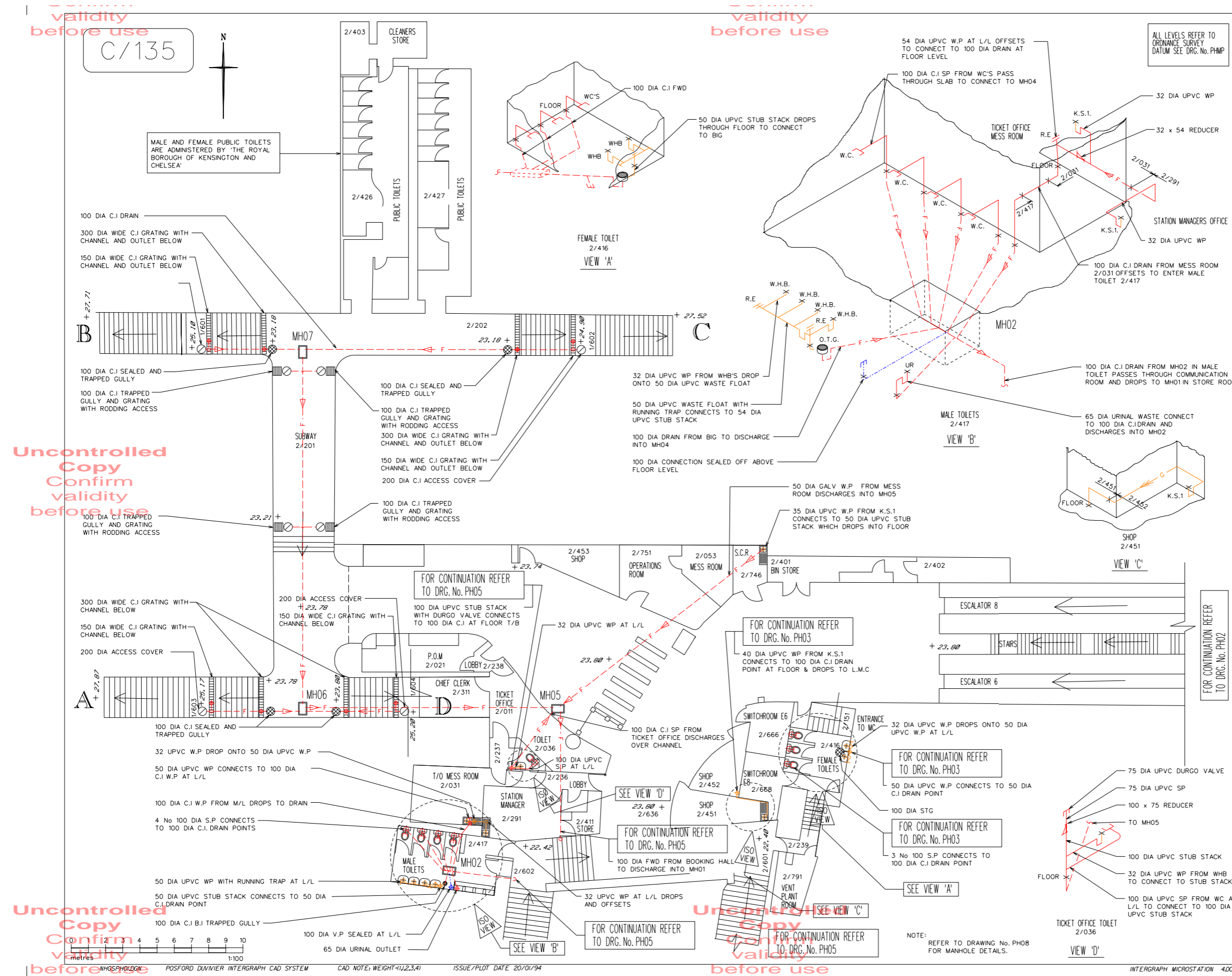
The required station services and systems diversions and extensions have been reviewed and are scheduled overleaf. From the information currently available there is nothing unduly onerous or unusual in the areas to be adapted. If it is proposed that a lift be installed it will be necessary to confirm the sufficiency of power in the station.



<p>3 Fitzroy Mews London • W1T 6DF • 020 7388 0004 • www.tma.uk.com</p>	SKETCH			Date: 24/08/13	Scale: 1:250 @ A3	Revision: -	Client: London Underground Limited
				Drawing Number: 130624-NHG-TMA-Section A			Project: Notting Hill Gate Station
				Drawn by: LVM	Checked by:	Approved by:	Drawing Title: Section A
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				Drawing Number: 130624-NHG-TMA-SECTION B			Project: NOTTING HILL GATE
				Drawn by: LVM	Checked by: -	Approved by: -	Drawing Title: SECTION B
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**LEGEND** (FOR FULL LEGEND REFER DRG. PHLG)

**PUMP LINES**

- DELIVERY (EXPOSED) - D ->
- DELIVERY (CONCEALED) - D ->
- SUCTION (EXPOSED) - SU ->
- SUCTION (CONCEALED) - SU ->

**GRAVITY LINES**

- FOUL (EXPOSED) - F ->
- FOUL (CONCEALED) - F ->
- GREY (EXPOSED) - G ->
- GREY (CONCEALED) - G ->
- SURFACE (EXPOSED) - SW ->
- SURFACE (CONCEALED) - SW ->

**FOUL VENT PIPING**

- FOUL VENT PIPING - F ->
- GREY VENT PIPING - G ->

**REDUNDANT/DISUSED PIPEWORK**

- REDUNDANT/DISUSED PIPEWORK - - - - -

**ABBREVIATIONS**

- A.A.V. AIR ADMITTANCE VALVE
- A/C ACCESS COVER
- B.I.G. BACK INLET GULLY
- C.I. CAST IRON
- C.S.1. CLEANERS SINK (BELFAST)
- C.S.2. CLEANERS SINK (JANITORS)
- Cu COPPER
- EXT.G. EXISTING
- F.A. FROM ABOVE
- F.B. FROM BELOW
- F.V. FOOT VALVE
- GALV. GALVANISED MILD STEEL
- G.T. GREASE TRAP
- H/L HIGH LEVEL
- I.V. ISOLATING VALVE
- K.S.1. KITCHEN SINK (SINGLE BOWL)
- K.S.2. KITCHEN SINK (DOUBLE BOWL)
- L/L LOW LEVEL
- MH MANHOLE
- M/L MEDIUM LEVEL
- M.V. MOTORISED VALVE
- N.R.V. NON RETURN VALVE
- O.T.G. OPEN TOP GULLY
- R.E. RODDING EYE
- R.W.O. RAINWATER OUTLET
- SHR SHOWER
- S.T.G. SEALED TOP GULLY
- STR STRAINER
- S.V.P. SOL VENT PIPE
- T.A. TO ABOVE
- T.B. TO BELOW
- U.P.V.C. PLASTIC
- UR URINAL
- V.C. VITRIFIED CLAY
- V.P. VENT PIPE
- W.C. WATER CLOSET
- W.H.B. WASH HAND BASIN
- W.P. WASTE PIPE

REV.	DATE	DESCRIPTION	BY	APP.
<b>SURVEY APPROVED</b>				
SV1	01/94	SURVEY APPROVED	D.S.H.	P.L.B.
SVA	08/93	SURVEY APPROVED	D.S.H.	P.L.B.
SVR	05/93	SURVEY REVIEW	D.S.H.	P.L.B.



30 THE SOUTH COLONNAD  
CANARY WHARF  
LONDON E14 5EU  
TEL: 0171-222-5600

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TECHNICAL CONTRACTOR:  
**POSFORD DUVIVIER**  
4, Deans Yard  
London SW1P 3NL  
Tel: 071-222-2115  
Fax: 071-222-2659

PROJECT:  
PUMPS AND DRAINAGE  
NOTTING HILL GATE STATION

TITLE:  
PLUMBING AND SANITARY SURVEY  
TICKET HALL

PROJECT REF. No: 716/C135/057/3500/PH01	REV: SVA1
DRAWN: M.G.	DATE: 20/01/94
CHECKED: B.F.B.	APPROVED: P.L.B.
LUL DRG. No: PS/67131	CAD D.A.T. PLOT SIZE A1
LUL MICROFILM REF: 6 OF 15	SHEET: DRG. No: PH01

Option 3 • Services and Systems Requirements

Enabling Works

In both options there is some disturbance to the existing road/pavement. Although the main sewers appear to be avoided it must be assumed that some utility diversions will be required.

Station Operations and Control Room

These are either side of the gateline, and it is assumed they will not be impacted by the works.

New Passageways and Stairs

Will require:

- Lighting
- PAVA
- Power for advertising panels, signage and 110V sockets
- CCTV
- PHP(s)
- Fire alarm to PHPs and EDNE
- Canopy lighting / supply
- Gate Alarm
- Cable Management for all of the above

It is assumed that all ceiling voids will be less than 800mm

If installed, the lift will require:

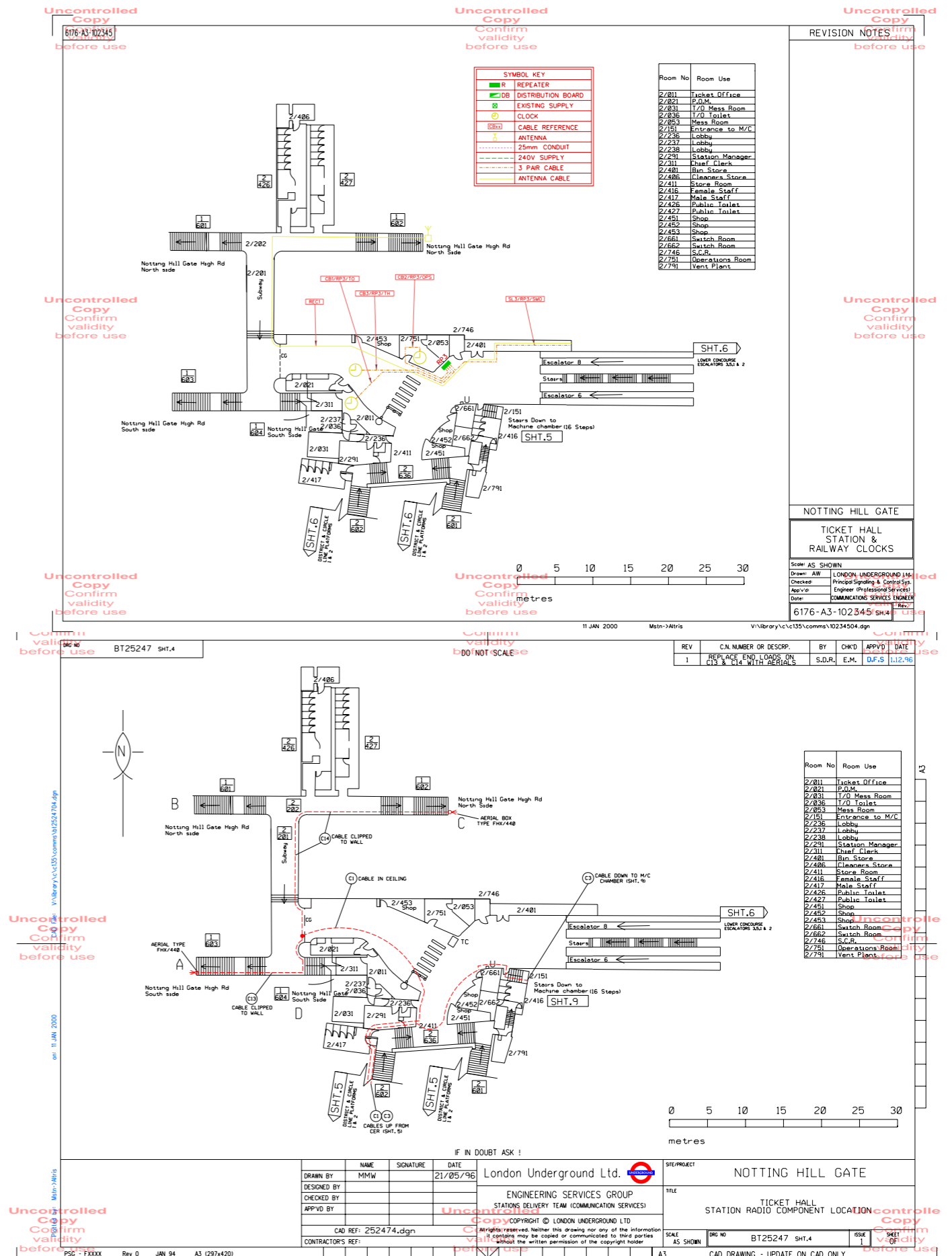
- Dual power supplies
- LEER cooling and vent
- Local lighting and power to the LEER and the lift shaft
- VESDA smoke detection system

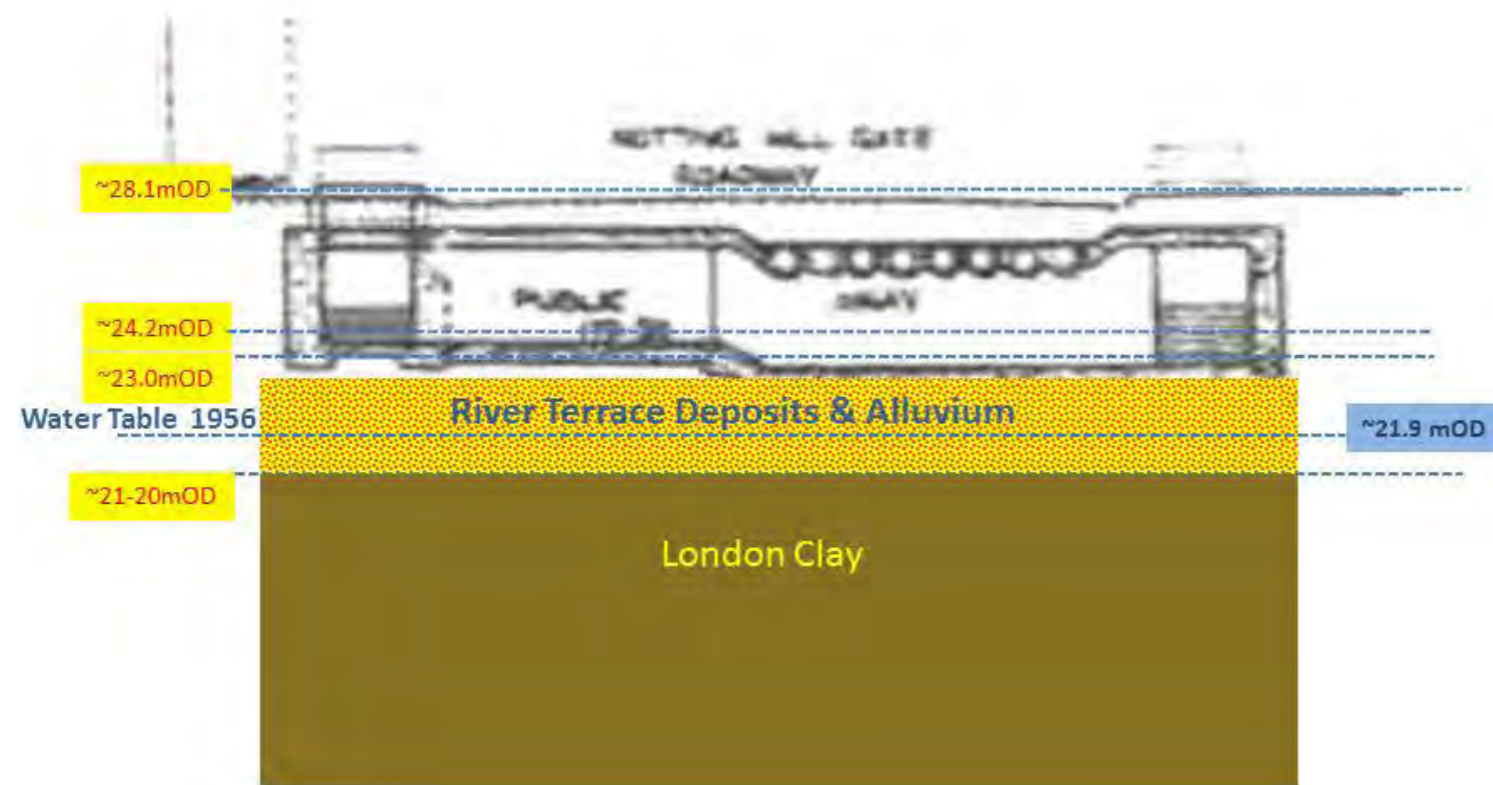
Existing station areas will require diversions to existing services in the areas interfacing the new construction. It is assumed these will be fairly minor, with the exception of a dry riser, which it is understood is located in the RBKC public toilets.

