

METROLINK

Integrated Transport. Integrated Life.

A5.3

**Construction
Sequence Report**

DOC No. D574-LBA-REFD-ROUT_XX-RPT-Z-A08-2130

METROLINK - EIAR UPDATE CONSTRUCTION SEQUENCES

Issue	Date	Description	Produced by	Reviewed by	Approved by
00.01	17/12/2020	Draft for review (North Portal, South Portal, Albert College Shaft, St Stephen's Green)	Leah Jacobs		
00.02	04/02/2021	Seatown, Ballymun and Mater Stations added	Leah Jacobs	Ian Grace	Alex Kevan
00.03	04/03/2021	Fosterstown, Glasnevin, Charlemont Stations added	Leah Jacobs	Ian Grace	Alex Kevan
00.04	14/04/2021	All remaining station and work areas included	Leah Jacobs	Ian Grace	Alex Kevan
00.05	24/06/2021	Narrative added and Charlemont sequence updated	Leah Jacobs	Ian Grace	Alex Kevan
00.06	29/10/2021	Amended to reflect changes to TTM and other comments	Leah Jacobs	Ian Grace	Alex Kevan
01.00	27/07/2022	Final EIAR comments addressed (Estuary, Cut & Cover, O'Connell Street, Tara and Charlemont)	Adam Smith	Ian Grace	Alex Kevan

London Bridge Associates Ltd

Cranhurst Lodge
37 – 39 Surbiton Hill Road
Surbiton
Surrey
KT6 4TS

Tel: +44 (0)20 8399 8614

E-mail: welcome@lba.london

Web: www.lba.london

Contents

1.	Executive Summary	1
1.1.	Purpose	1
1.2.	Overview	2
1.3.	Other relevant documents for reference:	3
2.	Estuary Station & P+R	5
3.	Broadmeadow Viaduct and Approaches	11
4.	Surface Station and Route along R132	12
4.1.	Overview	12
4.2.	Seatown Station	13
4.3.	Swords Central Station	19
4.4.	Fosterstown Station	26
4.5.	Cut & Cover, Retained Walls and Cutting	33
4.6.	Typical U-Sections	37
5.	Dublin Airport	38
5.1.	Overview	38
5.2.	North Portal Construction Plan	38
5.3.	Dublin Airport Station	40
5.4.	South Portal	45
6.	Dardistown Station and Depot	46
6.1.	Overview	46
6.2.	Station and Approaches Construction	46
6.3.	Dardistown Depot Construction Sequence	62
7.	M50 Crossing and Approaches	70
7.1.	Overview	70
7.2.	Construction Sequence	71
8.	Deep Stations/Structures: Northwood to Charlemont	77
8.1.	Overview	77
8.2.	Northwood Station and TBM Portal	78
8.3.	Ballymun Station	86
8.4.	Collins Avenue Station	90
8.5.	Albert College Park Shaft	94
8.6.	Griffith Park Station	96
8.7.	Glasnevin Station – Extended Closure Option (ECO)	100
8.8.	Glasnevin IR	114
8.9.	Mater Station	115
8.10.	O'Connell Station – Development Progressed after Station Completion	124
8.11.	O'Connell Station – Post Developer Completed Station	131
8.12.	Tara Station	137
8.13.	St Stephen's Green Station	144
8.14.	Charlemont Station	150
8.15.	Charlemont Station – Developer Alternative	157
9.	Deep Station Cross Sections	166
9.1.1.	Typical TBM First Station Cross Sections	166
9.1.2.	Typical Station First Cross Sections	185

List of Figures

Figure 1-1 Metrolink Route Map.....	1
Figure 2-1 Estuary Station - Area locations.....	5
Figure 2-2 Estuary Station - Stage 1 Site Set up.....	6
Figure 2-3 Estuary Station - Stage 2 - Piling, Traffic Management and Park and Ride Works.....	7
Figure 2-4 Estuary Station Stage 3 - Building and Station Works.....	8
Figure 2-5 Estuary Station - Stage 4 Finishing and Fit Out Works	9
Figure 2-6 Estuary Station Stage 5 Demobilisation	10
Figure 3-1 Broad Meadow Viaduct.....	11
Figure 4-1 Seatown Station Stage 1 - Site Set Up	13
Figure 4-2 Seatown Station Stage 2 - Piling Works.....	14
Figure 4-3 Seatown Station Stage 3a - Box Excavation	15
Figure 4-4 Seatown Station Stage 3b - Box Excavation-.....	16
Figure 4-5 Seatown Station Stage 3c Box Excavation	17
Figure 4-6 Seatown Station Stage 4 - Cut and Cover	18
Figure 4-7 Swords Central Station Stage 1 - Site Set up.....	19
Figure 4-8 Swords Central Station Stage 2 - Piling Works	20
Figure 4-9 Swords Central Station Stage 3a - Box Excavation.....	21
Figure 4-10 Swords Central Station Stage 3b - Box Excavation.....	22
Figure 4-11 Swords Central Station Stage 3c - Box Excavation.....	23
Figure 4-12 Swords Central Station Stage 4 - Cut and Cover	24
Figure 4-13 Swords Central Station Stage 5 - Site Demobilisation.....	25
Figure 4-14 Fosterstown Station Stage 1 - Site Set Up	26
Figure 4-15 Fosterstown Station Stage 2 - Piling Works	27
Figure 4-16 Fosterstown Station Stage 3a - Box Excavation	28
Figure 4-17 Fosterstown Station Stage 3b - Box Excavation	29
Figure 4-18 Fosterstown Station Stage 3C - Box Excavation.....	30
Figure 4-19 Fosterstown Stage 4 - Cut and Cover	31
Figure 4-20 Fosterstown Station Stage 5 Road Diversion.....	32
Figure 4-21 Typical Cut and Cover Construction sequence	35
Figure 4-22 Open cut excavation – up to 24.0m wide	36
Figure 4-23 U - Section Type - 3.8M < TOR / TERRAIN < 5.8M	37
Figure 5-1 Dublin Airport North Portal Layout	39
Figure 5-2 Dublin Airport Station Stage 1 - Site Establishment	40
Figure 5-3 Dublin Airport Station Stage 2 - Diaphragm Walling.....	41
Figure 5-4 Dublin Airport Station Stage 3 - Excavate to Formation of Roof Slab.....	42
Figure 5-5 Dublin Airport Station Stage 4 - Roof Slab Construction Begins.....	43

Figure 5-6 Dublin Airport Station Stage 5 - Top-Down Station Construction Begins.....	44
Figure 5-7 Dublin Airport South Portal - Site Layout.....	45
Figure 6-1 Dardistown Station Stage 1- Site Access & Compound	46
Figure 6-2 Dardistown Station Overview	47
Figure 6-3 Dardistown Station Overview (section S3 below)	48
Figure 6-4 Dardistown Station Site Location Map	49
Figure 6-5 Dardistown Station S1 Structure Sequence	50
Figure 6-6 S2 Structure Construction Sequence.....	51
Figure 6-7 Dardistown Station Construction Platforms, Lift Shafts and Stairs	52
Figure 6-8 Dardistown Station Complete Roof, MEP & Fit-out	53
Figure 6-9 Dardistown Station - Station Box Construction.....	55
Figure 6-10 Dardistown Station Structure S3 Construction Sequence	56
Figure 6-11 Dardistown Station - 4 Track U Section Construction Sequencing	57
Figure 6-12 Dardistown Station Structure S7 Area 1 Construction Sequence	59
Figure 6-13 Dardistown Station Structure S7 Area 2 Construction Sequence	61
Figure 6-14 Dardistown Depot Site Layout.....	62
Figure 6-15 Dardistown Depot - Building Layout.....	63
Figure 6-16 Dardistown Depot Building G Construction Sequence – Cross Section	64
Figure 6-17 Dardistown Depot - Typical Steel Construction	65
Figure 6-18 Dardistown Depot Building C Construction Sequence	66
Figure 6-19 Dardistown Depot Building D Construction Sequence	67
Figure 6-20 Dardistown Depot Building P Construction Sequence.....	68
Figure 6-21 Dardistown Depot Building E Construction Sequence.....	69
Figure 7-1 Crossing Over the M50 - Site location to the North	71
Figure 7-2 Crossing over the M50 - Site locations to the South.....	72
Figure 7-3 Crossing over the M50 - Bridge Beam Installation	73
Figure 7-4 Crossing Over the M50 - Phases	74
Figure 7-5 Crossing Over the M50 - TTM in Plan.....	75
Figure 8-1 Northwood Station and Portal Stage 1 - Site Establishment.....	78
Figure 8-2 Northwood Station and Portal Stage 2 - Diaphragm and Piling Works	79
Figure 8-3 Northwood Station and Portal Stage 3 - Commence Station Box Roof Construction.....	80
Figure 8-4 Northwood Station and Portal TTM Realignment	81
Figure 8-5 Northwood Station and Portal Stage 5- Diaphragm Walling	82
Figure 8-6 Northwood Station and Portal Stage 6 - Construction of Roof Slab.....	83
Figure 8-7 Northwood Station and Portal Stage 7 - Excavation of Station Box.....	84
Figure 8-8 Northwood Station and Portal Stage 8 - Handover of TTM	85
Figure 8-9 Ballymun Station Stage 1 – Site Establishment	86
Figure 8-10 Ballymun Station Stage 2 – Diaphragm Wall and Piling Construction	87

Figure 8-11 Ballymun Station Stage 3 – Roof Slab Construction	88
Figure 8-12 Ballymun Station Stage 4 – Complete Top-Down Construction.....	89
Figure 8-13 Collins Avenue Station – Stage 1 - Site Establishment	90
Figure 8-14 Collins Avenue Station Stage 2 – Central Excavation and Piling Works.....	91
Figure 8-15 Collins Avenue Station Stage 3 - Diaphragm Wall and Main Piling Construction	92
Figure 8-16 Collins Avenue Stage 4 - Roof Slab Construction	93
Figure 8-17: Albert College Park Shaft Layout	94
Figure 8-18: Aerial View of Albert College Park Shaft Site	95
Figure 8-19 Griffith Park Station Stage 1 - Site Establishment	96
Figure 8-20 Griffith Park Station - Stage 2 - Diaphragm Wall and Piling Construction.....	97
Figure 8-21 Griffith Park Station Stage 3 Roof Slab Construction	98
Figure 8-22 Griffith Park Station Stage 4 - Complete Top-Down Construction	99
Figure 8-23 Glasnevin Station - Stage 1 & 2 AEW and Site Establishment.....	100
Figure 8-24 Glasnevin Station - Stage 3 D-Wall and Piling Phase 1	101
Figure 8-25 Glasnevin Station - Stage 4 Top Down (North) - Excavation and Demolition (South).	102
Figure 8-26 Glasnevin Station - Stage 5 Top Down (North) - D-Wall (South)	103
Figure 8-27 S Glasnevin Station - Stage 6 Top Down (North) - Piling Interchange.....	104
Figure 8-28 Glasnevin Station Stage 6A Piling and D-walls - South.....	105
Figure 8-29 Glasnevin Station - Stage 7 Top Down on hold (North) Reduce Levels and Bridge Casting Slab	106
Figure 8-30 Glasnevin Station - Stage 8 Top Down on hold (North) Full Track Lowering West of CH 850	107
Figure 8-31 Glasnevin Station Stage 9 Top Down on hold (North) - GSWR Closure Works.....	108
Figure 8-32 Glasnevin Station - Stage 10 Top Down on Hold (North) - Subway Roof and Bridge Slide	109
Figure 8-33 Glasnevin Station - Stage 11 Top Down on Hold (North) - GSWR Railway Works.....	110
Figure 8-34 Glasnevin Station - Stage 12 Top Down on Hold (North) - Station Roof Slab Construction	111
Figure 8-35 Glasnevin Station - Stage 13 Top Down on Hold (North) - Subway Works.....	112
Figure 8-36 Glasnevin Station - Stage 14 Top Down (North & South) - Open Railways.....	113
Figure 8-37 Mater Station Stage 1 - Site A Establishment	115
Figure 8-38 Mater Station Stage 2 - Commission TTM Phase 1	116
Figure 8-39 Mater Station Stage 3 - TTM Phase 2.....	117
Figure 8-40 Mater Station Stage 4 -Roof Slab Construction.....	118
Figure 8-41 Mater Station Stage 5 – Roof slab Construction.....	119
Figure 8-42 Mater Station Stage 6 – Station Void Fit-out	120
Figure 8-43 Mater Station Stage 7 - Commission TTM Phase 3	121
Figure 8-44 Mater Station Stage 8 – Prepare and Commission TTM	122
Figure 8-45 Mater Station - Stage 9.....	123

Figure 8-46 O'Connell Street Stage 1 – Site Establishment	124
Figure 8-47 O'Connell Street Stage 2 – Diaphragm wall & piling construction	125
Figure 8-48 O'Connell Street Stage 3 – Roof slab construction	126
Figure 8-49 O'Connell Street Stage 4 – Complete Top-down construction.....	127
Figure 8-50 O'Connell Street Stage 5 – Construction sequence/subway link.....	128
Figure 8-51 O'Connell Street Stage 6 – Station structure completed – MEP fit out	129
Figure 8-52 O'Connell Street Stage 7 – Station completed: Structures, TBM, Civils and MEP, Station commissioned.....	130
Figure 8-53 O'Connell Street – Site establishment Civil works/MEP fit out.....	131
Figure 8-54 O'Connell Street – Access routes to sites Civil works/MEP fit out	132
Figure 8-55 O'Connell Street – Site establishment Civil works/ MEP fit out.....	133
Figure 8-56 O'Connell Street – Civil works/ MEP fit out	134
Figure 8-57 O'Connell Street – Civil works/ MEP fit out	135
Figure 8-58 O'Connell Street – Civil works/ MEP fit out Construct mezzanine slab.....	136
Figure 8-59 Tara Station Stage 1 - TTM Works	137
Figure 8-60 Tara Station Stage 2 Diaphragm Wall and Piling Works	138
Figure 8-61 Tara Station Stage 3 - Roof Slab Construction	139
Figure 8-62 Tara Station Stage 4 - Top-down Construction Works	140
Figure 8-63 Tara Station Stage 5 Permanent Void Fit out.....	141
Figure 8-64 Tara Station Stage 6 - Site Reinstatement Works.....	142
Figure 8-65 Tara Station Stage 7 - Commission TTM	143
Figure 8-66 St Stephen's Green Stage 1 - Site Establishment.....	144
Figure 8-67 St Stephen's Green Stage 2 – Diaphragm wall & piling works	145
Figure 8-68 St Stephen's Green Stage 3 – Roof slab construction	146
Figure 8-69 St Stephen's Green Stage 4 – Top-down works.....	147
Figure 8-70 St Stephen's Green Stage 5 – Station fit-out.....	148
Figure 8-71 St Stephen's Green Stage 6 - Station void fit-out.....	149
Figure 8-72 Charlemont Station - Stage 1 Hines Development.....	150
Figure 8-73 Charlemont Station - Stage 2 Metrolink Construction Site Set Up.....	151
Figure 8-74 Charlemont Station - Stage 3 Metrolink Construction Stage 1.....	152
Figure 8-75 Charlemont Station - Stage 3a Metrolink Construction Stage 1.....	153
Figure 8-76 Charlemont Station - Stage 3b Metrolink Construction Stage 3 Roof Construction	154
Figure 8-77 Charlemont Station - Stage 4 Excavation and Propping	155
Figure 8-78 Charlemont Station Stage 5.....	156
Figure 8-79 Charlemont Station Stage 1 – Site establishment & Civil Works	157
Figure 8-80 Charlemont Station Stage 1 – Civil works	158
Figure 8-81 Charlemont Station Stage 1 – Roof slab construction	159

Figure 8-82 Charlemont Station Stage 1 – Construction North end roof slab & South-east d-wall stage	160
Figure 8-83 Charlemont Station – Complete Stage 1	161
Figure 8-84 Charlemont Station – Stage 2 & 3 – Civil works & Area 2 roof construction	162
Figure 8-85 Charlemont Station – Stage 3 – roof slab	163
Figure 8-86 Charlemont Station – Stage 3 – roof slab construction at South end	164
Figure 8-87 Charlemont Station – Stage 3 – reinstate site and open Dartmouth Road	165
Figure 9-1 TBM First Station - Stage 1.....	167
Figure 9-2 TBM First Station - Stage 2.....	167
Figure 9-3 TBM First Station - Stage 3.....	168
Figure 9-4 TBM First Station - Stage 4.....	169
Figure 9-5 TBM First Station - Stage 5.....	170
Figure 9-6 TBM First Station - Stage 6.....	171
Figure 9-7 TBM First Station - Stage 7.....	172
Figure 9-8 TBM First Station - Stage 8.....	173
Figure 9-9 TBM First Station - Stage 9.....	174
Figure 9-10 TBM First Station - Stage 10.....	175
Figure 9-11 TBM First Station – Stage 11.....	176
Figure 9-12 TBM First Station - Stage 12.....	177
Figure 9-13 TBM First Station - Stage 13.....	178
Figure 9-14 TBM First Station - Stage 14.....	179
Figure 9-15 TBM First Station – Stage 15.....	180
Figure 9-16 TBM First Station - Stage 16.....	181
Figure 9-17 TBM First Station - Stage 17.....	182
Figure 9-18 TBM First Station - Stage 18.....	183
Figure 9-19 TBM First Station - Stage 19.....	184
Figure 9-20 Station First Stage 1	185
Figure 9-21 Station First Stage 2	186
Figure 9-22 Station First Stage 3	187
Figure 9-23 Station First Stage 4	188
Figure 9-24 Station First Stage 5	189
Figure 9-25 Station First Stage 6	190
Figure 9-26 Station First Stage 7	191
Figure 9-27 Station First Stage 8	192
Figure 9-28 Station First Stage 9	193
Figure 9-29 Station First Stage 10	194
Figure 9-30 Station First Stage 11	195

1. Executive Summary

1.1. Purpose

This report presents the construction sequences for the locations identified in Figure 1-1 below. The site layout plans present the construction sequences that have been developed to accompany the EIAR programme of works D574-LBA-REFD-ROUT_XX-PRG-Z-A08-2184.

The construction sequences have been produced considering any temporary traffic and utilities diversion works that are required at each work sites to be accessed and for the Works to be completed within those sites.

This report has been prepared for the purpose of the EIAR Assessment and may be updated later subject to the issue of new or updated design information or later engagement with relevant stakeholders and utility providers.

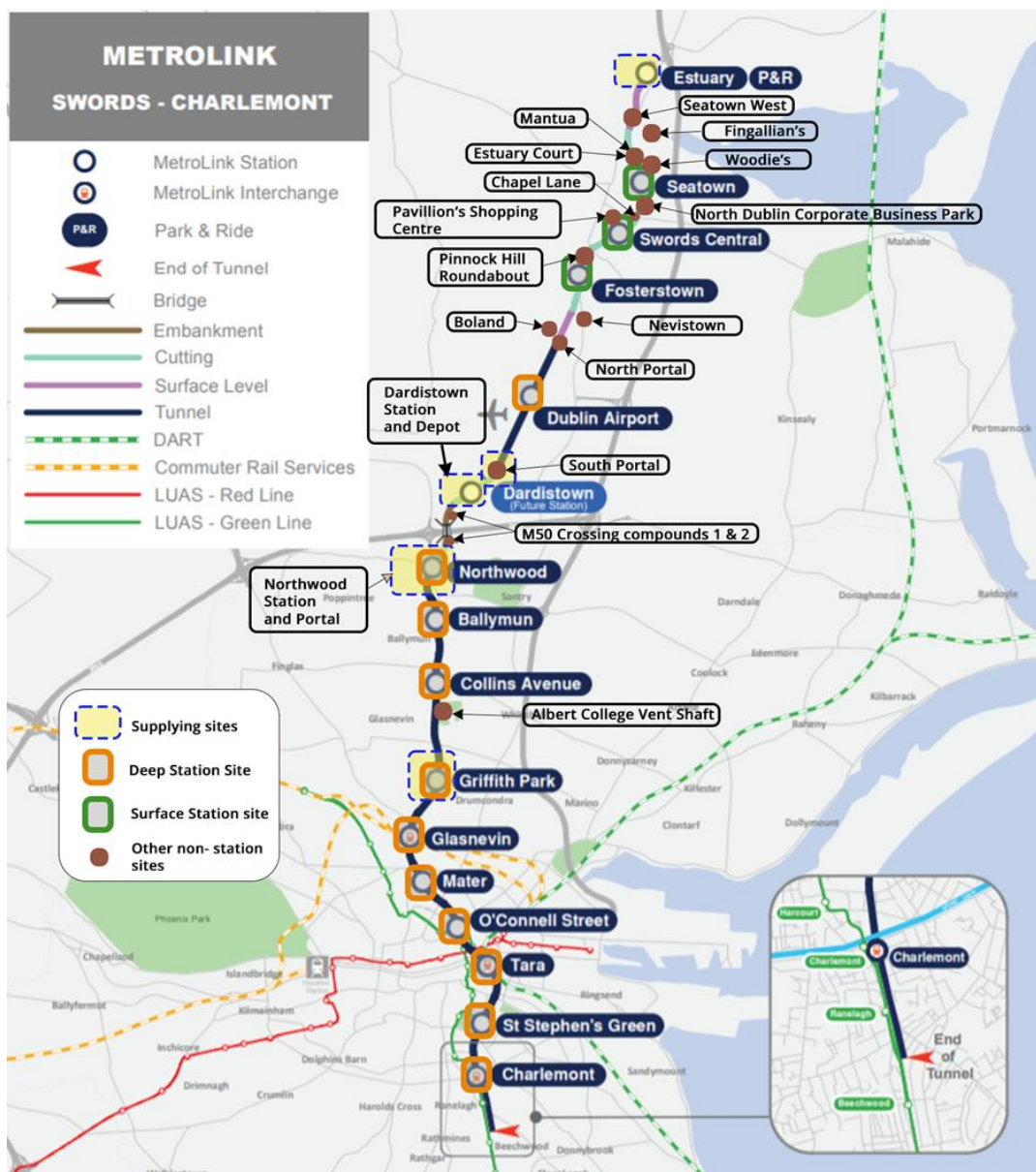


Figure 1-1 Metrolink Route Map

1.2. Overview

The preliminary design for the MetroLink route between Estuary in the north and Charlemont in the south requires various construction approaches and techniques to deliver the scheme (The Works) to completion.

Following the acquisition of the land required for the Works, in terms of sequence of construction, the initial activity is to access and take possession of the relevant sites and lands needed to deliver the Works, both permanent land and land needed on a temporary basis either for the purpose of accessing or managing the Works (Traffic Management, Storage etc).

In a built up urban area, typical of the vast majority of the purpose MetroLink Route, possession and access to sites for the purpose of delivery the Works will require multiply activities or sequences to allow the Works to be progressed and in the following order:

- Enabling Works - Preparation.
- Main Works - Civils.
- Main Works – Rail Systems.

The details of the Works are further broken down as follows.

Enabling Works - Preparation	Main Works – Civils	Main Works – Rail Systems
Will comprise of the following at all locations: <ul style="list-style-type: none"> • Background Surveys and Environmental Baseline Monitoring. • Environmental Mitigation Works. • Utility Diversions and Protection. • Ground Movement Monitoring and Mitigation Works. • Traffic Works. • Establishment of Construction Site, Office and Compounds, and • Location Dependant Access Works: <ul style="list-style-type: none"> ○ Demolition. ○ Heritage Mitigation. ○ Remediation of Contaminated Sites. ○ Vegetation and Tree Clearance, including the removal of any Invasive Alien Plant Species. 	Will comprise of some or all of the following (location dependent): <ul style="list-style-type: none"> • Road construction and traffic; • Subsurface Structures; • Tunnelling; • Stations; • Viaducts/Bridges; • Intervention Shafts; • Blasting • Material Management. • Reinstatement of heritage, and • Compound removal and landscaping. 	Including Commissioning and Finalisation, comprising of <ul style="list-style-type: none"> • The installation and fit-out of railway systems; and • The finalisation works including: <ul style="list-style-type: none"> ○ Compound removal and landscaping (Dardistown and Estuary); ○ Reinstatement of heritage, and ○ Systems testing and commissioning.

The sequences detailed within this report are broken down into the following areas along the route that broadly have similar Location Dependent Access Works and Main Civil Works construction technique characteristics:

Project Area - Location	Location Dependent Access Works	Construction Technique
AZ1 Northern Section - Estuary & Park and Ride	<ul style="list-style-type: none"> • Creation of site accesses. • Vegetation and Tree Clearance • Minor demolition. 	<ul style="list-style-type: none"> • Surface Station • Buildings and Structures
AZ1 Northern Section - Broadmeadow Viaduct	<ul style="list-style-type: none"> • Creation of site accesses. • Vegetation and Tree Clearance • Working over a river 	<ul style="list-style-type: none"> • Embankments • Viaduct/Bridge Construction

Project Area - Location	Location Dependent Access Works	Construction Technique
AZ1 Northern Section - Surface Stations and Route along the R132 <i>Note: The sequences are prepared assuming a signalised upgrade of the R132 exists at Construction.</i>	<ul style="list-style-type: none"> • Temporary Traffic Management (TTM) • Utility diversions. • Vegetation and Tree Clearance. • Localised demolition works. 	<ul style="list-style-type: none"> • Top Down Station Box construction, • Cut and cover structures, • Retained walls and cuttings. • Road construction and Traffic.
AZ2 Airport Section - Dublin Airport, include North & South Portals	<ul style="list-style-type: none"> • Creation of site accesses. • Vegetation and Tree Clearance. 	<ul style="list-style-type: none"> • Top Down Deep Station Box Construction. • Tunnelling.
AZ3 Dardistown to Northwood - Dardistown Station and Depot	<ul style="list-style-type: none"> • Creation of site accesses. • Vegetation and Tree Clearance. 	<ul style="list-style-type: none"> • Cut and cover structures, • Retained walls and cuttings. • Buildings & Structures.
AZ3 Dardistown to Northwood - M50 Crossing and Approaches	<ul style="list-style-type: none"> • Creation of site accesses. • Vegetation and Tree Clearance • Working over a motorway 	<ul style="list-style-type: none"> • Embankments, • Viaduct/Bridge Construction. • Road Construction and Traffic.
AZ4 Northwood to Charlemont - Deep Stations/Structures.	<ul style="list-style-type: none"> • Creation of site accesses. • TTM and utility diversions required at most locations • Heritage Mitigation Works (TBC). • Remediation of Contaminated Sites (TBC) • Multi phased TTM required at Northwood and Mater Stations for access. • Localised Demolition Works at: Glasnevin, O'Connell Street, Tara and Charlemont. 	<ul style="list-style-type: none"> • Top Down Deep Station Box Construction • Blasting for excavation. • Tunnelling.

For further information on the tunnelling works refer to. TBM Tunnels, D574-RPT-CT-ROUT-0021 Rev Draft 04 and SCL Methodology, D574-LBA-REFD-ROUT_XX-TN-Z-A04-2053, Rev 01.00.

1.3. Other relevant documents for reference:

D574-LBA-REFD-ROUT_XX-RPT-Z-A02-2013 Staff and Workforce Numbers

D574-LBA-REFD-ROUT_XX-RPT-Z-A03-2011 General Approach to Demolition

D574-LBA-REFD-ROUT_XX-RPT-Z-A03-2027 Tara Street Station Demolition Works

D574-LBA-REFD-ROUT_XX-RPT-Z-A03-2032 Methodologies - culvert and watercourse construction

D574-LBA-REFD-ROUT_XX-RPT-Z-A08-2183 - Construction Sustainable Mobility Plan

D574-LBA-REFD-ROUT_XX-TN-Z-A03-2019 Temporary Spatial Requirements
D574-LBA-REFD-ROUT_XX-TN-Z-A03-2021 Site Lighting Approach
D574-LBA-REFD-ROUT_XX-TN-Z-A03-2051 TBM Consumables
D574-LBA-REFD-ROUT_XX-TN-Z-A04-2001 Dwall & Secant Piling
D574-LBA-REFD-ROUT_XX-TN-Z-A04-2047 Track Laying Methodology
D574-LBA-REFD-ROUT_XX-TN-Z-A08-2174 - Water Management
D574-LBA-REFD-ROUT_XX-TN-Z-A08-2202 Non Blasting Station Excavation
D574-RPT-AT-STPL-0055 Constructability Report Dublin Airport South Portal
D574-RPT-CT-MS10-0013-03 Constructability Report Griffith Park Station
D574-RPT-CT-MS11-0014 Glasnevin Constructability Report G-G
D574-RPT-CT-ROUT-0021-03 Constructability Report TBM Tunnels
D574-RPT-PRJ-ROUT-0057 Construction Vehicles Report
D574-RPT-SWC-DEPM-0008 Constructability Report Dardistown Depot
D574-RPT-SWN-SURF-0002 Constructability Report Start of Route to Seatown Station
D574-RPT-SWN-SURF-0005 Constructability Report Pinnock Hill Roundabout - North Portal

2. Estuary Station & P+R

Estuary – Construction Sequence



Key Programme Elements

- A&EW utility works. Site setup
- Demolition & site clearance
- Piling works (P&R and Station Underpass structure) and station excavation
- Park & Ride works
- Traction Substation works
- Track/base slab
- Platform construction
- BOH works
- MEP and architectural fit-out works
- Test and commissioning



Figure 2-1 Estuary Station - Area locations

Estuary – Construction Sequence

Stage 1 – Site Setup



(Assumed utility diversions and demolition works are carried out before start of main works)

1. Road construction works on R132 for site access/egress before the start of main construction works
2. Erect site hoarding and secure worksite
3. Form site access/egress
4. Set up project office, laydown areas
5. Complete demolition/site clearance
6. Construct piling platform/guide wall
7. Option to use existing access
8. Install TTM along Ennis Lane

NB A temporary railhead is established at Estuary (Jul 26 – Nov 26) for track laying from Estuary to Dublin Airport North Portal. The railhead will be relocated to Dardistown Depot.