The phasing of the works to keep the station open will require temporary works to the services, depending on the phasing arrangement.

Externals

Potentially there will need to be some external lighting works to the entrances and the adjacent street/pavement.





**Option 3 • Ground Conditions**

The borehole data currently on record gives an indication of the normal geological strata and the ground water level in the broad location of the station entrance.

The data indicates that the existing ticket hall box rests on the gravels, with the base of the deepest section, being the underpass to the northern stairs, sitting just above the 1956 water table.

Other station record drawings indicate that the eastern wall of the passageway is toed into the top of the London Clay to provide a degree of additional stability.

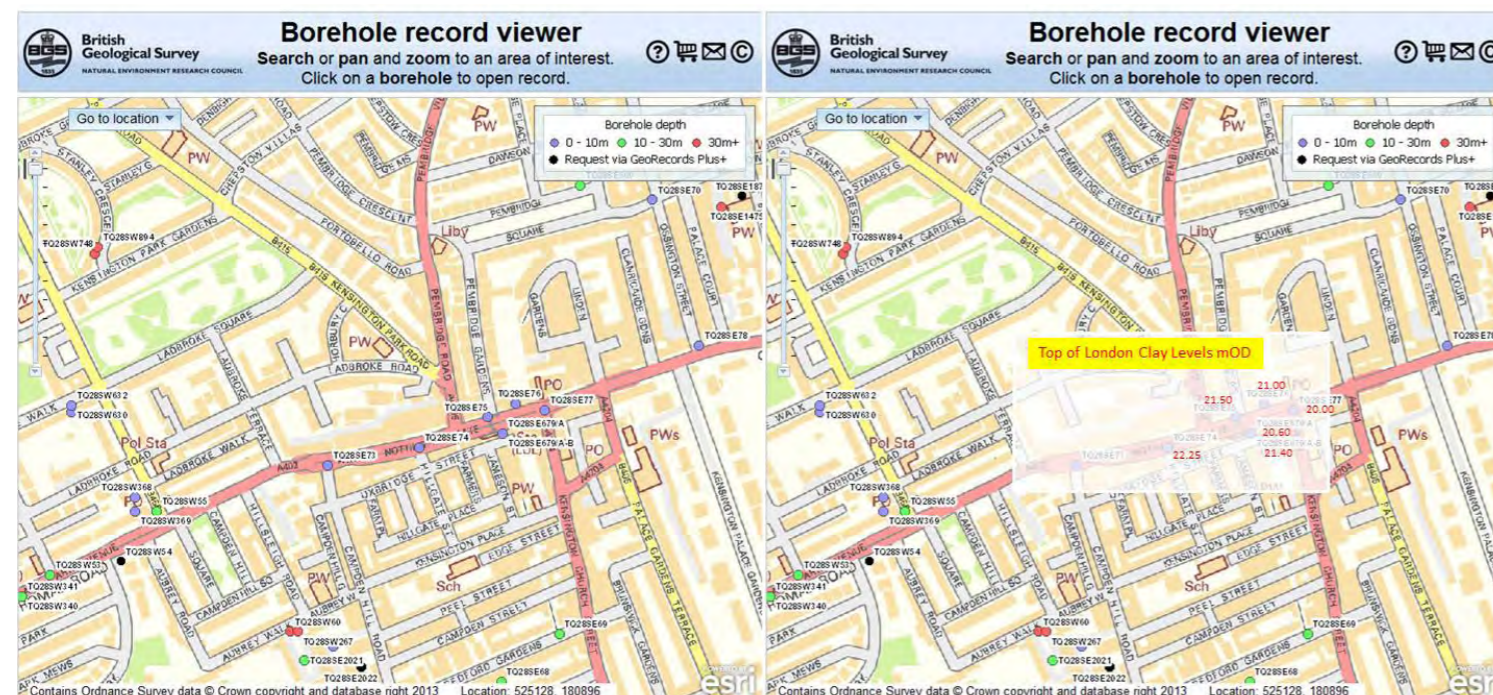
It is anticipated that ongoing works to the utilities in the road involve reinforcing the gravels and the fill that lies above, and this appears to be through the use of mass or foam concrete. Should these works extend into the areas required for the new passageways, they will have a significant effect on the progress and therefore cost of construction.

**Option 3 • Geology**

From the borehole records that are publicly available from the British Geological Survey it can be inferred that the level of the top of the London Clay varies across the site between 120mTD and 121mTD, possibly becoming deeper towards the East. The London Clay is overlain by River Terrace Deposits and Alluvium (Sand, Gravel and “Yellow Clay”). Note that ‘TD’ is “Tunnel Datum” which is taken to be -100mOD.

The water table in the site area was reported to be at 121.9mTD in boreholes drilled in 1956, and at 120mTD in a borehole drilled in 1891.

Since the Options do not involve ground works below 123mTD the works can be inferred to be undertaken wholly in Made Ground, River Terrace Deposits and Alluvium above the water table. The Metropolitan Line tunnels and local sewer both potentially act as drains in this area and so prevent significant water level fluctuations, but this assumption would need to be confirmed by later investigations for design development.



### Option 3 • Utility Services

The area is currently subject to major road-works by Thames Water which recently discovered a significant void beneath the road, and this has resulted in a road closure on the grounds of safety. It is believed that a leaking water main may have resulted in scouring of the superficial geological materials, washing them away down the local sewer.

There are a number of major services recorded on the LU record drawings including 30 and 36 inch mains for water and gas and these determine the roof and floor level of the existing underpass, giving a ~1.2m difference in level between the foot of the current northern access stairs (~123mTD) and the southern access stairs, the latter being the ticket hall floor level. ~124.2mTD.

The low cover between the crown of this underpass and the base of the services is a major constraint on construction options. The greater width of the planned new subway implies deeper roof trusses will be required, since the services cannot be raised this implies the roof of the new subway must be lowered. Furthermore, the absence of ground between the services and subway limit the construction options and prevent options involving ground treatment or pipe arches, only direct support methods appears to be feasible unless a much deeper subway alignment is proposed and can be approved. Regrettably, direct service support must involve carriageway possession in Notting Hill Gate and major road-works.

The historic record drawings also record the diversion in the alignment of a deep “Mid-level” sewer undertaken to construct the escalators, this will further constrain piling options for Option 3A.

The service drawings are not exhaustive in their coverage and extent so service clashes remain a risk to all the schemes. The absence of information concerning the current road remediation works also introduces the risk that the ground and services will be changed and not be as assumed by the planning in this report.

It is currently assumed that the diversion of the above major trunk mains will not be acceptable or feasible for these works and must be left in-situ and functioning for the duration of construction.

Options 3A and 3B both involve the reuse and remodelling of a former local authority underground public toilet which is understood to house a number of services. These will need to be identified and relocated prior to either Option, as will any service routes that use the current stair access points, since these are to be backfilled in all the proposed schemes. The historic record drawings do indicate cable paths are located in the existing underpass crossing beneath the road, it is not known if these remain in use.

### Option 3 • Worksite & Work Traffic

The minimising of impact upon traffic and external parties is an obvious objective, to address this it is assumed that the works will employ an, as yet unidentified, external logistical support site to minimise the size of the work site required and permit just in time deliveries and spoil removal for these schemes and that the traffic between the worksites can be managed with minimum impact on both traffic and work programme.

Even with external support a worksite will be required for these schemes to provide secure site offices, welfare facilities, and material and plant holding areas. For the purposes of planning for this study, it is assumed that the road and one pavement of Pembridge Gardens would be occupied for this purpose with the road closed to through traffic.

This minimises the impact duration on Notting Hill Gate and Pembridge Road. However, owing to the need to physically support utilities during the formation of the new subway, this assumption does not prevent the need for a carriageway possession in Notting Hill Gate.

### Option 3 • Working Hours

Works that are undertaken remote from LU interfaces would be undertaken in normal site working hours. The works that involve interface with LU station operations which could not be isolated by hoardings, would be undertaken in station closure hours.

By arrangement with LU these may be slightly longer than the LU Engineering Hours dictated by train operations. The degree to which these working hours may be negotiated has not been investigated but would have a potentially significant effect on programme durations.

The interaction between LU working hours and restrictions placed on the surface site working hours will require careful management.

### Option 3 • Concessions from LU Standards

The subway headroom may require a concession due to the utility interface above.

There is also a requirement that developments above LU assets should have independent foundations to the LU asset. This may not be possible in some of these schemes.

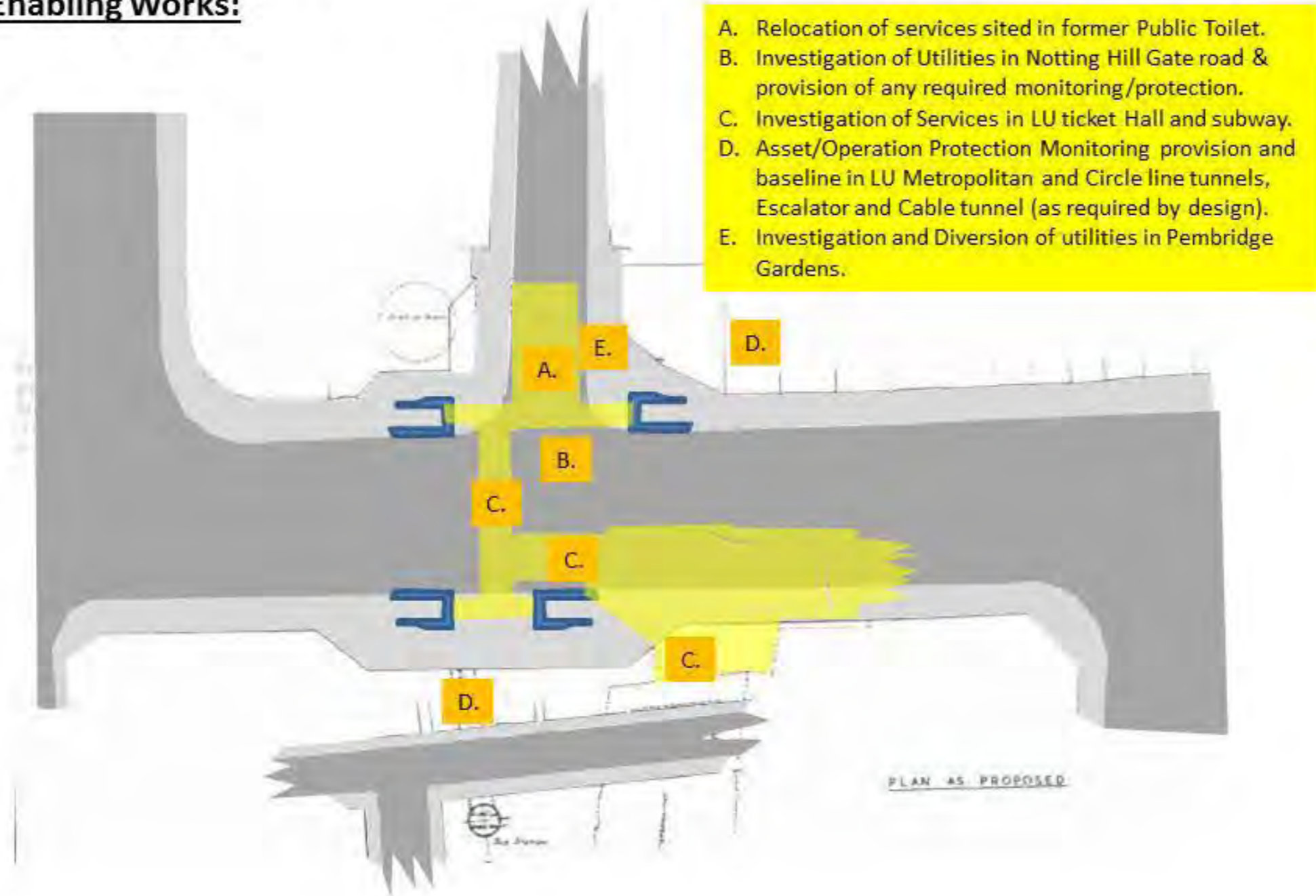
### Option 3 • Party Wall Issues

The use of new property sites in these schemes implies the demolition and reconstruction of the properties in question and particularly the potential deepening of their basement structures which may lead to the loss of support to the abutting buildings.

These issues are assumed to be resolved in the Options being considered without undue cost or programme impact, but this assumption will need to be confirmed in future design stages.

## Notting Hill Gate – Option 3A – Construction Sequence Sketches.

### Enabling Works:



**Option 3A Construction Sequence**

The following sketches describe the anticipated construction sequence for Option 3A, based on the best available record and ground conditions data. This sequence and the associated programme has been used to develop the cost estimate included later in this report.

There are effectively two sites operating concurrently, the northern site constructing the new north stair entrance and the subway beneath Notting Hill Gate, the southern site construction the southern stair entrance and lift. Both stair entrances are likely to require reconstruction of the buildings above, and these will require foundations. The foundations potentially affect LU tunnel assets.

The southern lift is integral to the new building, the head house intruding into the first floor of the structure, which will inevitably delay the installation of the lift until completion of the building civil works. So whilst the new stair may be brought into use whilst the building is reconstructed above, the lift will not come into service until a considerable time later.