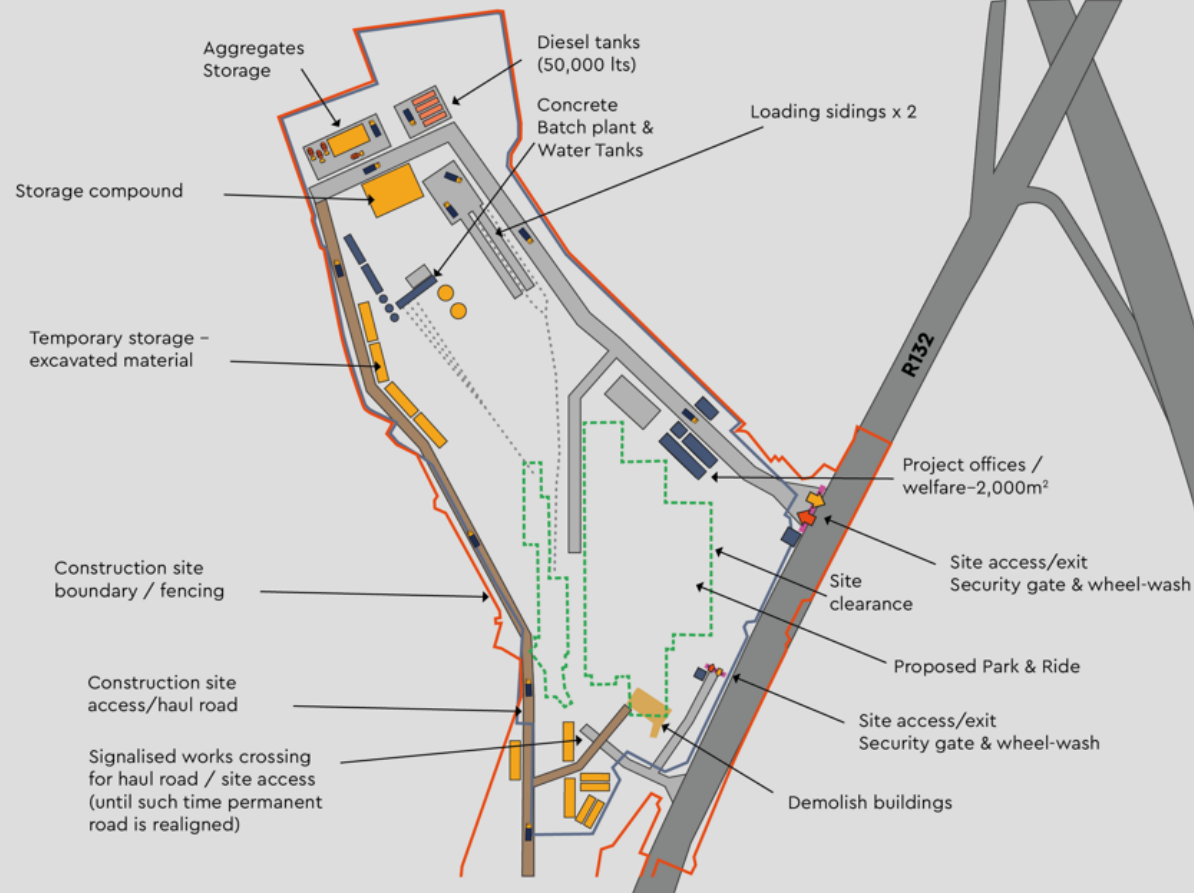


Figure 2-2 Estuary Station - Stage 1 Site Set up

Estuary - Construction Sequence

Stage 2 - Piling, TTM and P&R works



1. Commence station piling works
2. Progressively remove guide walls
3. Commence guide wall/CFA piling (assumed for P&R and underpass)
4. Road modification works on R132 (TTM Phase 1 to Phase2 layout)
5. Park and Ride pad and ground beam foundation works.

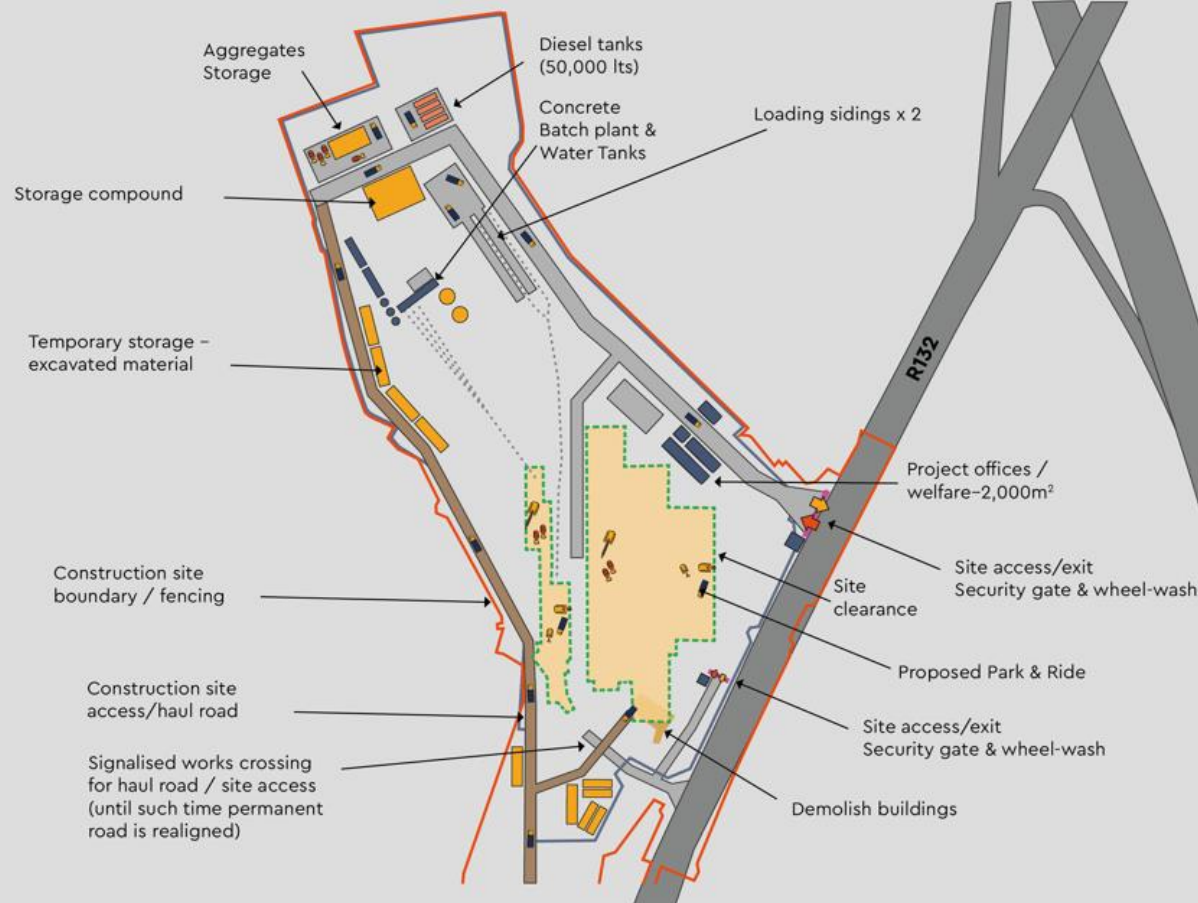


Figure 2-3 Estuary Station - Stage 2 - Piling, Traffic Management and Park and Ride Works