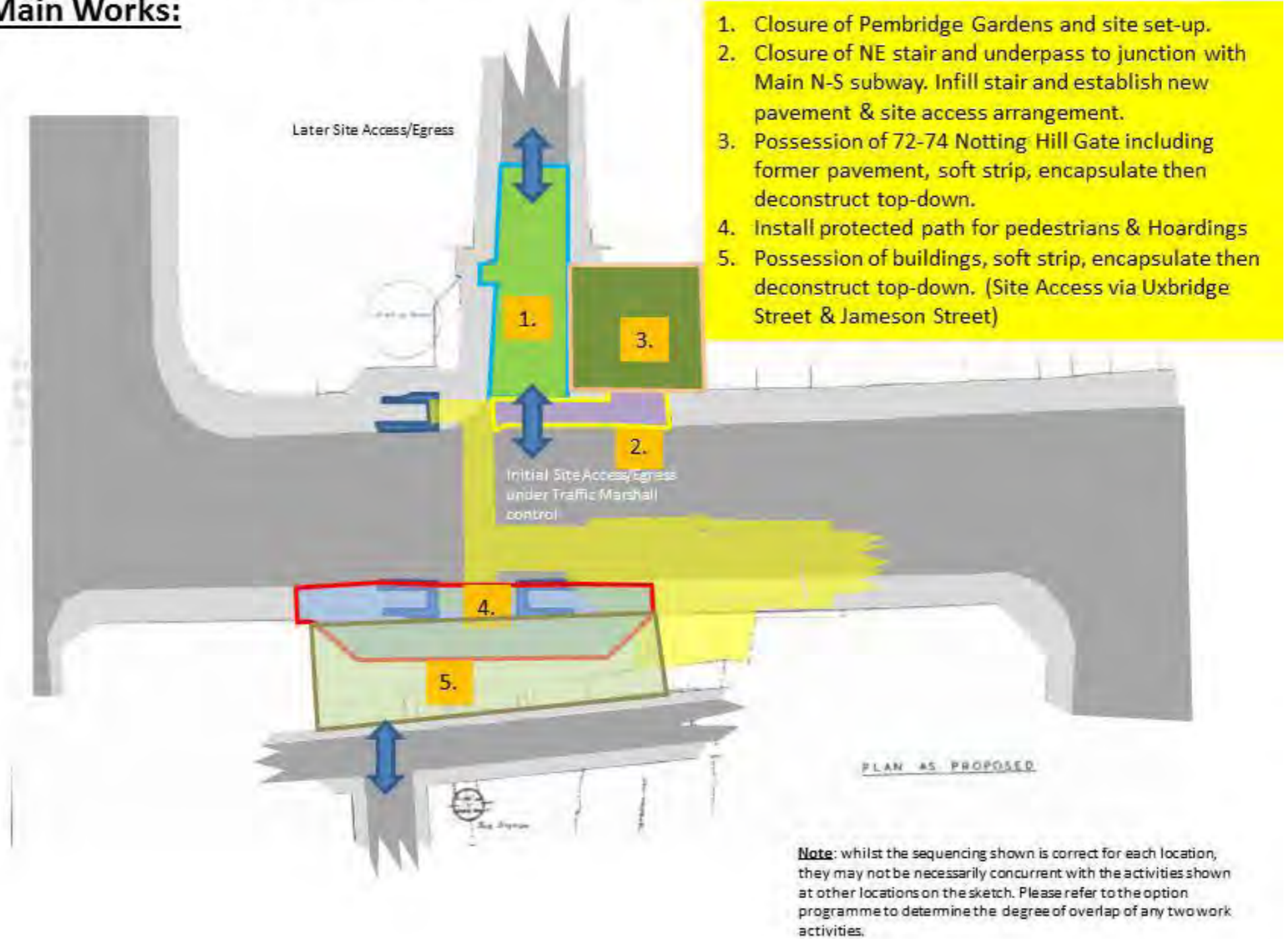
A list of risks relating to this option are included later in this report and most relate to the lack of knowledge concerning the designs, third party assets or the site conditions, particularly concerning the new subway beneath Notting Hill Gate.

The subway construction is particularly challenging due to the proximity of major services to the roof of the proposed subway. A road deck scheme is the proposed solution and has been used on a number of occasions (at Bank and London Bridge) to reduce the impact on traffic. This approach and its attendant risks is common to Option 3A and Option 3B.

The sketches show an indicative worksite area for each phase. The implications for highway and pavement closures and associated traffic diversions will need to be reviewed in detail at a later stage of design.

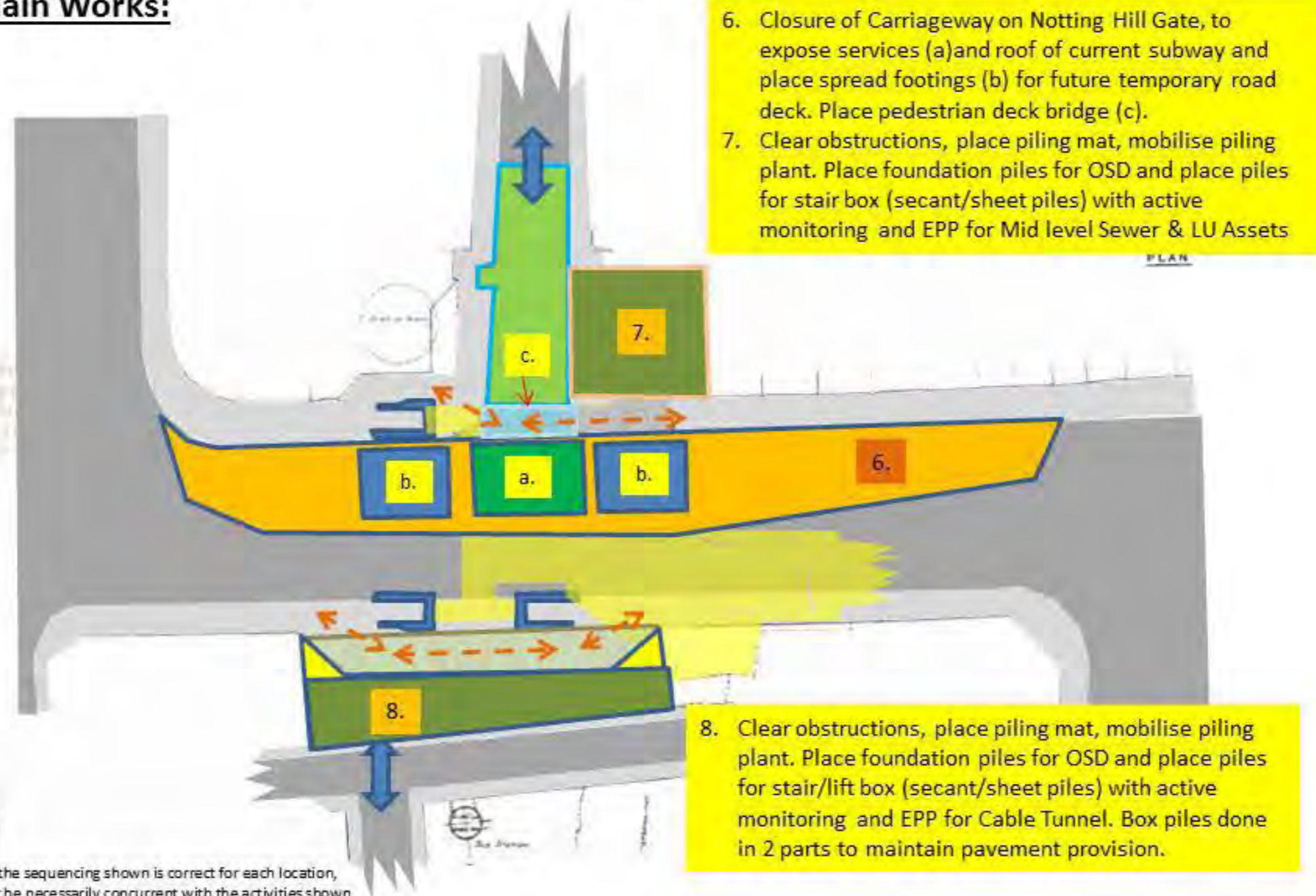
**Notting Hill Gate – Option 3A – Construction Sequence Sketches.**

**Main Works:**



## Notting Hill Gate – Option 3A – Construction Sequence Sketches.

### Main Works:



6. Closure of Carriageway on Notting Hill Gate, to expose services (a) and roof of current subway and place spread footings (b) for future temporary road deck. Place pedestrian deck bridge (c).

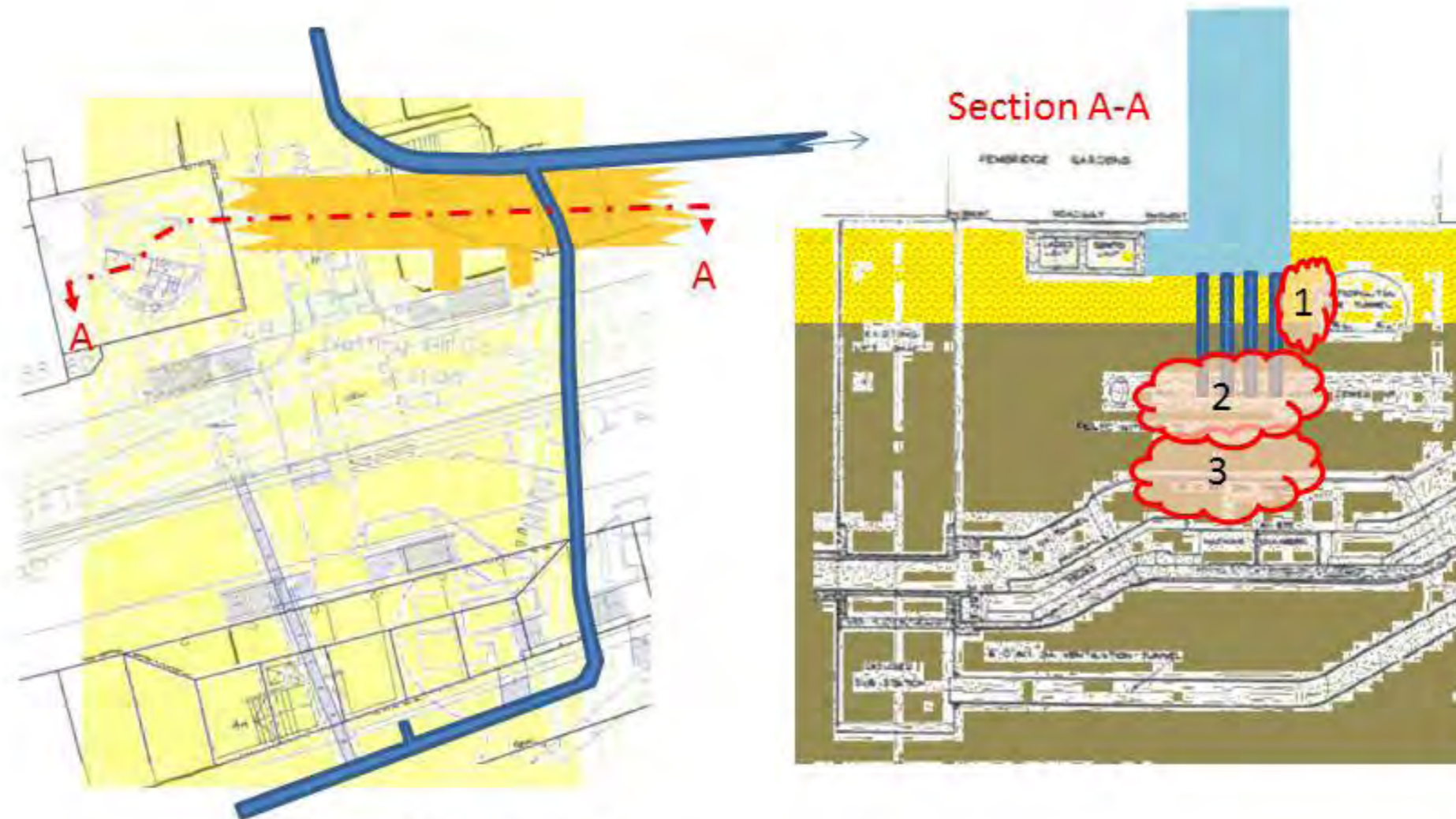
7. Clear obstructions, place piling mat, mobilise piling plant. Place foundation piles for OSD and place piles for stair box (secant/sheet piles) with active monitoring and EPP for Mid level Sewer & LU Assets

8. Clear obstructions, place piling mat, mobilise piling plant. Place foundation piles for OSD and place piles for stair/lift box (secant/sheet piles) with active monitoring and EPP for Cable Tunnel. Box piles done in 2 parts to maintain pavement provision.

**Note:** whilst the sequencing shown is correct for each location, they may not be necessarily concurrent with the activities shown at other locations on the sketch. Please refer to the option programme to determine the degree of overlap of any two work activities.



### Notting Hill Gate – Option 3A – Construction Sequence Sketches.

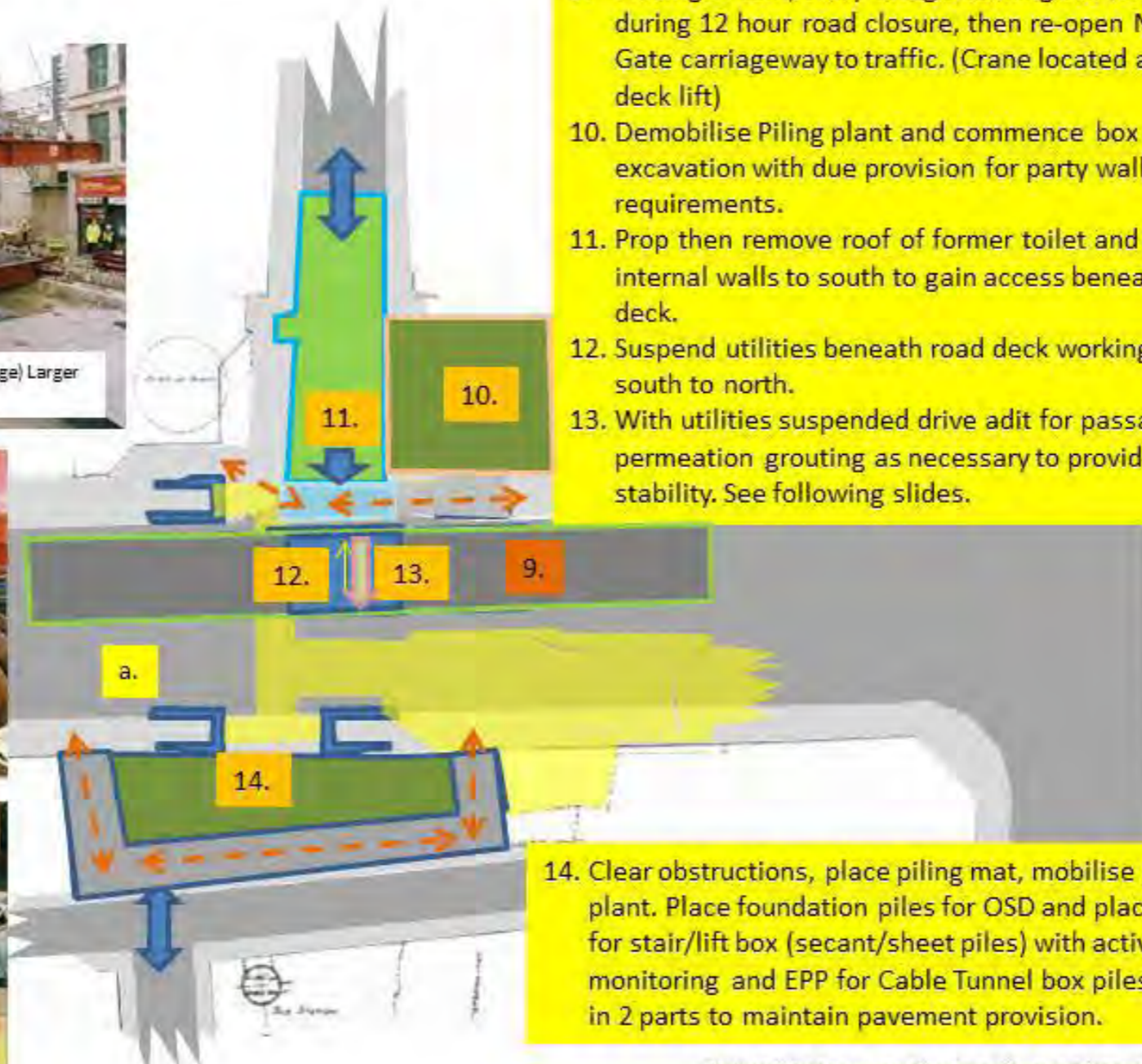


#### Piling Issues:

1. Conflict with mid level sewer.
2. Potentially within 6m of escalator barrel crown.
3. Potentially within 3m of Metropolitan/Circle tunnel.