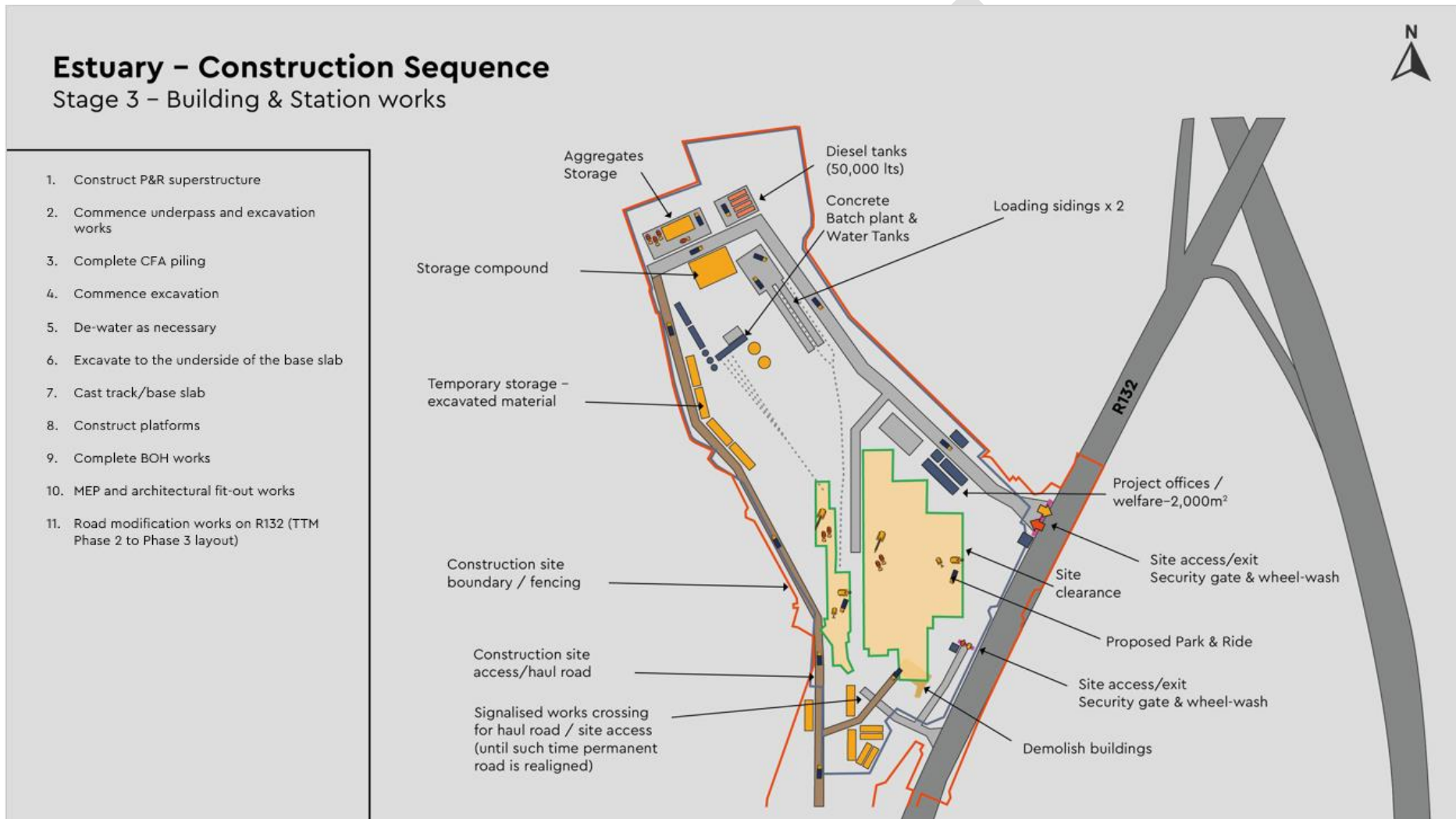


Figure 2-4 Estuary Station Stage 3 - Building and Station Works



Figure 2-5 Estuary Station - Stage 4 Finishing and Fit Out Works

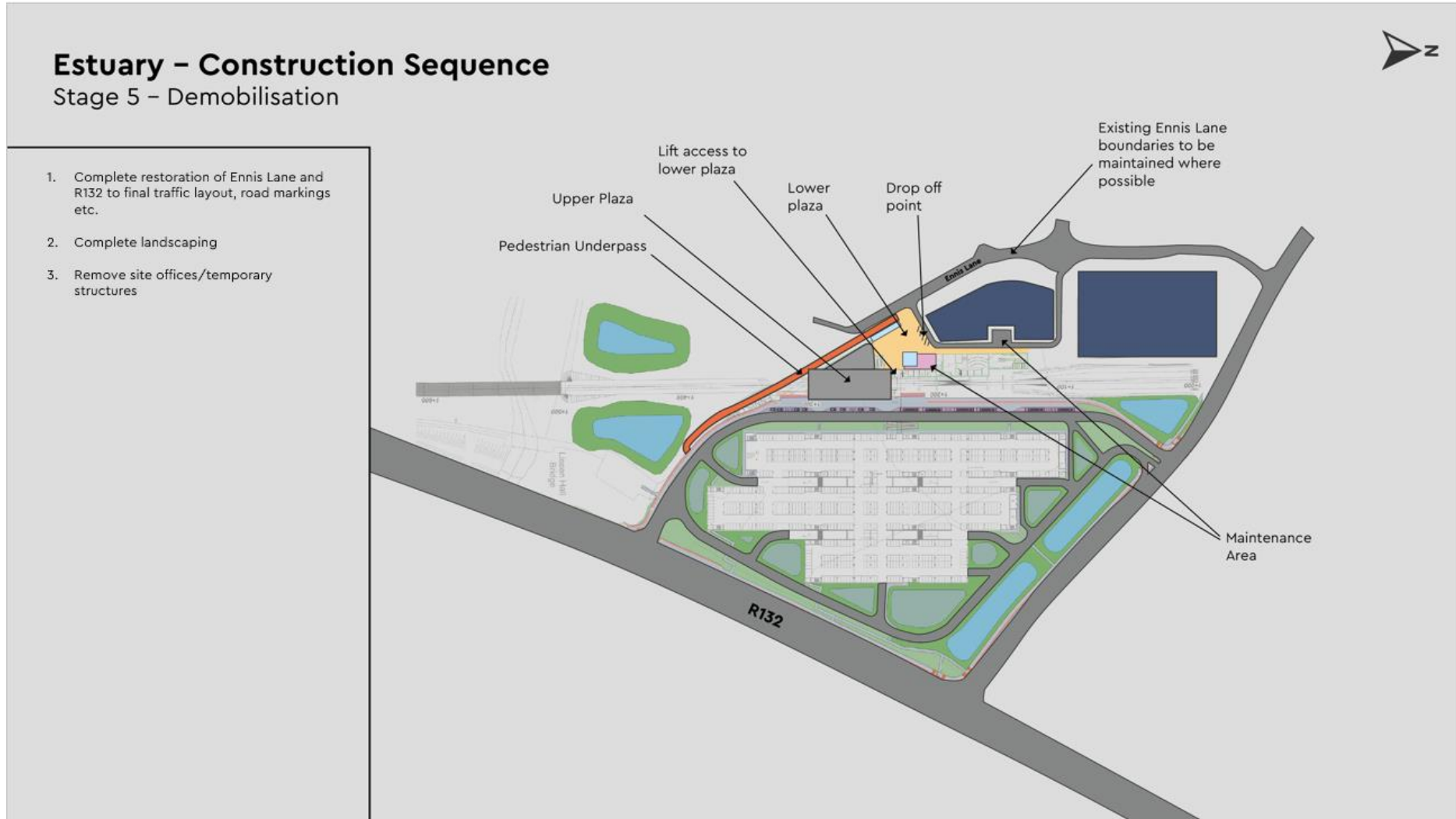


Figure 2-6 Estuary Station Stage 5 Demobilisation

3. Broadmeadow Viaduct and Approaches

Outline Construction Sequence



1. Install boundary fence & install environmental protection (silt screens etc)
2. Construct temporary bridge crossings & haul roads
3. Construct working or load transfer platform
4. Construct the abutments
5. Install cofferdams for piers/foundations adjacent to the watercourses
6. Excavate pier bases, blind, fix rebar and concrete RC foundation pads
7. Erect formwork, rebar and cast piers and cross heads
8. Backfill foundation excavations & remove cofferdams
9. Deliver W PCC beams to site in pairs and erect onto pot bearings
10. Install PCC deck units and side parapets
11. Lay in-situ concrete for track bed over completed bridge deck

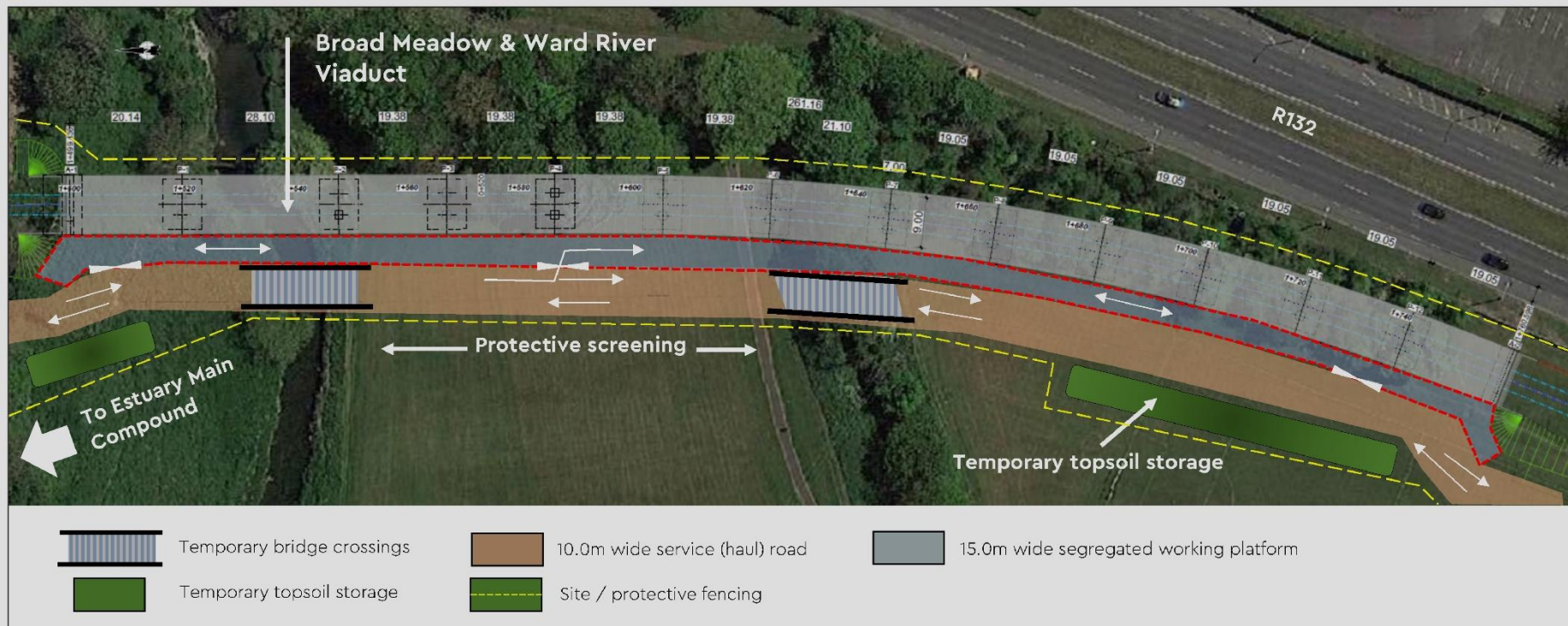


Figure 3-1 Broad Meadow Viaduct

4. Surface Station and Route along R132

4.1. Overview

The surface stations and train route along the R132 consist of sections of cut and cover and retained ground walls and 3 surface sections. The details of the construction sequences can be found in the sections below, including a summary of locations and lengths of various structure types outline in section 4.7.

The R132 is currently operating as a dual carriageway with roundabouts but is due to be upgraded to a signalised carriageway in advance of the MetroLink Works, with the assumption in the sequences below that this upgrade has been completed.

4.2. Seatown Station

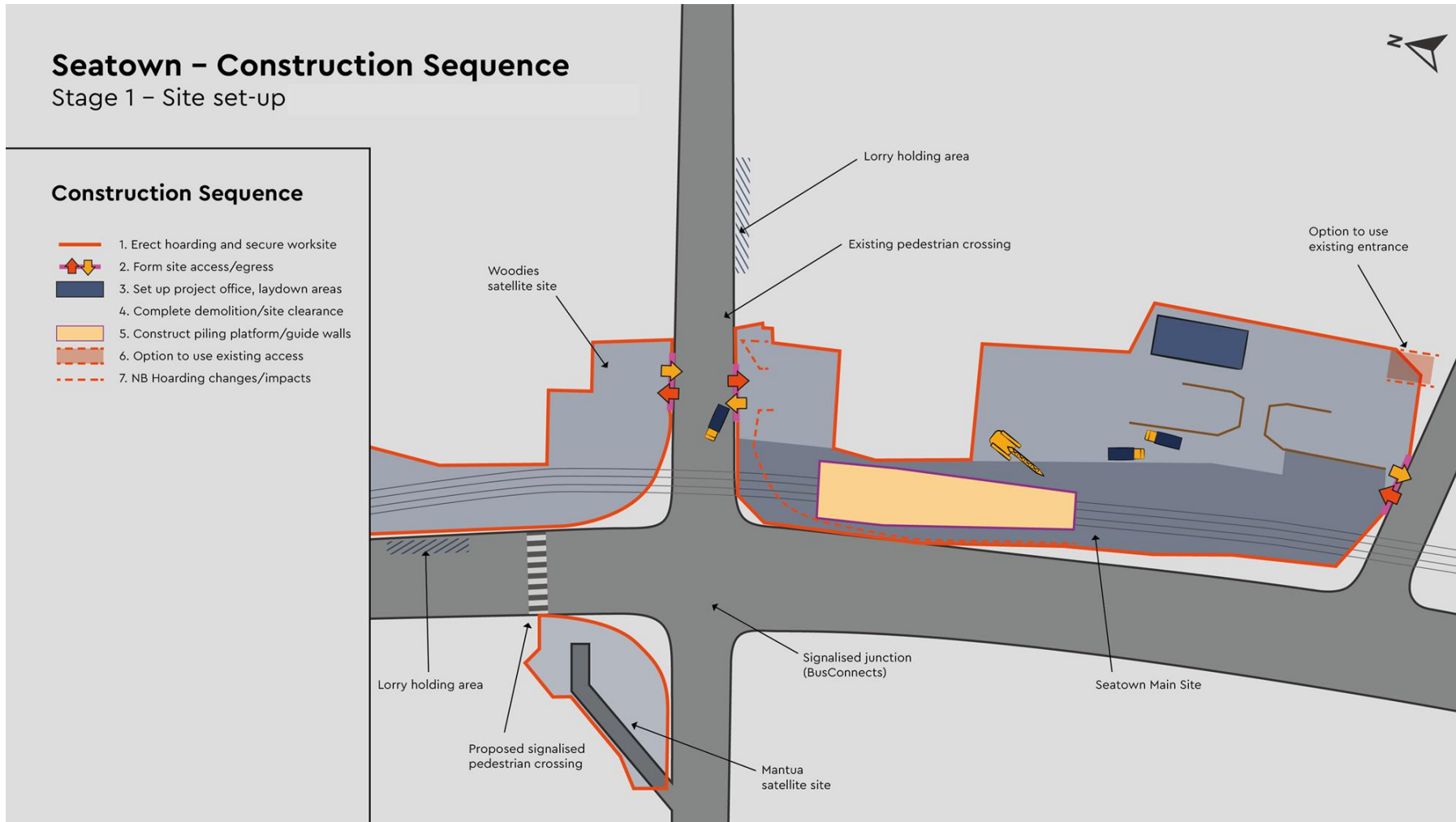


Figure 4-1 Seatown Station Stage 1 - Site Set Up

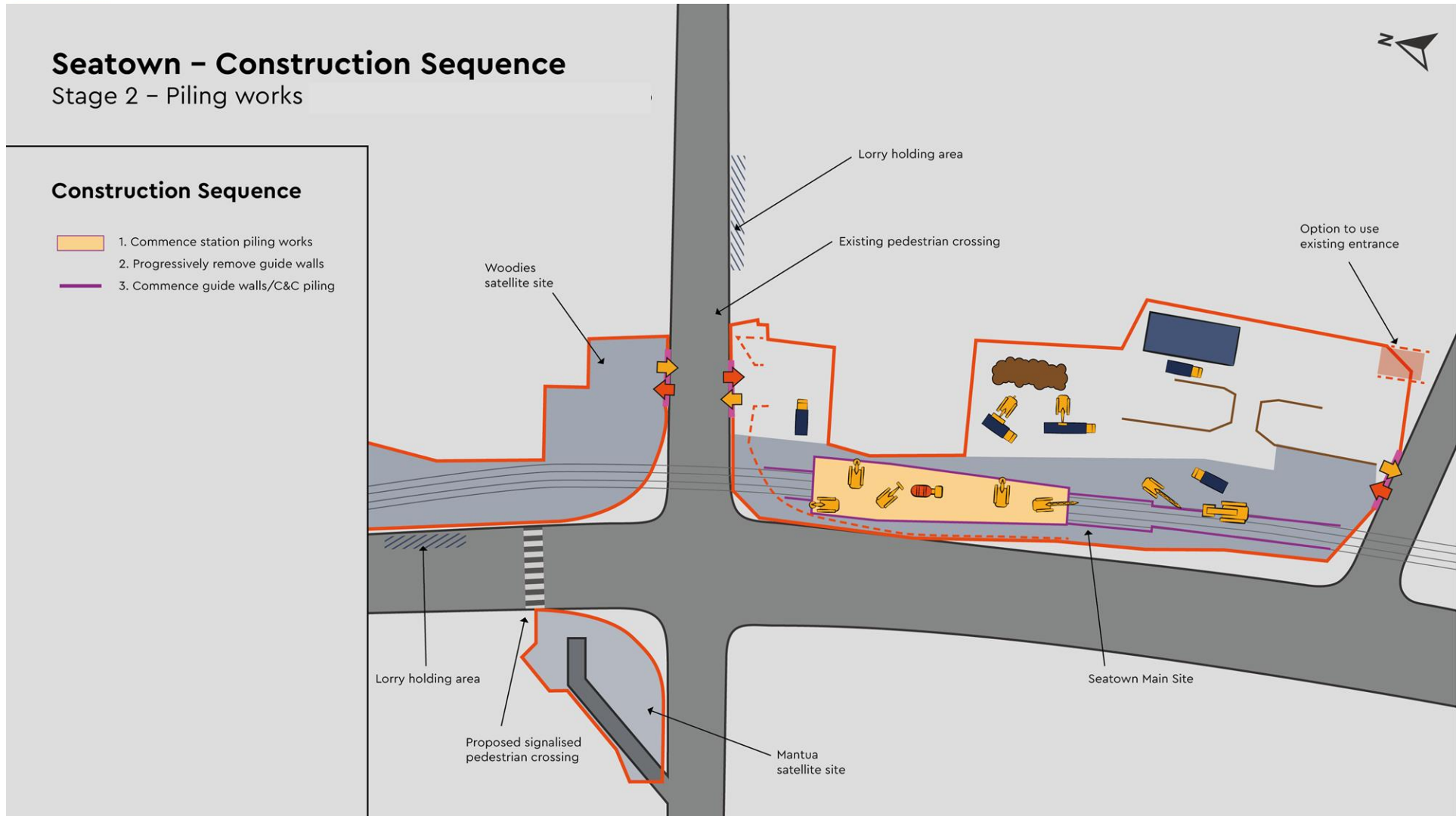


Figure 4-2 Seatown Station Stage 2 - Piling Works

Seatown – Construction Sequence

Stage 3a – Box excavation

Construction Sequence

- 1. Commence box excavation works
- 2. Complete C&C piling
- 3. Construct off-line provision for temporary road diversion

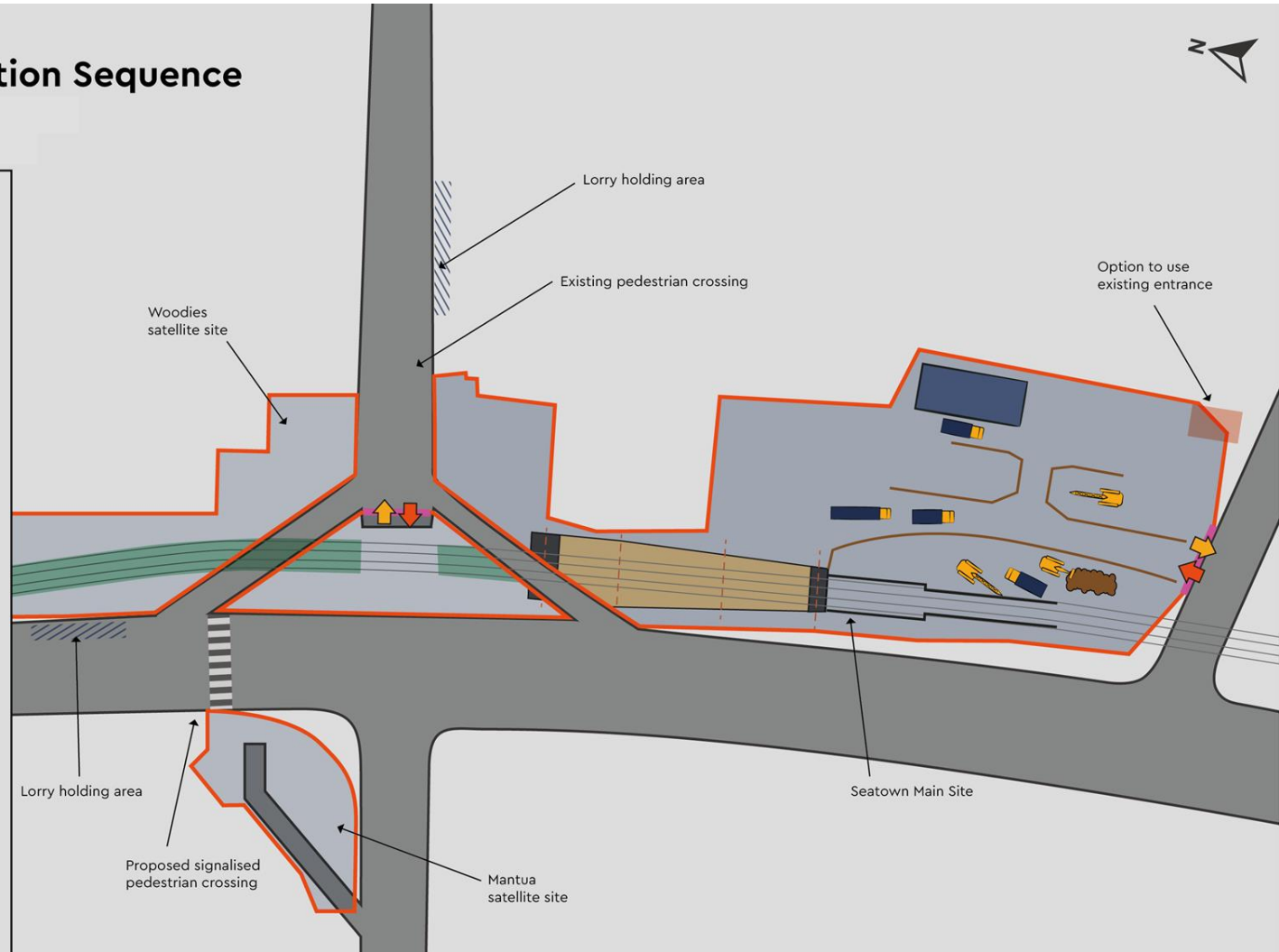


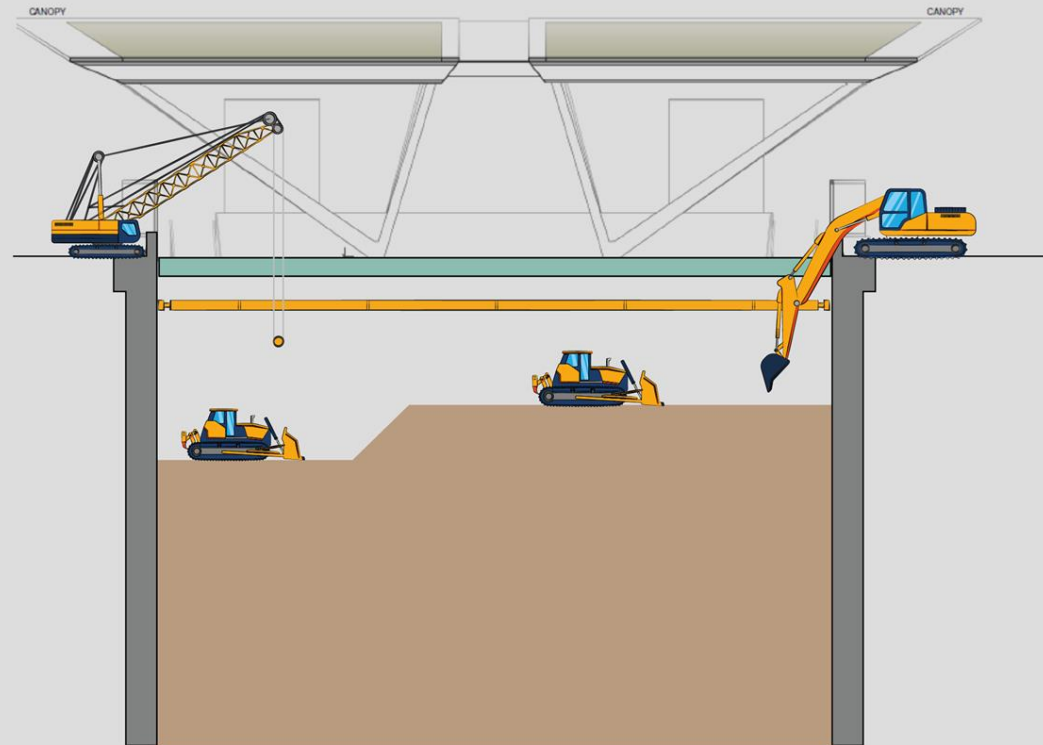
Figure 4-3 Seatown Station Stage 3a - Box Excavation

Seatown – Construction Sequence

Stage 3b – Box excavation

Construction Sequence

- 1. Construct capping beam
- 2. Cast concrete slab
- 3. Excavation to underside of temporary props
- 4. Install temporary props
- 5. Dewater as necessary



Plant shown for illustrative purposes only
Not to scale

Figure 4-4 Seatown Station Stage 3b - Box Excavation-

Seatown – Construction Sequence

Stage 3c – Box excavation

Construction Sequence

1. Excavate to underside of base slab
2. Cast track / base slab
3. Construct permanent propping/platforms
4. Remove temporary props
5. Complete BOH works
6. MEP and architectural fit-out works