## Notting Hill Gate – Option 3A – Construction Sequence Sketches.

### Main Works:



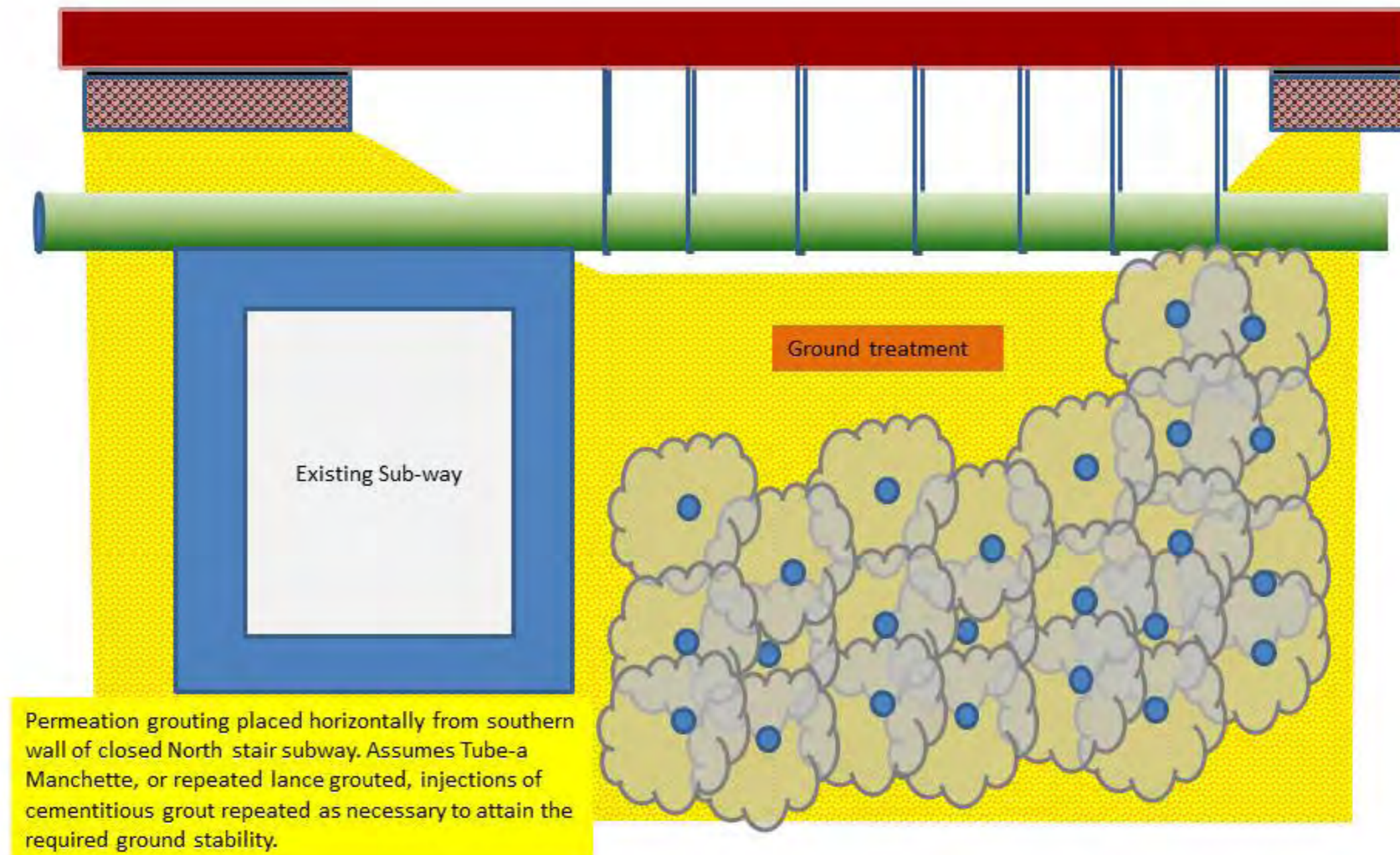
- 9. Placing of temporary bridge decking associated ramps during 12 hour road closure, then re-open Notting Hill Gate carriageway to traffic. (Crane located at a. for deck lift)
- 10. Demobilise Piling plant and commence box excavation with due provision for party wall requirements.
- 11. Prop then remove roof of former toilet and demolish internal walls to south to gain access beneath road deck.
- 12. Suspend utilities beneath road deck working back south to north.
- 13. With utilities suspended drive adit for passage wall, permeation grouting as necessary to provide ground stability. See following slides.

- 14. Clear obstructions, place piling mat, mobilise piling plant. Place foundation piles for OSD and place piles for stair/lift box (secant/sheet piles) with active monitoring and EPP for Cable Tunnel box piles done in 2 parts to maintain pavement provision.

**Note:** whilst the sequencing shown is correct for each location, they may not be necessarily concurrent with the activities shown at other locations on the sketch. Please refer to the option programme to determine the degree of overlap of any two work activities.

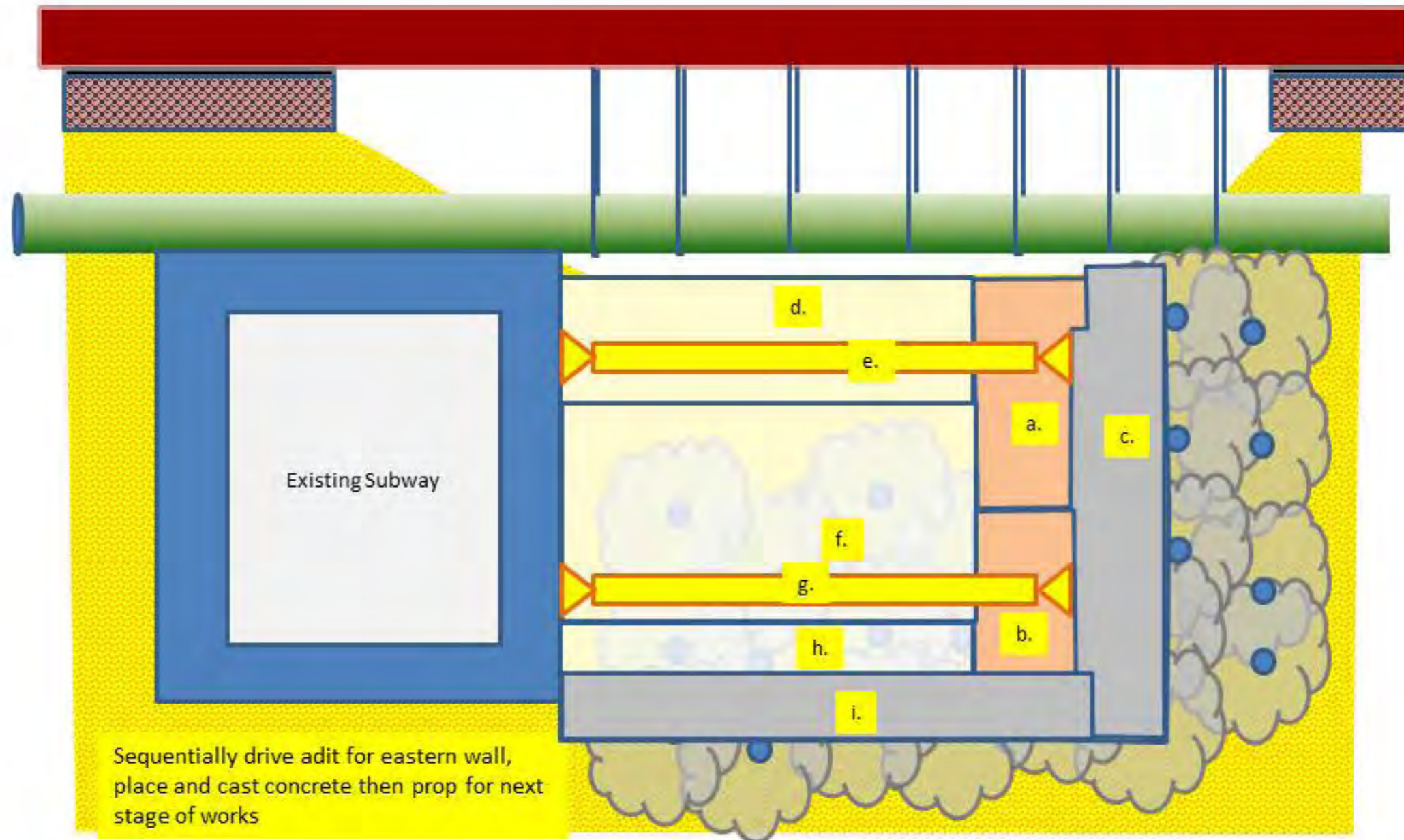
## Notting Hill Gate – Option 3A – Construction Sequence Sketches.

### Main Works: Subway works



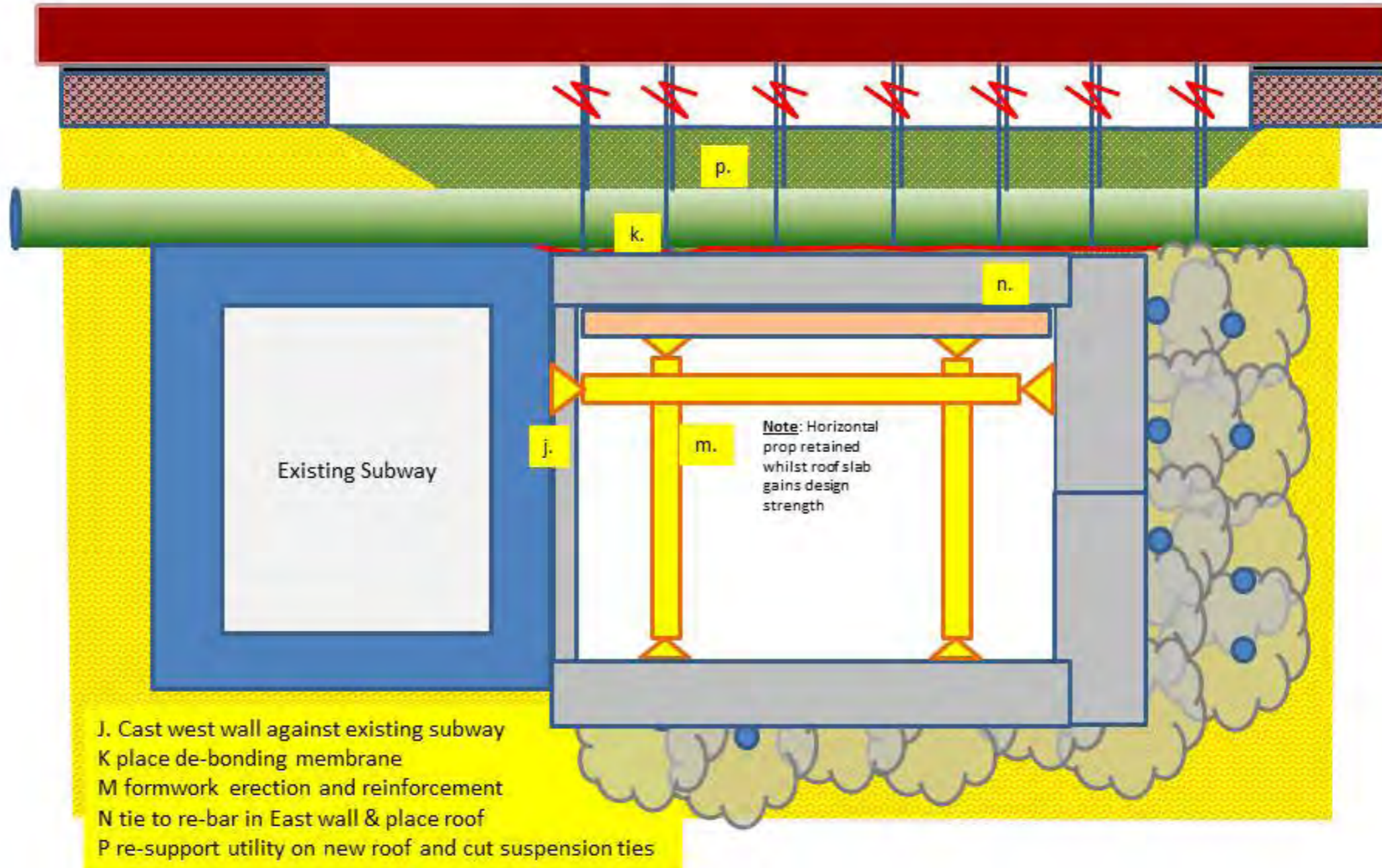
Notting Hill Gate – Option 3A – Construction Sequence Sketches.

Main Works: Subway works



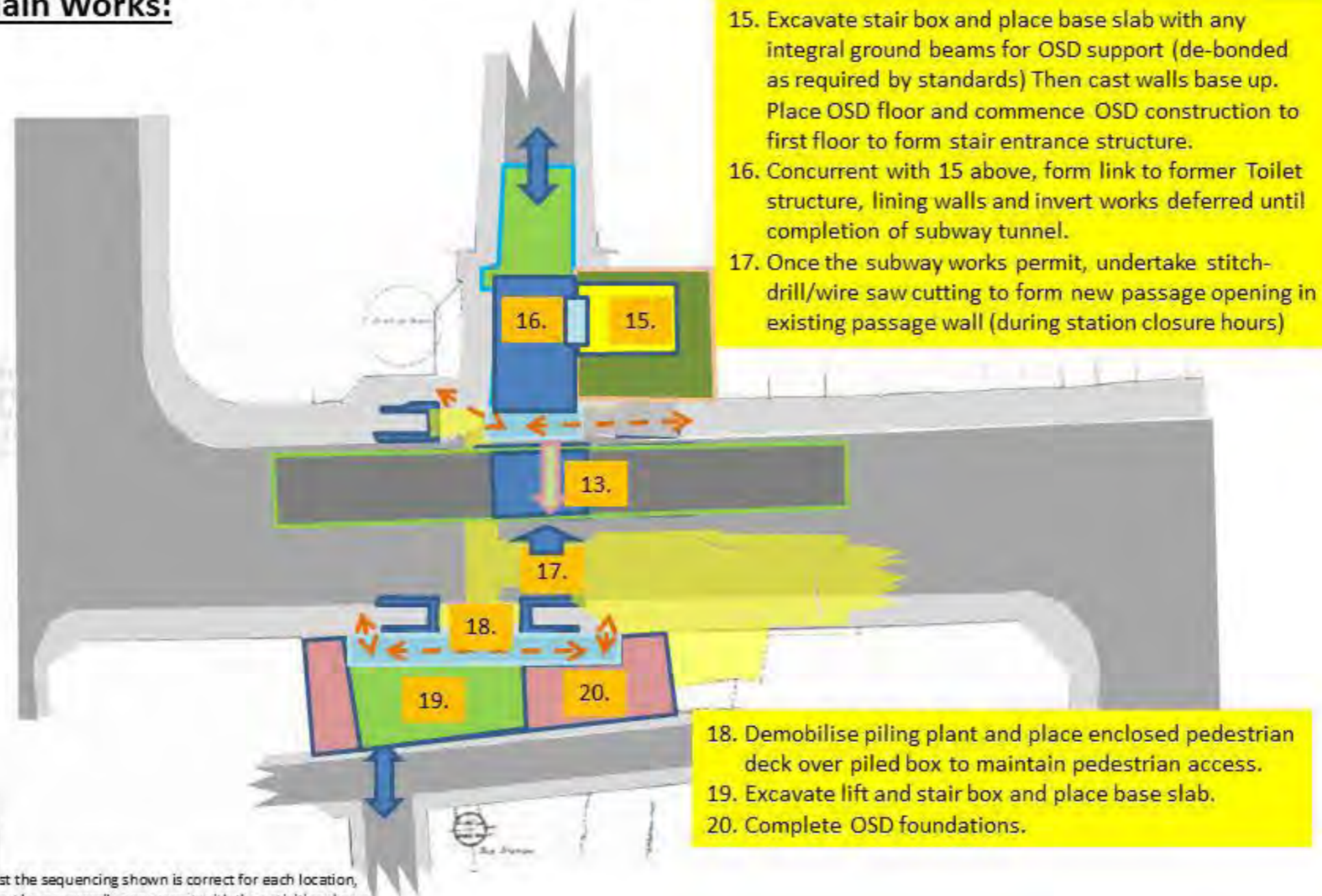
**Notting Hill Gate – Option 3A – Construction Sequence Sketches.**