Plant shown for illustrative purposes only
Not to scale

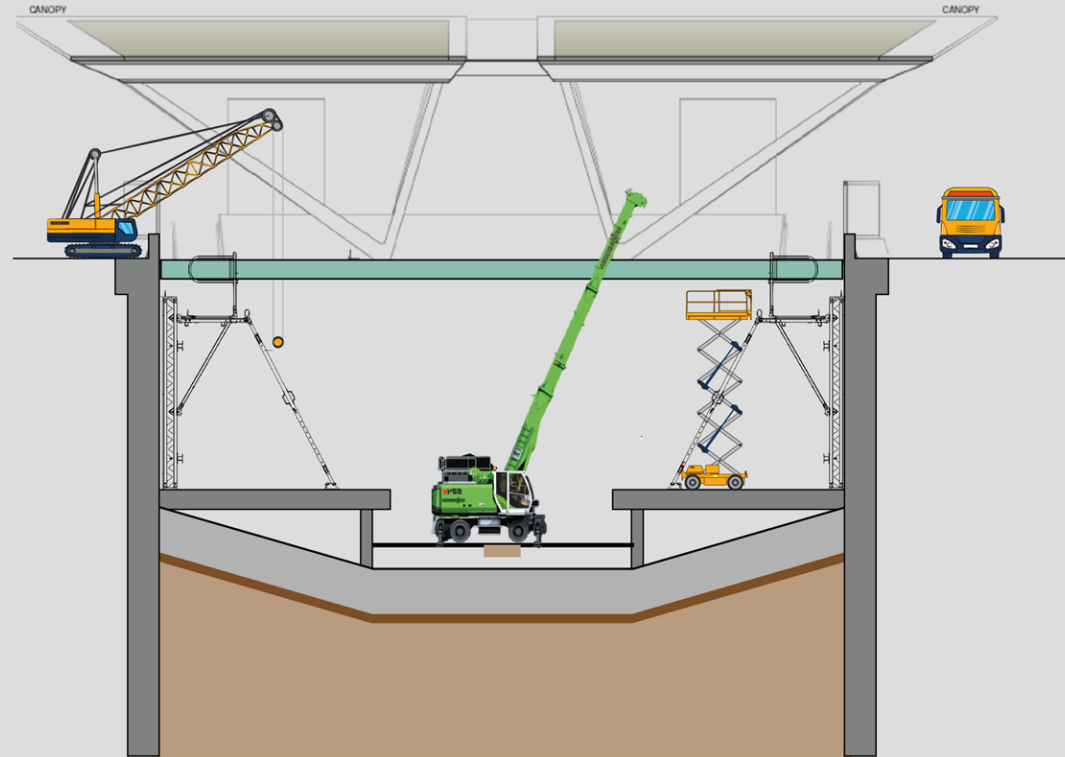


Figure 4-5 Seatown Station Stage 3c Box Excavation

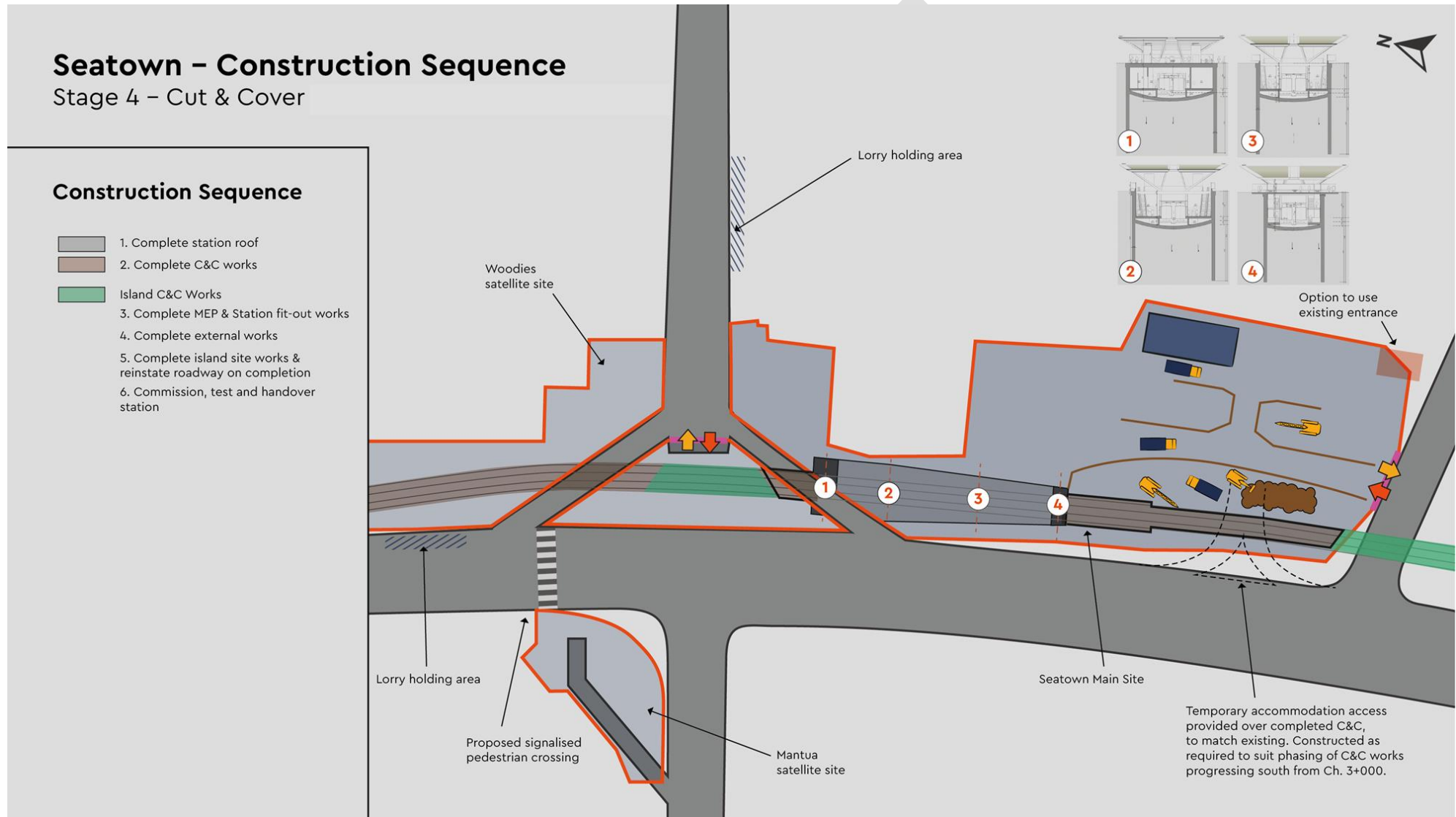


Figure 4-6 Seatown Station Stage 4 - Cut and Cover

4.3. Swords Central Station

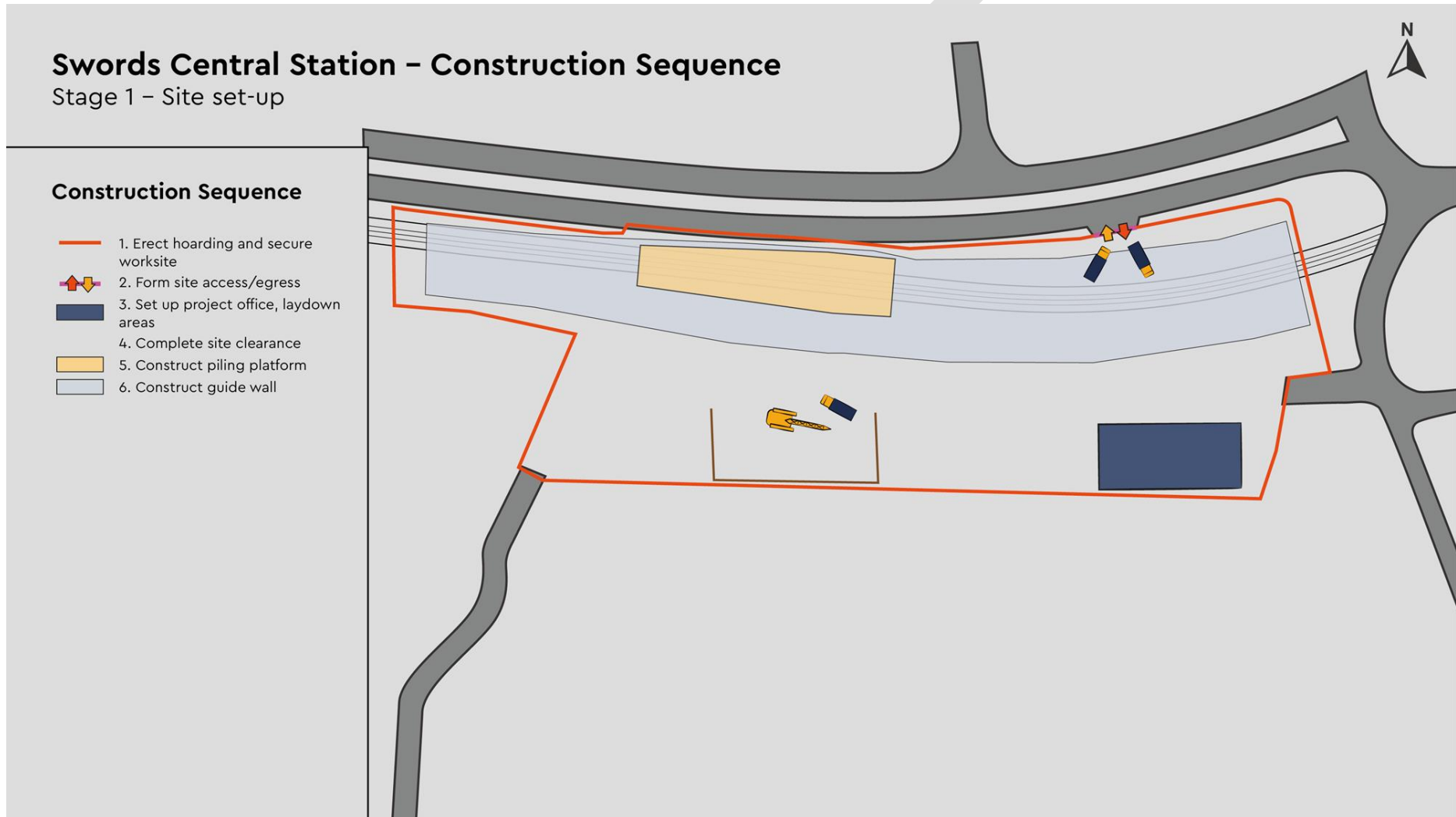





Figure 4-7 Swords Central Station Stage 1 - Site Set up

Swords Central Station – Construction Sequence

Stage 2 – Piling works

Construction Sequence

-  1. Commence station piling works
-  2. Progressively remove guide walls
-  3. Commence guide walls/C&C piling

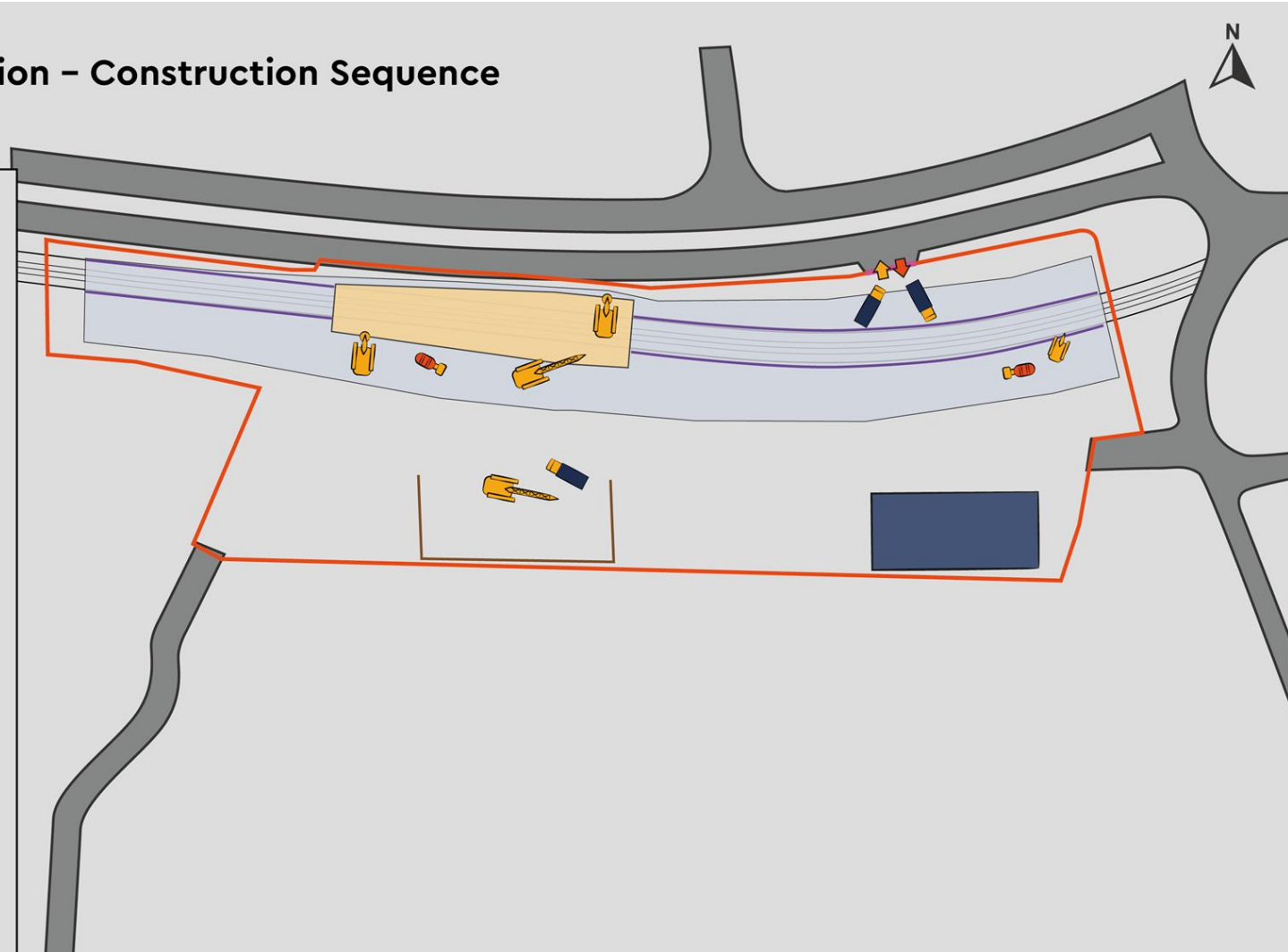


Figure 4-8 Swords Central Station Stage 2 - Piling Works

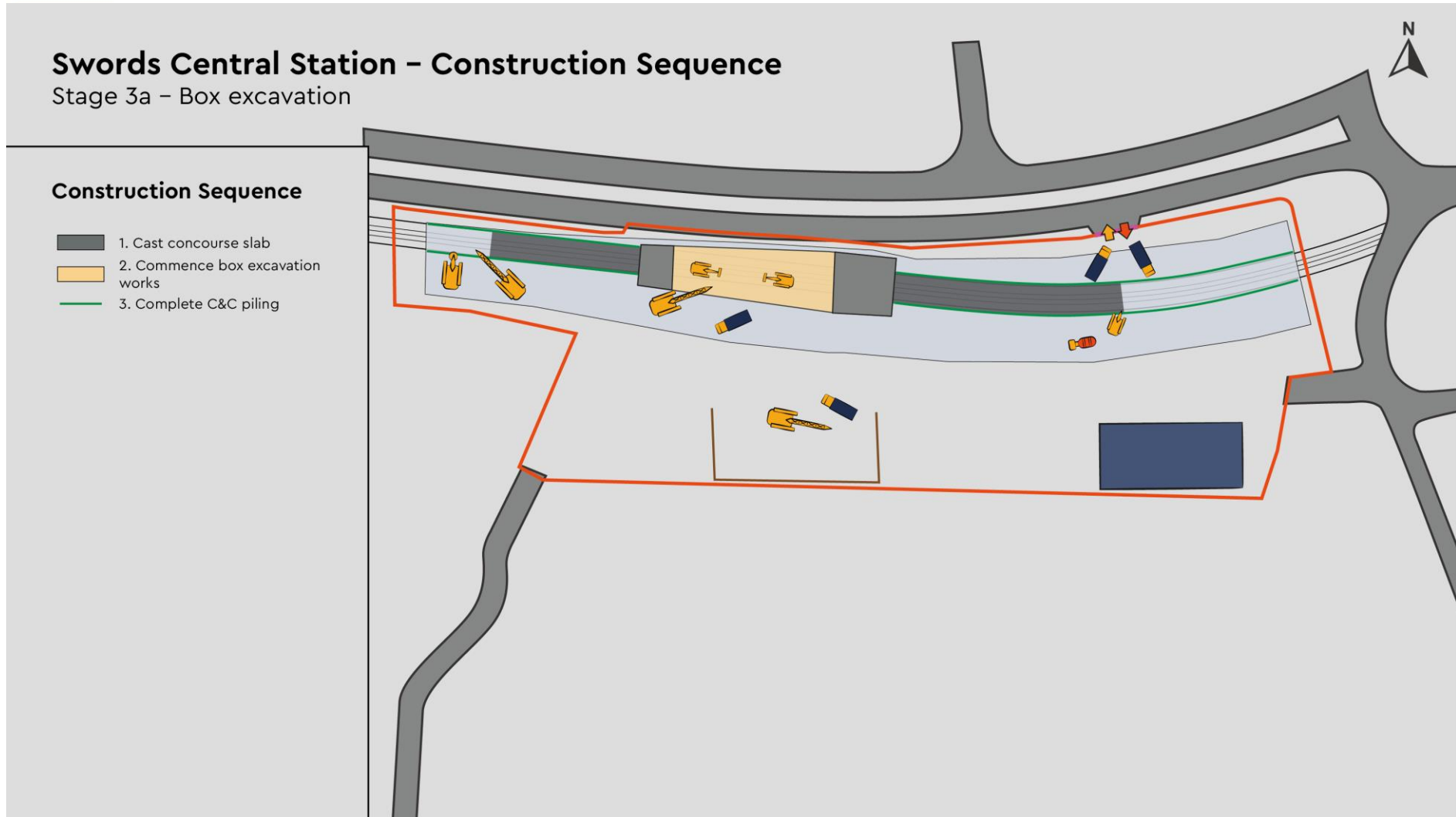


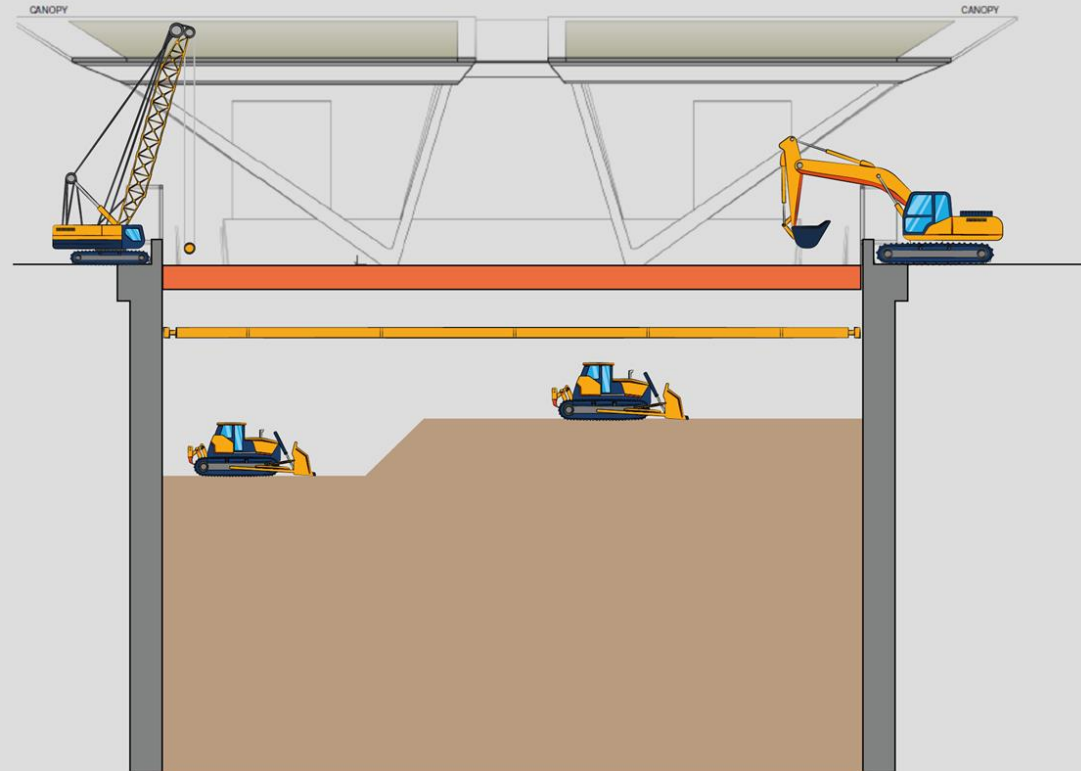
Figure 4-9 Swords Central Station Stage 3a - Box Excavation

Swords Central Station – Construction Sequence

Stage 3b – Box excavation

Construction Sequence

- 1. Construct capping beam
- 2. Cast concrete slab
- 3. Excavation to underside of temporary props
- 4. Install temporary props
- 5. Dewater as necessary



Plant shown for illustrative purposes only
Not to scale

Figure 4-10 Swords Central Station Stage 3b - Box Excavation

Swords Central Station – Construction Sequence

Stage 3c – Box excavation

Construction Sequence

1. Excavate to underside of base slab
2. Cast track/base slab
3. Construct permanent propping/ platforms
4. Remove temporary props
5. Complete BOH works
6. MEP and architectural fit-out works

Assume base slab is constructed / faceted on pre-formed blinding, CIP hit and miss fashion, 25m long bays