**Main Works: Subway works**



## Notting Hill Gate – Option 3A – Construction Sequence Sketches.

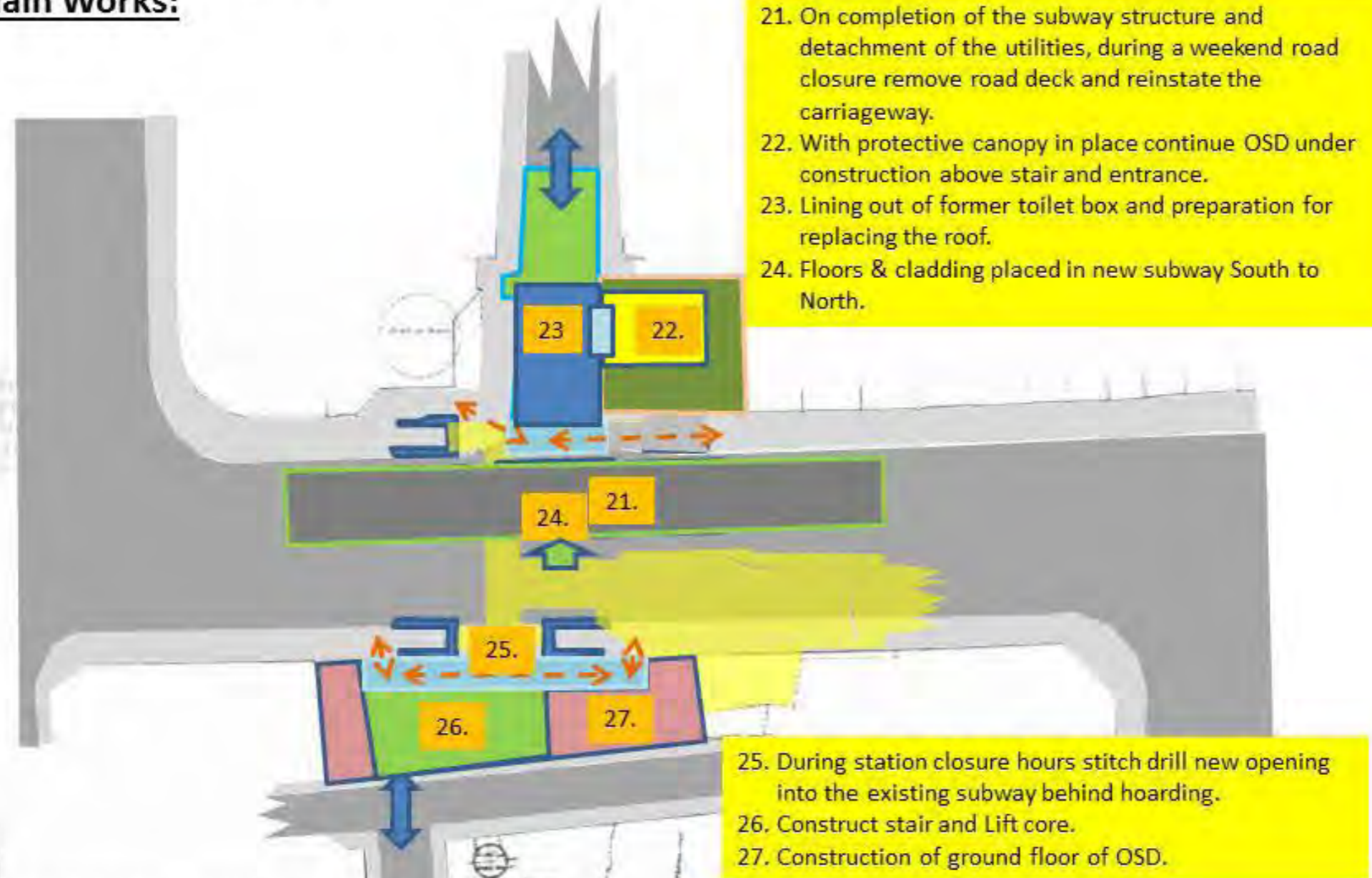
### Main Works:



**Note:** whilst the sequencing shown is correct for each location, they may not be necessarily concurrent with the activities shown at other locations on the sketch. Please refer to the option programme to determine the degree of overlap of any two work activities.

## Notting Hill Gate – Option 3A – Construction Sequence Sketches.

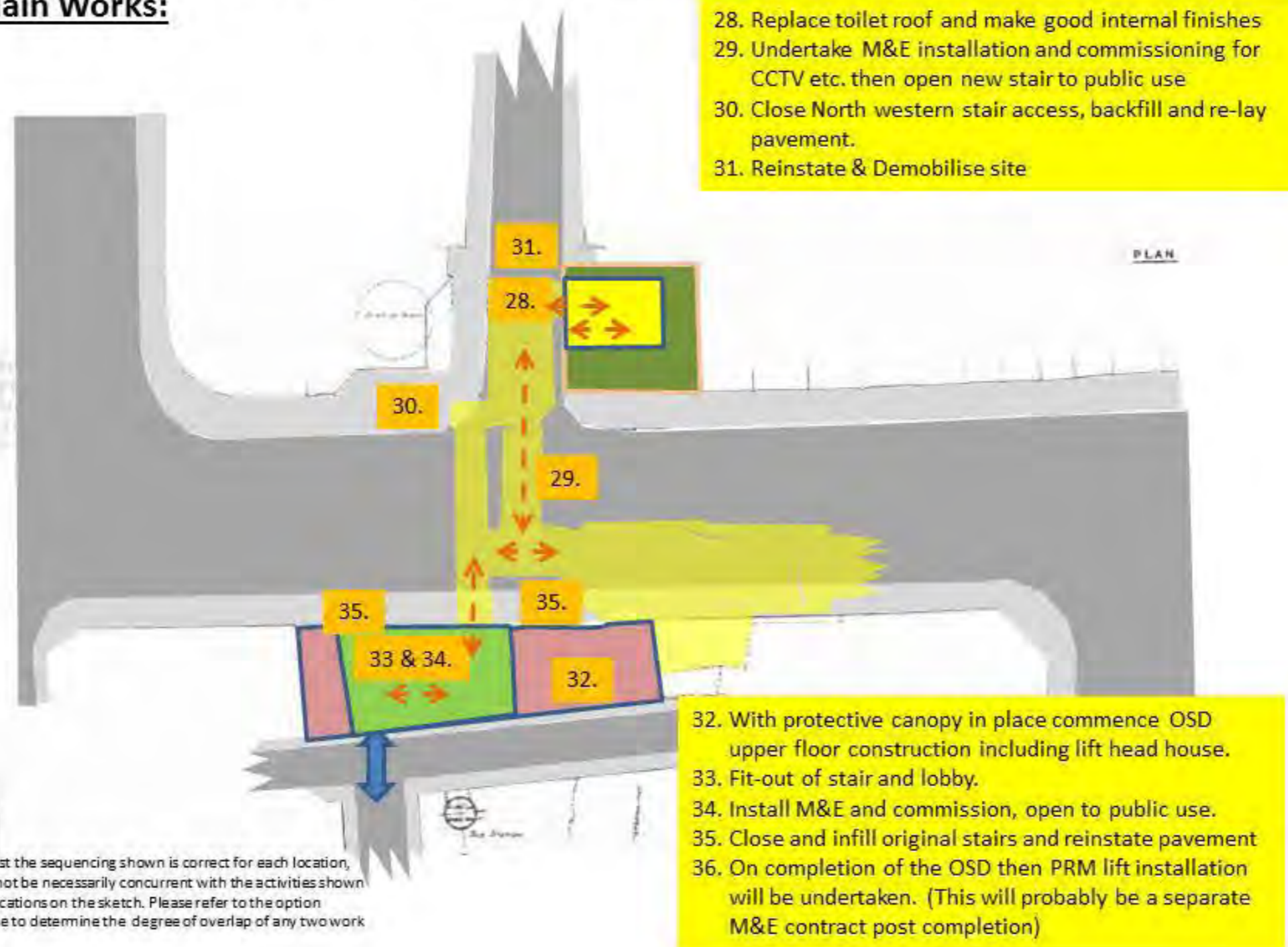
### Main Works:



**Note:** whilst the sequencing shown is correct for each location, they may not be necessarily concurrent with the activities shown at other locations on the sketch. Please refer to the option programme to determine the degree of overlap of any two work activities.

## Notting Hill Gate – Option 3A – Construction Sequence Sketches.

### Main Works:





### Option 3B Construction Sequence

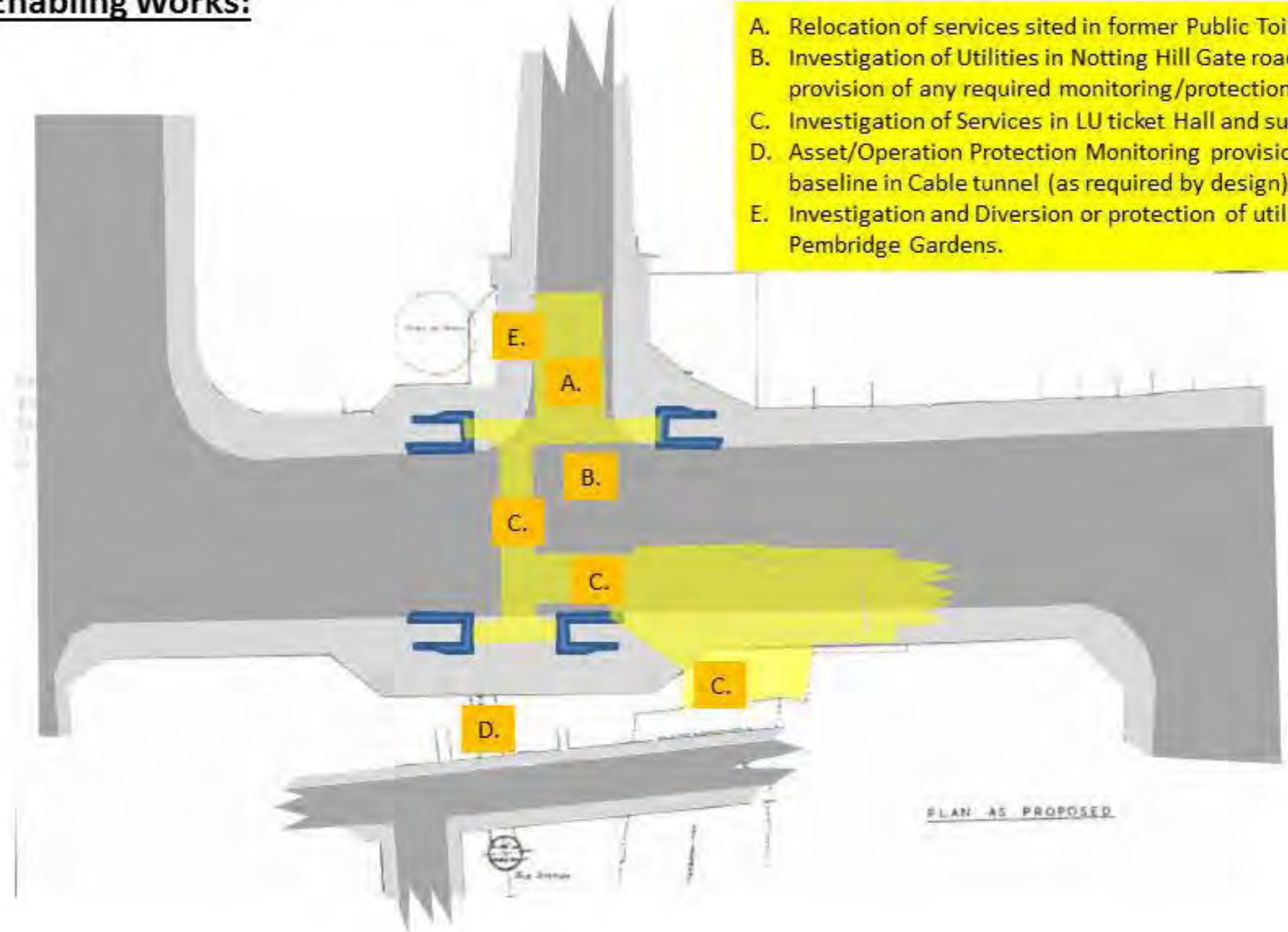
In construction terms the only significant difference between Option 3B and Option 3A lies in the omission of the northern building reconstruction and stair box. This removes potential pile impacts on LU assets.

The sequences of construction for the different locations pertinent to this Option relate to the programme included later in this report. A list of risks relating to this option are little different to Option 3A.

## Notting Hill Gate – Option 3B – Construction Sequence Sketches.

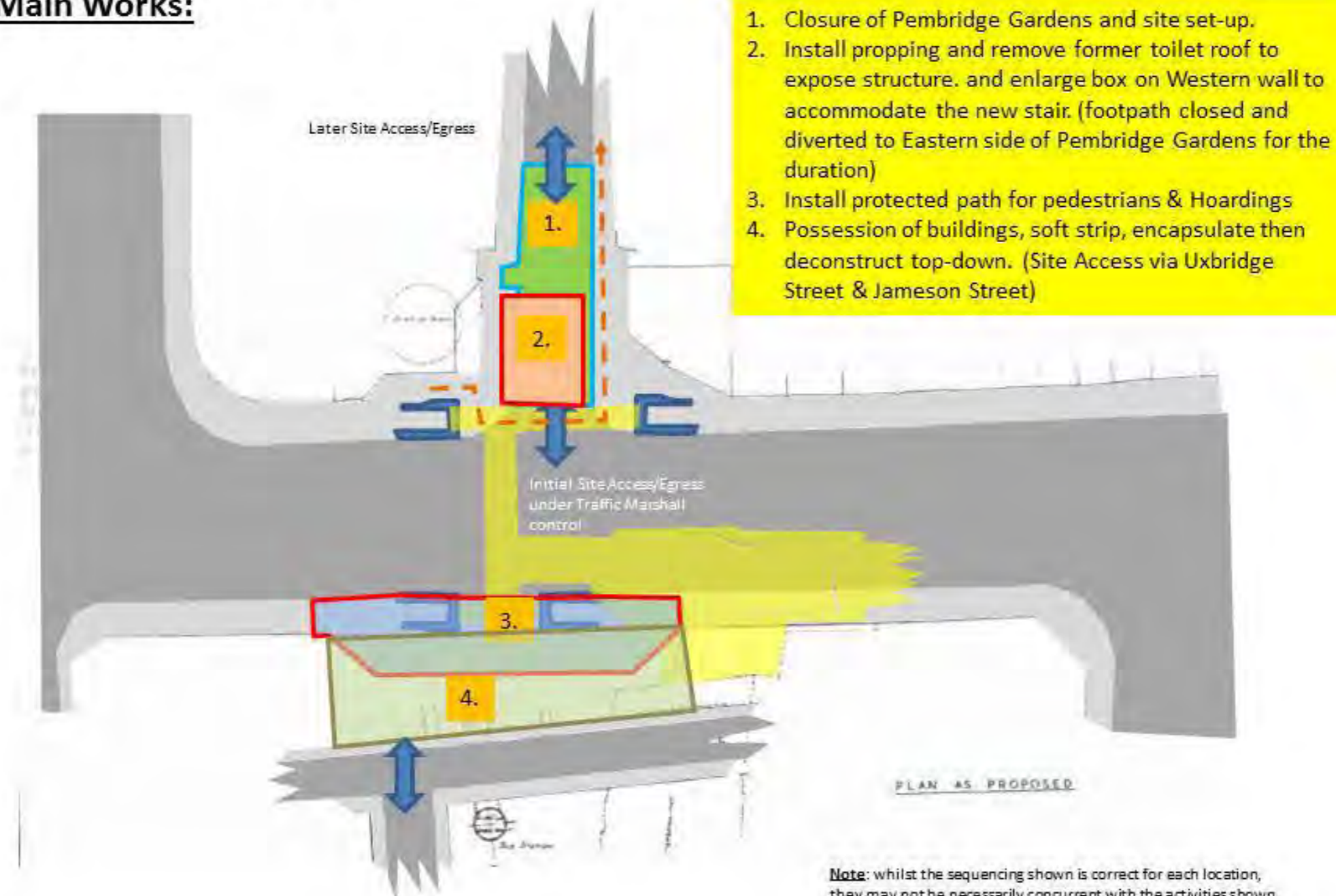
### Enabling Works:

- A. Relocation of services sited in former Public Toilet.
- B. Investigation of Utilities in Notting Hill Gate road & provision of any required monitoring/protection.
- C. Investigation of Services in LU ticket Hall and subway.
- D. Asset/Operation Protection Monitoring provision and baseline in Cable tunnel (as required by design).
- E. Investigation and Diversion or protection of utilities in Pembridge Gardens.