Plant shown for illustrative purposes only
Not to scale

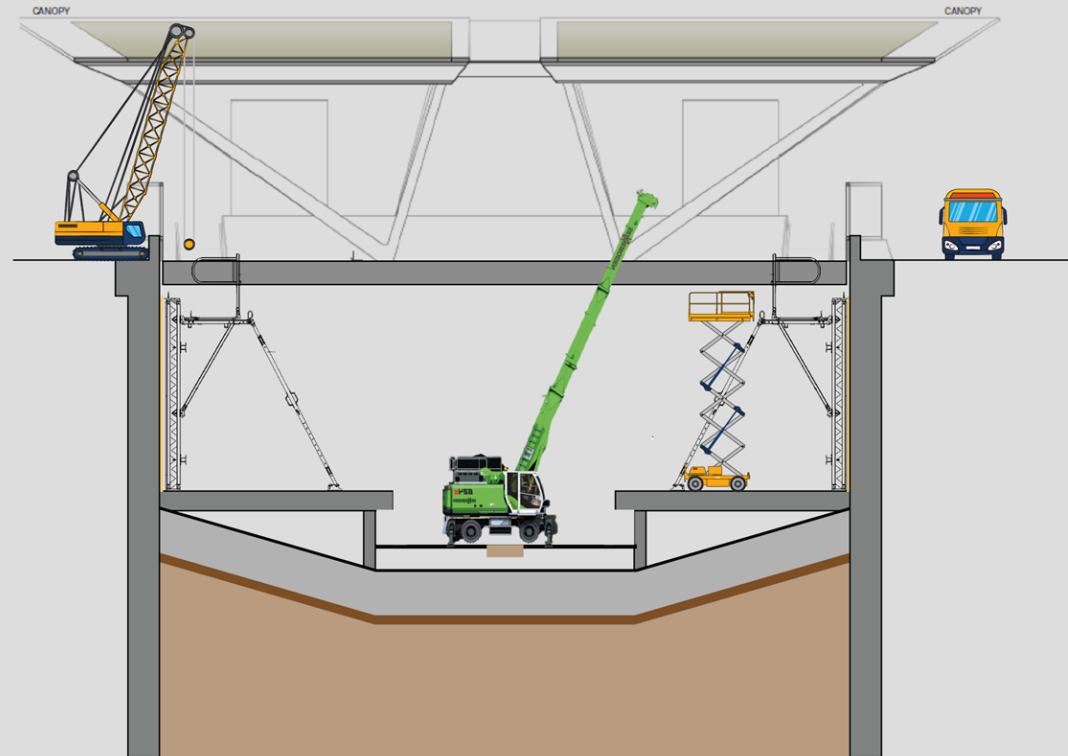


Figure 4-11 Swords Central Station Stage 3c - Box Excavation

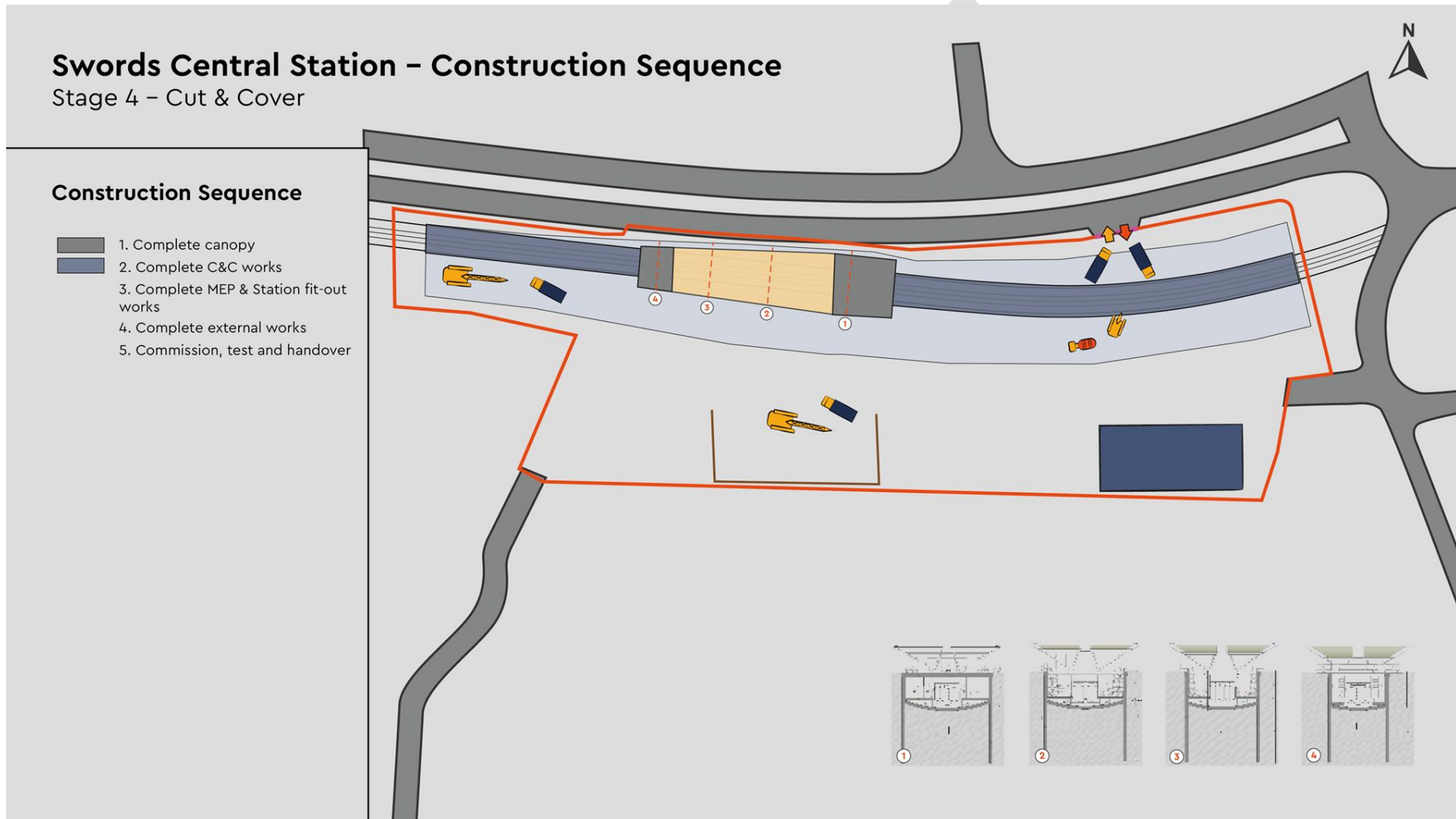


Figure 4-12 Swords Central Station Stage 4 - Cut and Cover

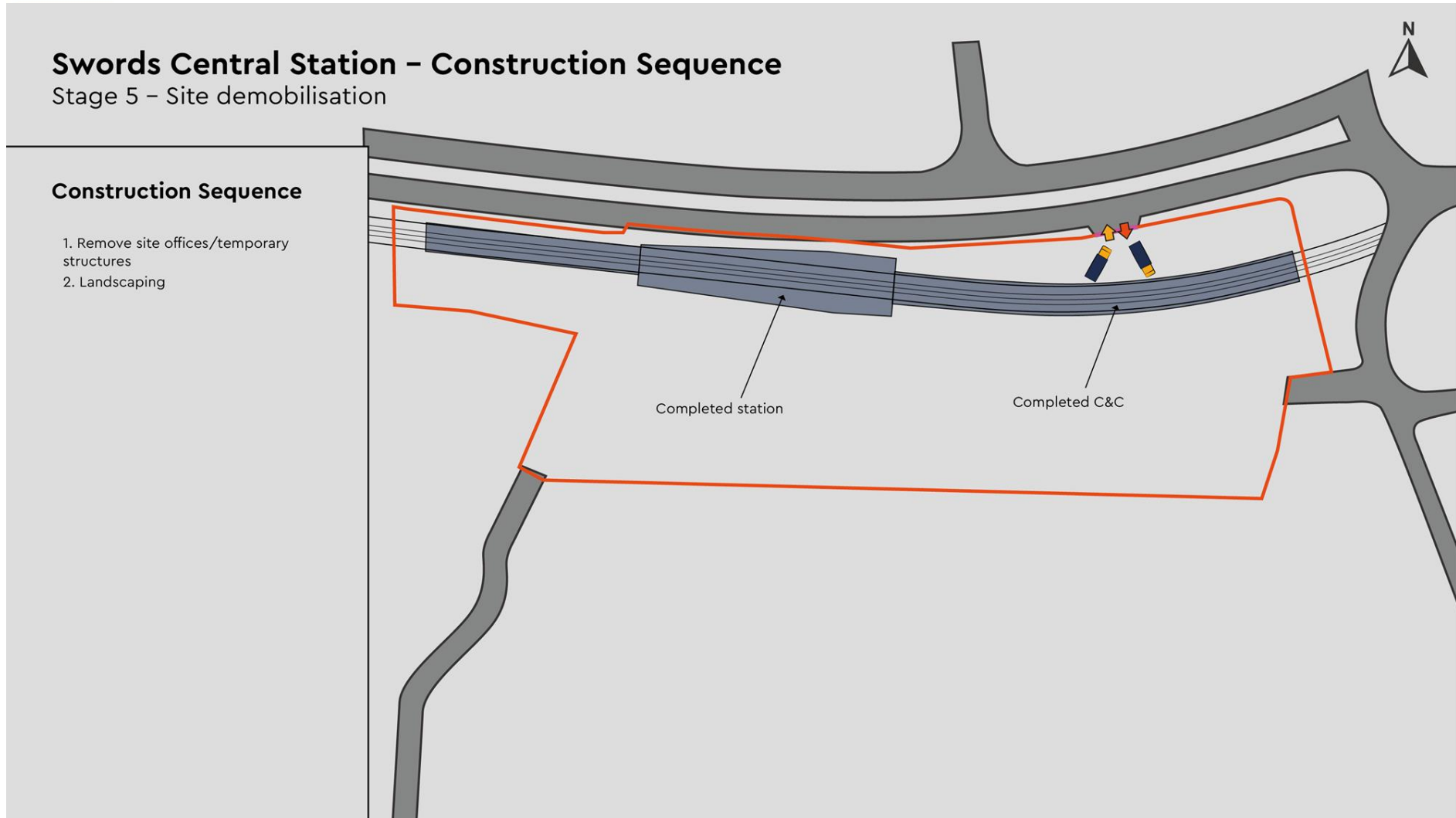


Figure 4-13 Swords Central Station Stage 5 - Site Demobilisation

4.4. Fosterstown Station

Fostertown Station – Construction Sequence

Stage 1 – Road diversion & Site set-up

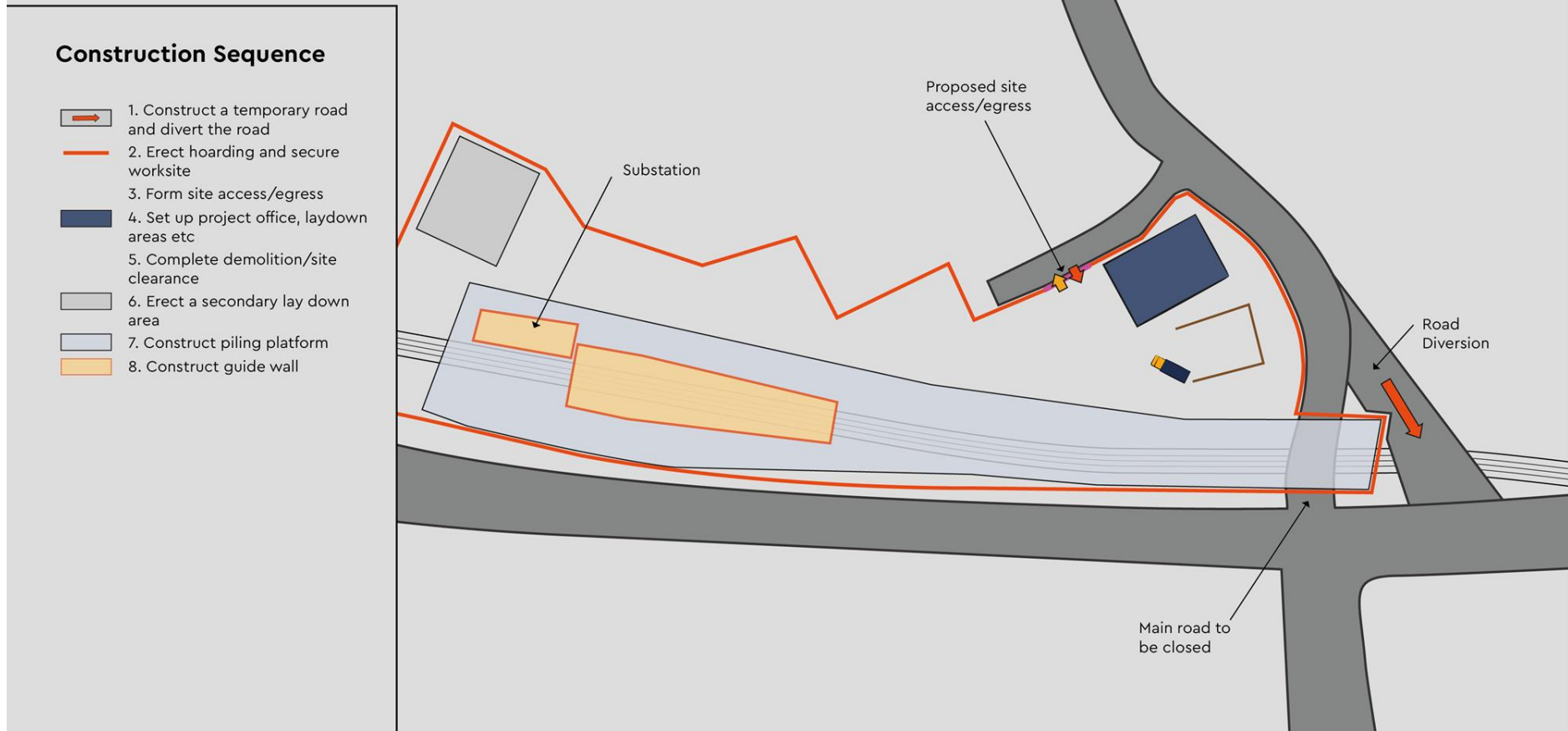


Figure 4-14 Fosterstown Station Stage 1 - Site Set Up



Fostertown Station – Construction Sequence

Stage 2 – Piling works

Construction Sequence

- 1. Commence station piling works
- 2. Progressively remove guide walls
- 3. Commence guide walls/C&C piling