## Notting Hill Gate – Option 3B – Construction Sequence Sketches.

### Main Works:

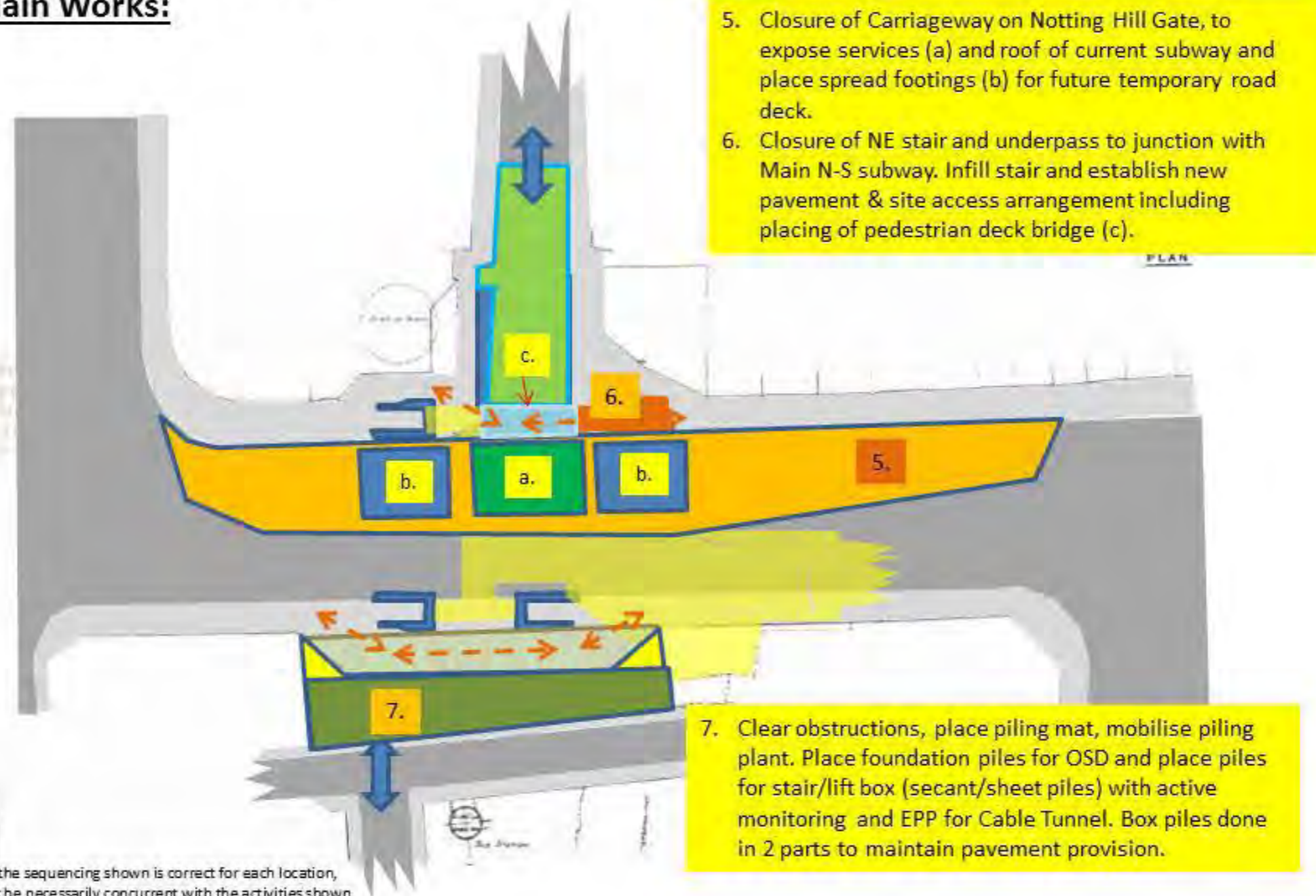


1. Closure of Pembridge Gardens and site set-up.
2. Install propping and remove former toilet roof to expose structure, and enlarge box on Western wall to accommodate the new stair. (footpath closed and diverted to Eastern side of Pembridge Gardens for the duration)
3. Install protected path for pedestrians & Hoardings
4. Possession of buildings, soft strip, encapsulate then deconstruct top-down. (Site Access via Uxbridge Street & Jameson Street)

**Note:** whilst the sequencing shown is correct for each location, they may not be necessarily concurrent with the activities shown at other locations on the sketch. Please refer to the option programme to determine the degree of overlap of any two work activities.

### Notting Hill Gate – Option 3B – Construction Sequence Sketches.

#### Main Works:



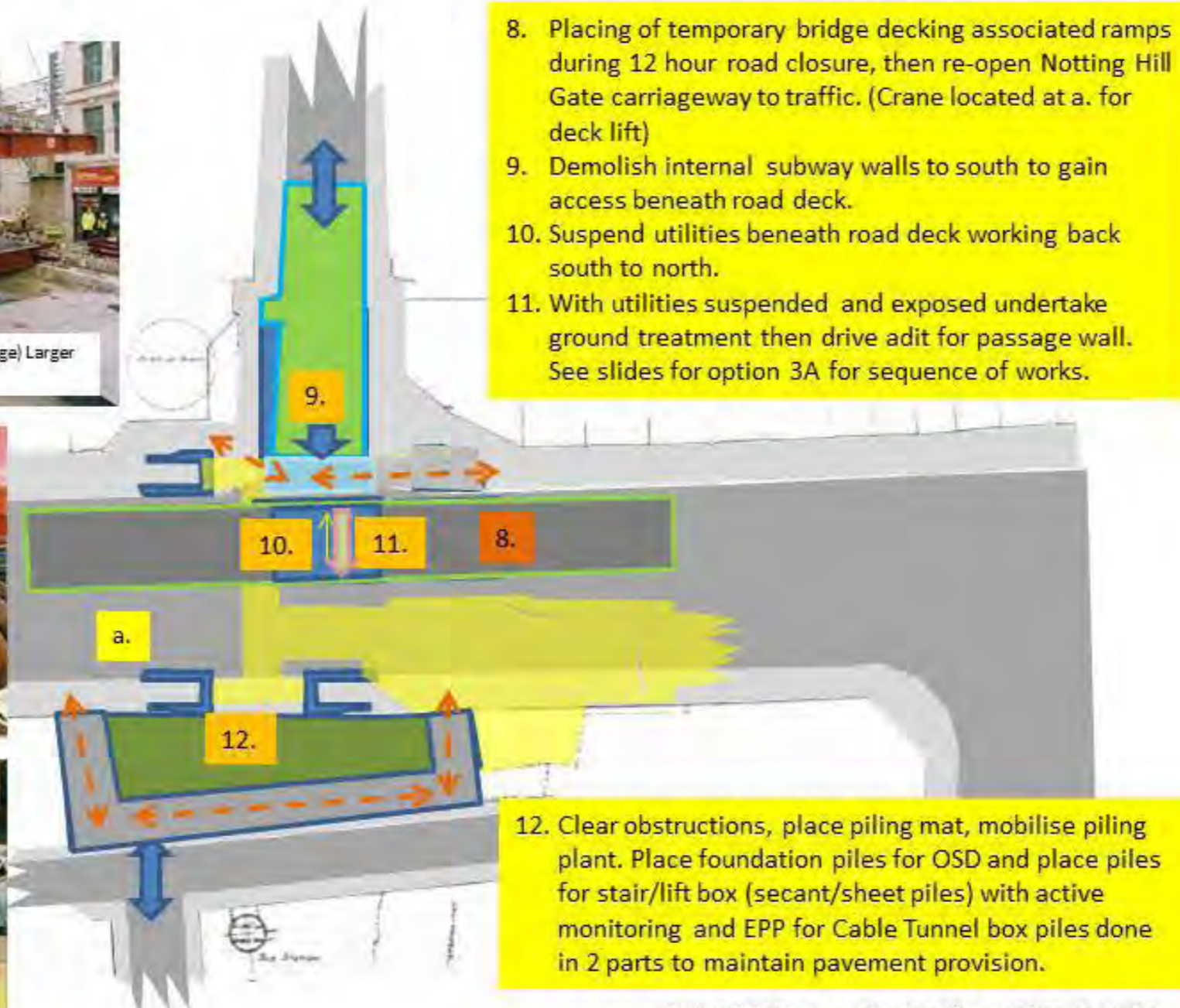
- 5. Closure of Carriageway on Notting Hill Gate, to expose services (a) and roof of current subway and place spread footings (b) for future temporary road deck.
- 6. Closure of NE stair and underpass to junction with Main N-S subway. Infill stair and establish new pavement & site access arrangement including placing of pedestrian deck bridge (c).

- 7. Clear obstructions, place piling mat, mobilise piling plant. Place foundation piles for OSD and place piles for stair/lift box (secant/sheet piles) with active monitoring and EPP for Cable Tunnel. Box piles done in 2 parts to maintain pavement provision.

**Note:** whilst the sequencing shown is correct for each location, they may not be necessarily concurrent with the activities shown at other locations on the sketch. Please refer to the option programme to determine the degree of overlap of any two work activities.

## Notting Hill Gate – Option 3B – Construction Sequence Sketches.

### Main Works:



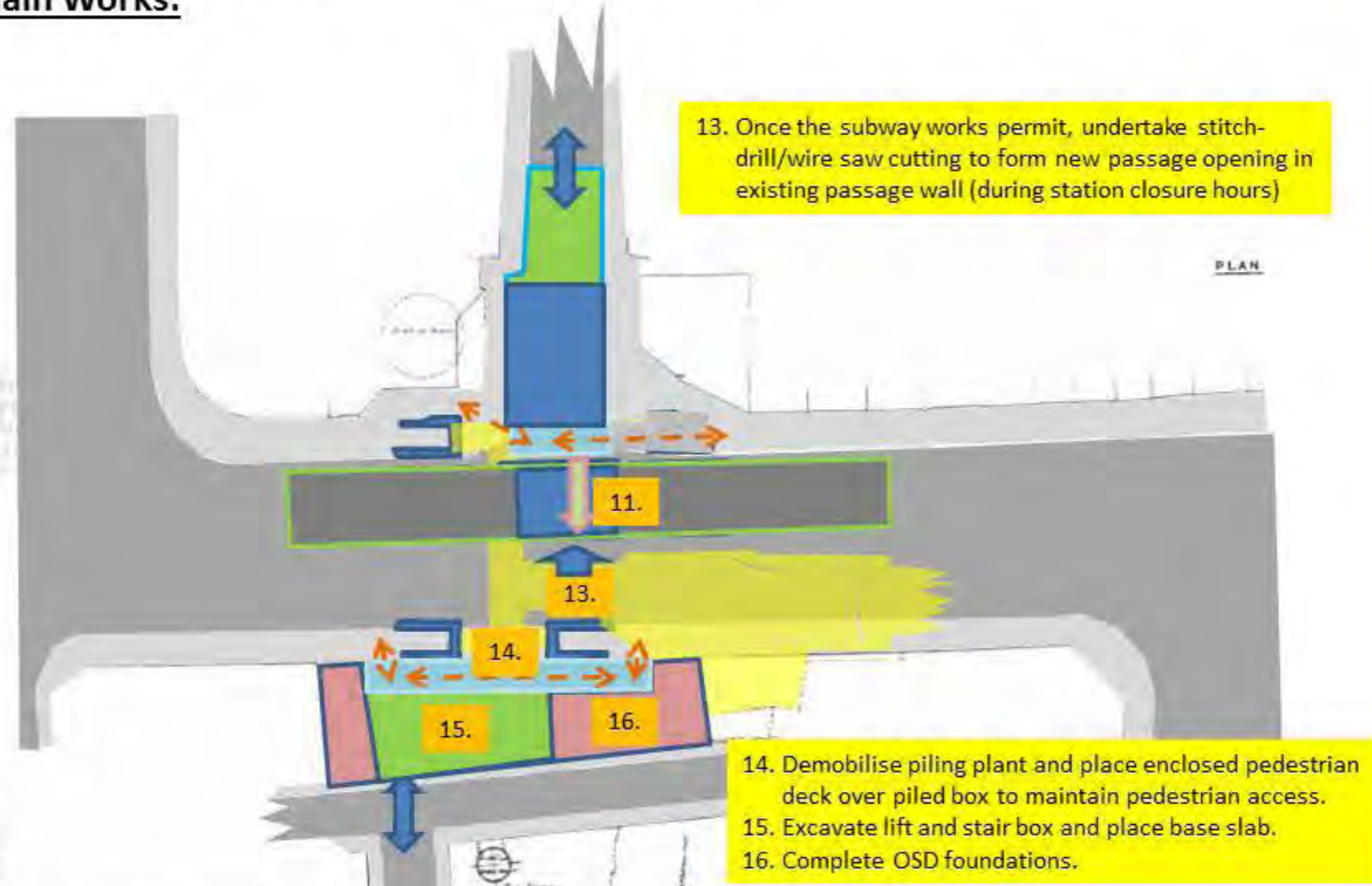
- 8. Placing of temporary bridge decking associated ramps during 12 hour road closure, then re-open Notting Hill Gate carriageway to traffic. (Crane located at a. for deck lift)
- 9. Demolish internal subway walls to south to gain access beneath road deck.
- 10. Suspend utilities beneath road deck working back south to north.
- 11. With utilities suspended and exposed undertake ground treatment then drive adit for passage wall. See slides for option 3A for sequence of works.

- 12. Clear obstructions, place piling mat, mobilise piling plant. Place foundation piles for OSD and place piles for stair/lift box (secant/sheet piles) with active monitoring and EPP for Cable Tunnel box piles done in 2 parts to maintain pavement provision.

**Note:** whilst the sequencing shown is correct for each location, they may not be necessarily concurrent with the activities shown at other locations on the sketch. Please refer to the option programme to determine the degree of overlap of any two work activities.

**Notting Hill Gate – Option 3B – Construction Sequence Sketches.**

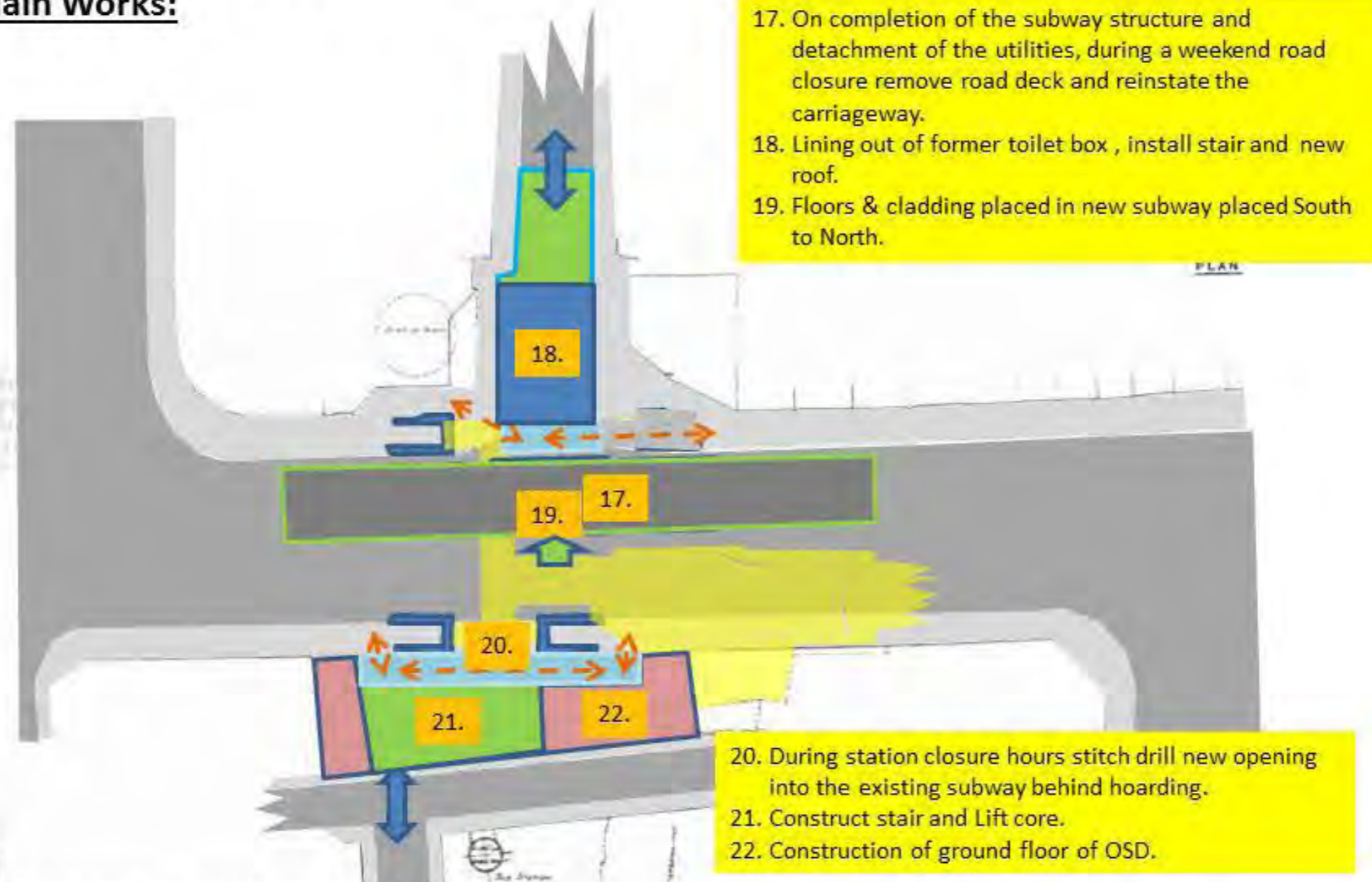
**Main Works:**



**Note:** whilst the sequencing shown is correct for each location, they may not be necessarily concurrent with the activities shown at other locations on the sketch. Please refer to the option programme to determine the degree of overlap of any two work activities.

**Notting Hill Gate – Option 3B – Construction Sequence Sketches.**

**Main Works:**



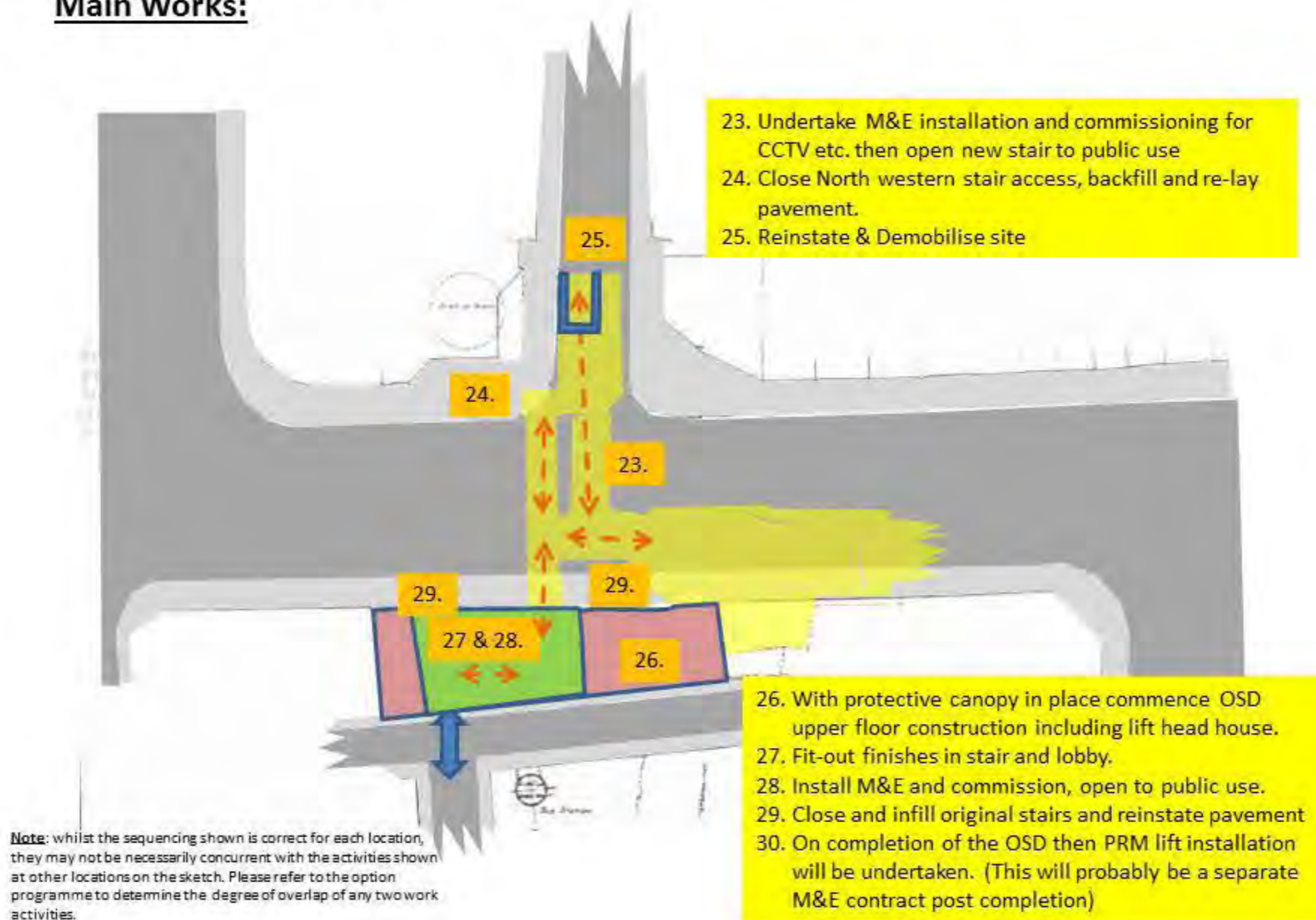
17. On completion of the subway structure and detachment of the utilities, during a weekend road closure remove road deck and reinstate the carriageway.  
 18. Lining out of former toilet box , install stair and new roof.  
 19. Floors & cladding placed in new subway placed South to North.

20. During station closure hours stitch drill new opening into the existing subway behind hoarding.  
 21. Construct stair and Lift core.  
 22. Construction of ground floor of OSD.

**Note:** whilst the sequencing shown is correct for each location, they may not be necessarily concurrent with the activities shown at other locations on the sketch. Please refer to the option programme to determine the degree of overlap of any two work activities.

## Notting Hill Gate – Option 3B – Construction Sequence Sketches.

### Main Works:



Notting Hill Gate - Option 3A - High Level Programme				Year -2	Year -1	Year 1	Year 2	Year 3
No	Activity	Duration Weeks	Start Week					
56	<b>Pre Contract Enabling works</b>							
	<i>Physical activities and programme allowances only - it does not explicitly address design, dialogue and authority / third party permission processes and permits</i>							
1	Relocation of services sited in former Public Toilet	18	-17.1					
2	Investigation of Utilities in Notting Hill Gate road & provision of any required monitoring/protection.	26	-25.7					
3	Investigation of Services in LU ticket Hall and subway.	18	-17.1					
4	Asset/Operation Protection Monitoring provision and baseline in LU Metropolitan and	36	-35.7					
5	Investigation and Diversion of utilities in Pembridge Gardens.	26	-25.7					
	<b>Main Contract Works</b>							
	<b>Northern Site Area Works</b>							
6	Closure of Pembridge Gardens and site set-up.	2	0					
7	Closure of NE stair and underpass to junction with Main N-S subway. Infill stair and establish new pavement & site access arrangement.	2	1.4					
8	Possession of 72-74 Notting Hill Gate including former pavement, soft strip, encapsulate then deconstruct top-down.	11	3.4					
9	Closure of Carriageway on Notting Hill Gate, to expose services and roof of current subway and place spread footings for future temporary road deck. Place pedestrian deck bridge	6	1.4					
10	Clear obstructions, place piling mat, mobilise piling plant. Place foundation piles for OSD and place piles for stair box (secant/sheet piles) with active monitoring and EPP for Mid level Sewer & LU Assets	9	14.1					
11	Placing of temporary bridge decking associated ramps during 12 hour road closure, then re-open Notting Hill Gate carriageway to traffic.	1	7.4					
12	Demobilise Piling plant and undertake box excavation with due provision for party wall requirements.	4	22.7					
13	Prop then remove roof of former toilet and demolish internal walls to south to gain access beneath road deck.	4	14.1					
14	Suspend utilities beneath road deck working back south to north.	4	8.4					
15	Mobilise drilling and grouting plant and place in former toilet area to treat ground beneath utilities	1	12.4					
16	Undertake ground treatment	3	13.4					
17	Demobilise grout plant & set up for tunnelling	1	16.4					
18	Drive upper sidewall adit (a)	2	17.4					
19	Drive lower sidewall adit (b)	3	19.4					
20	Place reinforcement and shuttering, cast and strike sidewall(c.)	4	22					
21	Excavate upper adit area & place props (d&e)	2	26					
22	Excavate mid adit area & place props (f&g)	2	28					
23	Excavate invert, place reinforcement and shuttering, cast and strike invert (h & i)	2	30					
24	After invert curing remove lower propping, place reinforcement and shuttering, cast and strike western sidewall (j)	4	32					
25	Place debonding under utilities, set roof formwork, reinforcement, cast concrete then strike shutter (includes ties to existing station walls/roofs) (m,n&k)	4	36					
26	Remove internal propping once roof has cured	3	40					
27	Support utilities if new subway roof and cut suspension ties from deck, backfill above utilities. (p)	3	43					
28	Place base slab with any integral ground beams for OSD support	3	26.7					
29	Sequentially place reinforcement and shuttering, cast and strike walls to stair box	7	29.7					
30	Place reinforcement and shuttering, cast and strike ground floor slab	3	36.7					
31	Stitch drill opening in former toilet box wall and form opening frame to link to new stair	5	32					
32	Mobilise plant and undertake stitch-drill/wire saw cutting to form new passage opening in existing passage wall (during station closure hours)	5	43					
33	During road closure remove road deck, reinstate road carriageway	1	46					
34	Construction of ground floor structure including stair entrance	7	39.7					
35	Erect protective canopy to permit OSD construction to continue and continue fitting out stair entrance.	1	46.7					
36	Refurbish toilet internal structure (cast new walls/cladding etc.)	5	37					
37	Floors, cladding and finishes to new subway & entrance	6	48					
38	Reinstate former toilet roof and make good internal finishes	3	54					
39	Install commission and integrate M&E in subway with station systems - CCTV, signage, Bostwick Gates etc. then open to public use	6	57					
40	Closure of NW stair, erect shutter and backfill, demolish entrance structure and re-lay pavement	6	63					
41	Demobilise site and reinstate street.	4	69					
	<b>Southern Site Area Works</b>							
42	Install protected path for pedestrians & Hoardings	1	0					
43	Possession of buildings, soft strip, encapsulate then deconstruct top-down. Phase 1: Clear obstructions, place piling mat, mobilise piling plant. Place foundation piles for OSD and place piles for stair/lift box (secant/sheet piles) with active monitoring and EPP for Cable Tunnel. Box piles done in 2 phases to maintain pavement provision.	18	1					
44	Change footpath alignment and undertake Phase 2 piling: Clear obstructions, place piling mat, mobilise piling plant. Place foundation piles for OSD and place piles for stair/lift box (secant/sheet piles) with active monitoring and EPP for Cable Tunnel.	10	18.1					
45	Demobilise piling plant and place enclosed pedestrian deck over piled box to maintain pedestrian access.	1	35.3					
46	Excavate lift and stair box and place base slab & walls	13	36.3					
47	Place ground slab and OSD foundation.	5	49.1					
48	During station closure hours stitch drill new opening into the existing subway behind hoarding.	4	54.1					
49	Construct stair and Lift core.	6	54.1					
50	Construction of ground floor structure including stair entrance	9	60.1					
51	With protective canopy in place commence OSD upper floor construction including PRM lift head house.	6	69.1					
52	Fit-out finishes in stair and lobby.	5	75.1					
53	Install commission and integrate M&E in subway with station systems - CCTV, signage, Bostwick Gates etc. then open to public use	5	80.1					
54	Close and infill original stairs and reinstate pavement	7	85.1					
55	Handover site to OSD contractor for ongoing completion							
	<b>Post Contract Works</b>							
56	On completion of southern OSD structure (assumed 6 months), install, commission and integrate PRM lift into station control systems	26	118					

Notting Hill Gate - Option 3B - High Level Programme				Year -2	Year -1	Year 1	Year 2	Year 3
No	Activity	Duration Weeks	Start Week					
46	<b>Pre Contract Enabling works</b>							
	<i>Physical activities and programme allowances only - it does not explicitly address design, dialogue and authority / third party permission processes and permits</i>							
1	Relocation of services sited in former Public Toilet	18	-17.1					
2	Investigation of Utilities in Notting Hill Gate road & provision of any required monitoring/protection.	26	-25.7					
3	Investigation of Services in LU ticket Hall and subway.	18	-17.1					
4	Asset/Operation Protection Monitoring provision and baseline in LU Metropolitan and	36	-35.7					
5	Investigation and Diversion of utilities in Pembridge Gardens.	26	-25.7					
	<b>Main Contract Works</b>							
	<b>Northern Site Area Works</b>							
6	Closure of Pembridge Gardens and site set-up.	2	0					
7	Prop then remove roof of former toilet, close West pavement of Pembridge Gardens and undertake enlargement of the toilet box western wall.	9	1.4					
8	Closure of NE stair and underpass to junction with Main N-S subway. Infill stair and establish new pavement & site access arrangement.	2	8.4					
9	Closure of Carriageway on Notting Hill Gate, to expose services and roof of current subway and place spread footings for future temporary road deck. Place pedestrian deck bridge	6	1.4					
10	Placing of temporary bridge decking associated ramps during 12 hour road closure, then re-open Notting Hill Gate carriageway to traffic.	1	7.4					
11	Suspend utilities beneath road deck working back south to north.	4	8.4					
12	Mobilise drilling and grouting plant and place in former toilet area to treat ground beneath utilities	1	12.4					
13	Undertake ground treatment	3	13.4					
14	Demobilise grout plant & set up for tunnelling	1	16.4					
15	Drive upper sidewall adit (a)	2	17.4					
16	Drive lower sidewall adit (b)	3	19.4					
17	Place reinforcement and shuttering, cast and strike sidewall(c.)	4	22					
18	Excavate upper adit area & place props (d&e)	2	26					
19	Excavate mid adit area & place props (f&g)	2	28					
20	Excavate invert, place reinforcement and shuttering, cast and strike invert (h & i)	2	30					
21	After invert curing remove lower propping, place reinforcement and shuttering, cast and strike western sidewall (j)	4	32					
22	Place debonding under utilities, set roof formwork, reinforcement, cast concrete then strike shutter (includes ties to existing station walls/roofs) (m,n&k)	4	36					
23	Remove internal propping once roof has cured	3	40					
24	Support utilities if new subway roof and cut suspension ties from deck, backfill above utilities. (p)	3	43					
25	Mobilise plant and undertake stitch-drill/wire saw cutting to form new passage opening in existing passage wall (during station closure hours)	5	43					
26	During road closure remove road deck, reinstate road carriageway	1	46					
27	Refurbish toilet internal structure (cast new walls/cladding etc.) and construct stair and	7	40					
28	Floors, cladding and finishes to new subway & entrance	6	48					
29	Install commission and integrate M&E in subway with station systems - CCTV, signage, Bostwick Gates etc. then open to public use	6	54					
30	Closure of NW stair, erect shutter and backfill, demolish entrance structure and re-lay pavement	6	60					
31	Demobilise site and reinstate street.	4	66					
	<b>Southern Site Area Works</b>							
32	Install protected path for pedestrians & Hoardings	1	0					
33	Possession of buildings, soft strip, encapsulate then deconstruct top-down. Phase 1: Clear obstructions, place piling mat, mobilise piling plant. Place foundation piles for OSD and place piles for stair/lift box (secant/sheet piles) with active monitoring and EPP for Cable Tunnel. Box piles done in 2 phases to maintain pavement provision.	18	1					
34	Change footpath alignment and undertake Phase 2 piling: Clear obstructions, place piling mat, mobilise piling plant. Place foundation piles for OSD and place piles for stair/lift box (secant/sheet piles) with active monitoring and EPP for Cable Tunnel.	10	18.1					
35	Demobilise piling plant and place enclosed pedestrian deck over piled box to maintain pedestrian access.	1	35.3					
36	Excavate lift and stair box and place base slab & walls	13	36.3					
37	Place ground slab and OSD foundation.	5	49.1					
38	During station closure hours stitch drill new opening into the existing subway behind hoarding.	4	54.1					
39	Construct stair and Lift core.	6	54.1					
40	Construction of ground floor structure including stair entrance	9	60.1					
41	With protective canopy in place commence OSD upper floor construction including PRM lift head house.	6	69.1					
42	Fit-out finishes in stair and lobby.	5	75.1					
43	Install commission and integrate M&E in subway with station systems - CCTV, signage, Bostwick Gates etc. then open to public use	5	80.1					
44	Close and infill original stairs and reinstate pavement	7	85.1					
45	Handover site to OSD contractor for ongoing completion							
	<b>Post Contract Works</b>							
46	On completion of southern OSD structure (assumed 6 months), install, commission and integrate PRM lift into station control systems	26	118					



**Construction Programme and Cost Estimate**

The preliminary construction programmes opposite are based on the sequence of activities in the earlier sketches and enable the assessment of the construction costs below.

It is anticipated that a minimum of 18 - 24 months will be required for design, approvals and the completion of enabling works, and a further 18 months to bring the new stairs into operation.

As the main influence on programme is the new connection beneath the utilities, Option 3A and 3B have approximately equal construction periods.

**NOTTING HILL STATION ENTRANCE RELOCATION**

**Option Cost Comparative Summary**

	Option 3A	Option 3B
<b>NORTHERN ENTRANCE</b>		
ADVANCED AND ENABLING WORKS	562,500	562,500
SITE PREPARATION	23,000	15,000
STAIR BOX	241,918	294,988
ADIT CONSTRUCTION	878,740	773,740
INTERNAL WORKS & FITOUT	405,750	852,850
<b>SOUTHERN ENTRANCE</b>		
ADVANCED AND ENABLING WORKS	35,000	35,000
SITE PREPARATION	30,000	30,000
STAIR BOX	307,630	307,630
LIFT	254,900	254,900
INTERNAL WORKS & FITOUT	330,000	330,000
<b>REMAINING WORKS</b>		
MECHANICAL & ELECTRICAL	275,000	255,000
HEADHOUSES	2,100,000	1,500,000
EXTERNAL WORKS & REINSTATEMENT	38,040	38,040
<b>Sub-Total Enabling Works &amp; Direct Works</b>	<b>5,482,478</b>	<b>5,249,648</b>
Contractor's Risk (10%)	548,248	524,965
Preliminaries (20%)	1,206,145	1,154,923
<b>Sub-Total Enabling Works &amp; Direct Works inc Prelim</b>	<b>7,236,871</b>	<b>6,929,536</b>
Contractor's Overhead & Profit (10%)	723,687	692,954
<b>Total Enabling Works &amp; Direct Works</b>	<b>7,960,558</b>	<b>7,622,490</b>
Design (15%)	1,194,084	1,143,374
Project Management/Client Cost (10%)	796,056	762,249
Risk (30%)	2,388,167	2,286,747
<b>Total Anticipate Final Cost</b>	<b>12,338,865</b>	<b>11,814,860</b>

**Exclusions**

- 1 Full Risk Assessment to be undertaken.
- 2 Property costs.
- 3 Legal costs
- 4 VAT
- 5 3rd Party compensations
- 6 Special work to listed buildings

NOTTING HILL STATION ENTRANCE RELOCATION		
Remit / Sub-Project / Section Title:	OPTION 3A	
Revision:	Revision 1.0	
DESCRIPTION		Total (£)
<b>Contractors Direct Costs</b>		
<b>NORTHERN ENTRANCE</b>		
ADVANCED AND ENABLING WORKS		562,500
SITE PREPARATION		23,000
STAIR BOX		241,918
ADIT CONSTRUCTION		878,740
INTERNAL WORKS & FITOUT		405,750
<b>SOUTHERN ENTRANCE</b>		
ADVANCED AND ENABLING WORKS		35,000
SITE PREPARATION		30,000
STAIR BOX		307,630
LIFT		254,900
INTERNAL WORKS & FITOUT		330,000
<b>REMAINING WORKS</b>		
MECHANICAL & ELECTRICAL		275,000
HEADHOUSES		2,100,000
EXTERNAL WORKS & REINSTATEMENT		38,040
<b>Sub-Total Enabling Works &amp; Direct Works</b>		<b>5,482,478</b>
Contractor's Risk	10%	548,248
Preliminaries	20%	1,206,145
<b>Sub-Total Enabling Works &amp; Direct Works inc Preliminaries</b>		<b>7,236,871</b>
Contractor's Overhead & Profit	10%	723,687
<b>Total Enabling Works &amp; Direct Works</b>		<b>7,960,558</b>
<b>Indirect Costs</b>		
Design	15%	1,194,084
Project Management/Client Costs	10%	796,056
Risk	30%	2,388,167
<b>Other Costs</b>		
Land/Property Purchase		Excluded
<b>GRAND TOTAL</b>		<b>12,338,865</b>

**Exclusions**

- 1 Full Risk Assessment to be undertaken.
- 2 Property costs.
- 3 Legal costs
- 4 VAT
- 5 3rd Party compensations
- 6 Special work to listed buildings

NOTTING HILL STATION ENTRANCE RELOCATION		
Remit / Sub-Project / Section Title:	OPTION 3B	
Revision:	Revision 1.0	
DESCRIPTION		Total (£)
<b>Contractors Direct Costs</b>		
<b>NORTHERN ENTRANCE</b>		
ADVANCED AND ENABLING WORKS		562,500
SITE PREPARATION		15,000
STAIR BOX		294,988
ADIT CONSTRUCTION		773,740
INTERNAL WORKS & FITOUT		852,850
<b>SOUTHERN ENTRANCE</b>		
ADVANCED AND ENABLING WORKS		35,000
SITE PREPARATION		30,000
STAIR BOX		307,630
LIFT		254,900
INTERNAL WORKS & FITOUT		330,000
<b>REMAINING WORKS</b>		
MECHANICAL & ELECTRICAL		255,000
HEADHOUSES		1,500,000
EXTERNAL WORKS & REINSTATEMENT		38,040
<b>Sub-Total Enabling Works &amp; Direct Works</b>		<b>5,249,648</b>
Contractor's Risk	10%	524,965
Preliminaries	20%	1,154,923
<b>Sub-Total Enabling Works &amp; Direct Works inc Preliminaries</b>		<b>6,929,536</b>
Contractor's Overhead & Profit	10%	692,954
<b>Total Enabling Works &amp; Direct Works</b>		<b>7,622,490</b>
<b>Indirect Costs</b>		
Design	15%	1,143,374
Project Management/Client Costs	10%	762,249
Risk	30%	2,286,747
<b>Other Costs</b>		
Land/Property Purchase		Excluded
<b>GRAND TOTAL</b>		<b>11,814,860</b>

**Exclusions**

- 1 Full Risk Assessment to be undertaken.
- 2 Property costs.
- 3 Legal costs
- 4 VAT
- 5 3rd Party compensations
- 6 Special work to listed buildings

London Underground - Notting Hill Gate: Option 3A

Risk ID	Risk Title	Risk Description	Risk Cause	Risk Effect	Risk Owner	Probability	Cost Impact	Time Impact	Current Risk Level	Risk Mitigation	Revised Risk Level
NHG(3A) 1	Unforeseen complications with utilities.	During exposure of utilities for suspension beneath the road deck, leakages are discovered or junctions found resulting in additional works or changes in methods which introduce delay to the programme or risk to operatives/public.	Lack of knowledge concerning the condition of services in affected areas	Failure in service leading to disruption of services, risk to operatives and public, need for road closure	Client, Designer and Contractor once appointed depending project stage	M	VH	VH	M	Future stages of design to review record drawings and confirm by site inspection and/or intrusive survey, provision of enabling works, fail-safe mitigations & EPP in future works, site supervision, works undertaken beneath live utilities must not have pathway into public subway and LU station.	L
NHG(3A) 2	Natural or man-made obstructions prevent horizontal ground treatment for the subway works.	Past temporary works from the original subway and ticket hall works, uncharted or disused utilities or natural variation of the ground prevents drilling or permeation grouting being effective forcing change in methods or unsafe working conditions (ground instability).	Lack of knowledge concerning the ground on subway alignment.	Abortive works, late change in methods, potentially unstable ground putting operatives at risk, risk of instability affecting overlying road, putting road users at risk.	Client, Designer and Contractor once appointed depending project stage	L	H	H	L	Future stages of design to review record drawings and confirm by site inspection and/or intrusive survey (GPR), provision of enabling works, fail-safe mitigations & EPP during future works to protect public & operatives.	L
NHG(3A) 3	Adverse Piling influence on LU assets and Mid Level Sewer	Piles for both stair boxes and their related OSD's will be potentially within the exclusion zone of LU assets and may lead to damage to the lining of LU assets (Escalator, Metropolitan and Circle Line and Cable tunnel). The northern stair box and OSD piles will be in close proximity to the Mid level sewer and may result in lining damage	Lack of clarity over OSD foundation designs and their interaction with LU assets	Long term impact on LU assets and increased maintenance, very slight risk of lining failure affecting services (power), passengers or operatives	Client / Designer	L	M	M	L	Future design development to clarify and address risk	VL
NHG(3A) 4	Over-run of road possession during installation of removal of the temporary road deck	The timing of works in placing and removing the decking will be critical, any delay in crane provision, resurfacing etc. would result in over-run of road closure	Delay in any of the critical path activities relating to road closure	Over-run of road closure leading to traffic disruption and reputational damage	Client, Designer and Contractor once appointed depending project stage	M	H	M	M	Future design development and construction planning to clarify and address risk with hold points and process mitigations and de-risking	L
NHG(3A) 5	Party Wall/instability issues.	Party wall issues result in delay to the works or greater works that planned increasing costs	Lack of knowledge concerning the structures to be demolished and their abutting structures	Delay to the work resulting in programme over-run, increased temporary works increasing costs, late change in methodology if discovered late.	Client, Designer and Contractor once appointed depending project stage	L	H	H	L	Future design development to clarify and address risk and avoid late disclosure	VL
NHG(3A) 6	Impact of works during construction / transition to new layout conflict with station fire strategy	The works will reduce access options (NE stair) and introduce hoardings restriction passage widths, these may, at peak times, cause congestion and reduce station evacuation time	Access restrictions during construction	Need to close station at peak demand periods for reasons of safety.	Client, Designer and Contractor once appointed depending project stage	L	L	L	L	Future design development and construction planning to clarify and address risk with LU operations agreed process mitigations and de-risking	VL
NHG(3A) 7	Discovery of Asbestos / Contamination	The works affecting the 1960's structure, utilities and LU station services may discover Asbestos / Lead or other contaminants resulting in risk of harm to operatives, additional cost and delay to the works.	Unknown temporary works, utilities or general ground contamination	Risk of harm to operatives, additional costs and delay	Client, Designer and Contractor once appointed depending project stage	M	H	H	M	Future design development to undertake desk study, intrusive surveys etc. Future construction to provide provision for site education, monitoring and testing during therelevant work activities	VL
NHG(3A) 8	Falls of personnel or materials from height during construction and maintenance	Construction, fit-out and maintenance of PRM lift and stair boxes will involve working a multiple levels for which this is a generic risk	An inevitable potential risk that arises from working in shafts or boxes.	Risk of injury or damage resulting in investigation or repair with ensuing cost and delay	Client & Designer (Contractor when appointed)	L	VH	VH	L	Issue to be addressed by methods of works during construction, lifting plans, and subsequently by the designed maintenance measures in the O&M manual etc.	VL

	Cost Impact	< £50k	£50-150k	£150-300	£300-500	> £500k
	Time Impact	< 1 week	1-3 weeks	3-10 weeks	10-20 weeks	>20 weeks
Probability	VH 70-100%	VH	VH	VH	VH	VH
	H 50-70%	H	H	H	H	H
	M 30-50%	M	M	M	M	M
	L 10-30%	L	L	L	L	L
	VL 0-10%	VL	VL	VL	VL	VL

## High Level Risk Assessment

A number of high level risks have been identified for the construction and delivery of the project which affect, to a greater or lesser extent, each of the Options proposed in this study. The construction risks and impacts for Option 3A are recorded opposite. The overall project risks and their impact on all options are recorded and measured below.

The impact of the risks on each of the Options has been scored on a 1>5 rising scale.

At this stage a number of the risks are 'unknowns' and initial mitigations will be through site survey work.

	Risk	Option1	Option2	Pembridge Tunnel	Option 3A	Option 3B
1	Nature of new ground where utilities re-supported at the junction of Notting Hill Gate and Pembridge Road	1	4	5	2	2
2	Condition of utilities under which new infrastructure will be mined	1	4	5	3	3
3	Structures and substructures of buildings to be employed for new stairs/lifts	3	2	0	3	2
4	Impact of enhanced access on station congestion	1	2	2	2	2
5	Full extent of station services diversions	3	2	2	3	3
6	Full extent of utilities diversions	2	4	5	3	2
7	Approvals and Third Party Agreements	4	4	3	3	2
		<b>15</b>	<b>22</b>	<b>22</b>	<b>19</b>	<b>16</b>
	Cost estimation accuracy	-	4	-	3	3

### Notes

The comparative risks rely largely on the components adopted in each Option.  
Not all of the Options offer the same functionality within the station.

Risk 1. The extent of concrete fill under the utilities is unknown.

Risk 4. A separate, dynamic assessment of each option will be required to assess whether the anticipated congestion impacts are valid.

Risk 7. This encompasses property agreements and local support to temporary and permanent highway impacts.