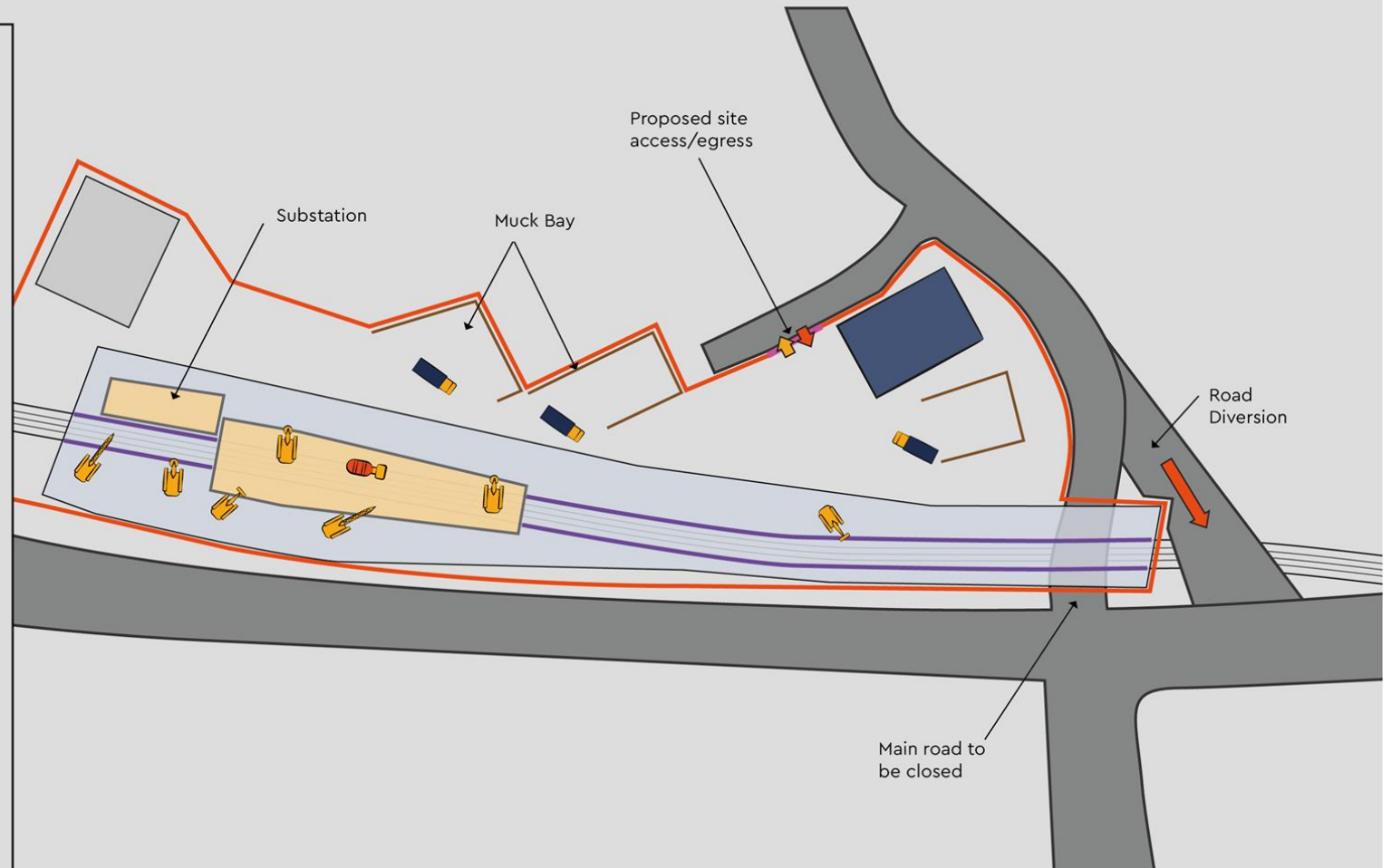


Figure 4-15 Fosterstown Station Stage 2 - Piling Works



Fostertown Station – Construction Sequence

Stage 3a – Box Excavation

Construction Sequence

- 1. Cast concourse slab
- 2. Commence box excavation works
- 3. Complete C&C piling

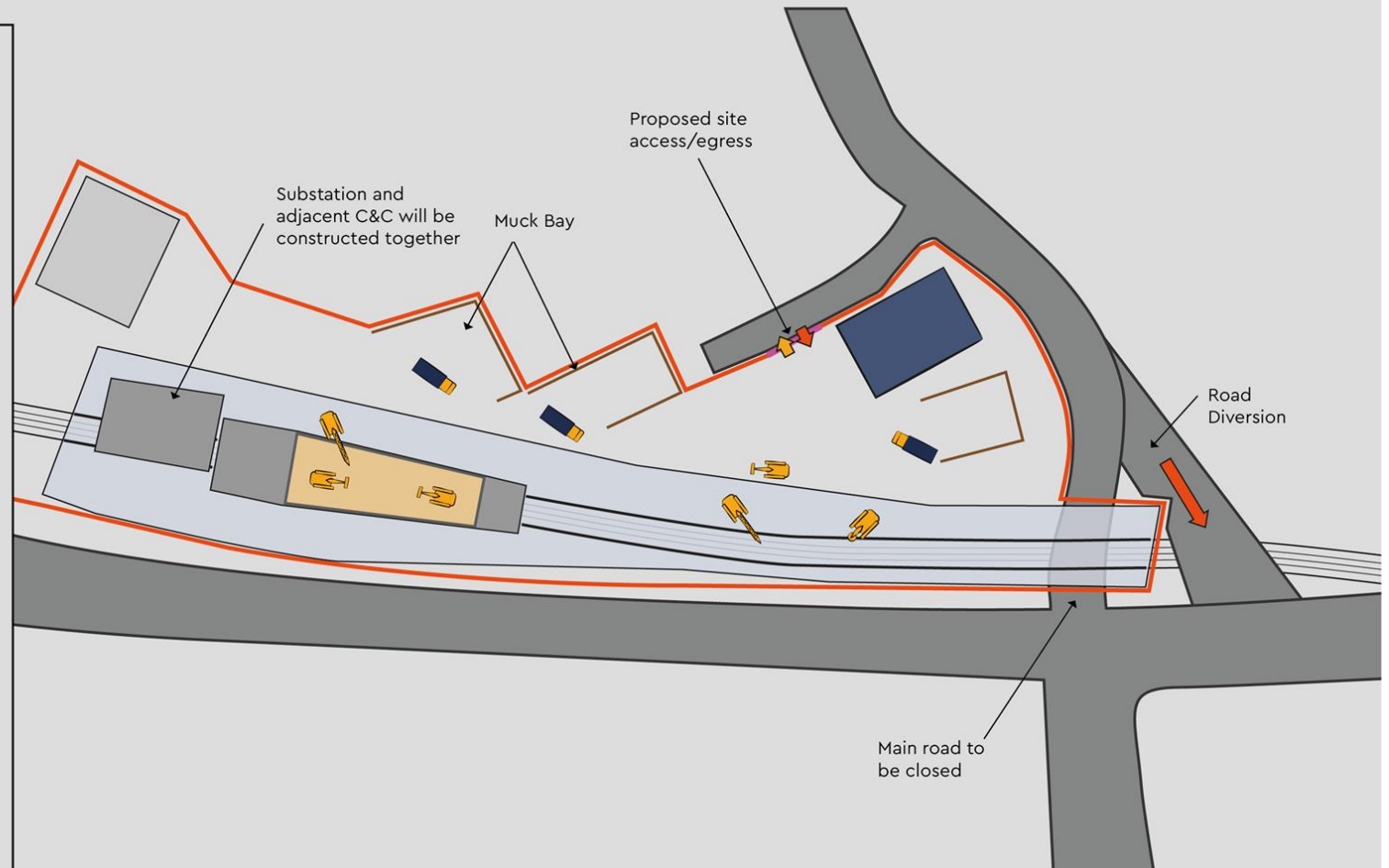


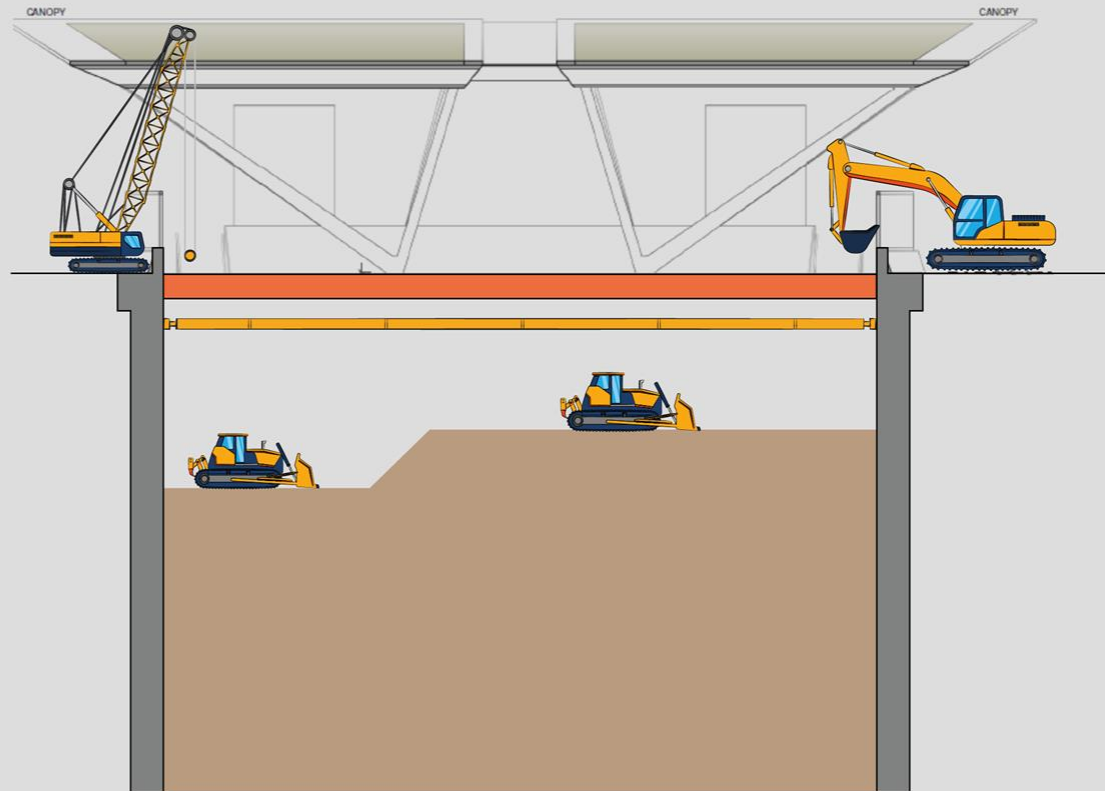
Figure 4-16 Fosterstown Station Stage 3a - Box Excavation

Fostertown Station – Construction Sequence

Stage 3b – Box excavation

Construction Sequence

- 1. Construct capping beam
- 2. Cast concrete slab
- 3. Excavation to underside of temporary props
- 4. Install temporary props
- 5. Dewater as necessary



Plant shown for illustrative purposes only
Not to scale

Figure 4-17 Fosterstown Station Stage 3b - Box Excavation

Fostertown Station – Construction Sequence

Stage 3c – Box excavation

Construction Sequence

1. Excavate to underside of base slab
2. Cast track/base slab
3. Construct permanent propping/
platforms
4. Remove temporary props
5. Complete BOH works
6. MEP and architectural fit-out works

Assume base slab is constructed / faceted
on pre-formed blinding, CIP hit and miss
fashion, 25m long bays

Plant shown for illustrative purposes only
Not to scale

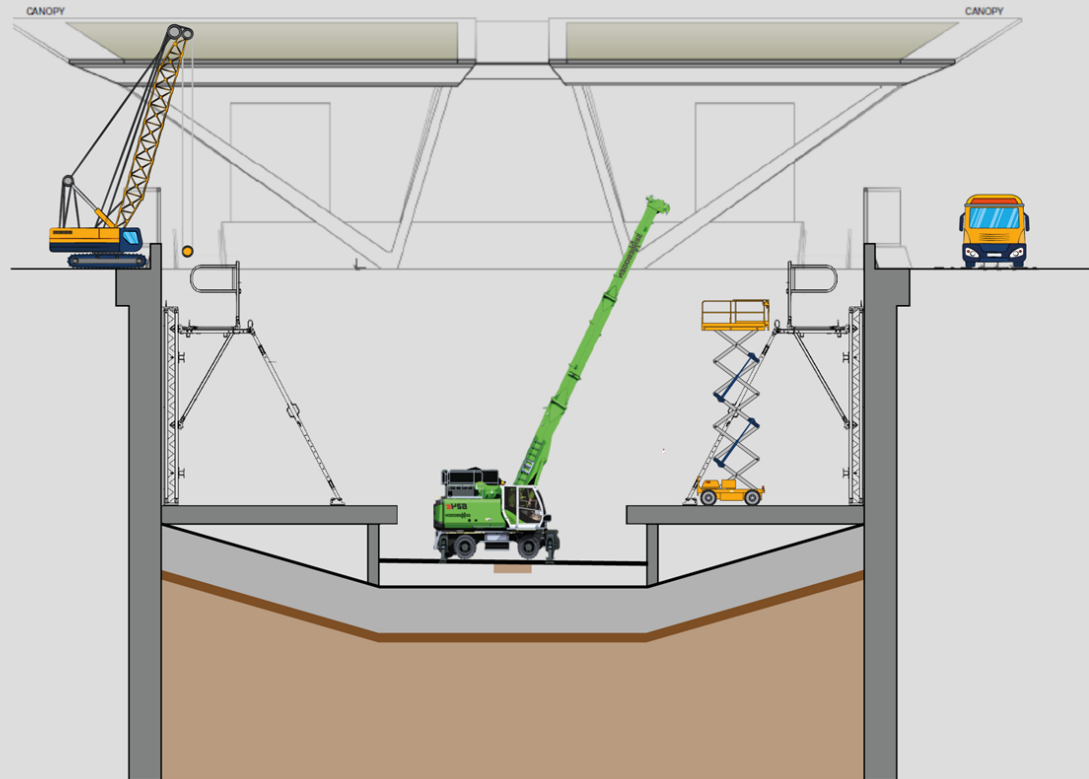


Figure 4-18 Fosterstown Station Stage 3C - Box Excavation



Fostertown Station – Construction Sequence

Stage 4 – Cut & Cover

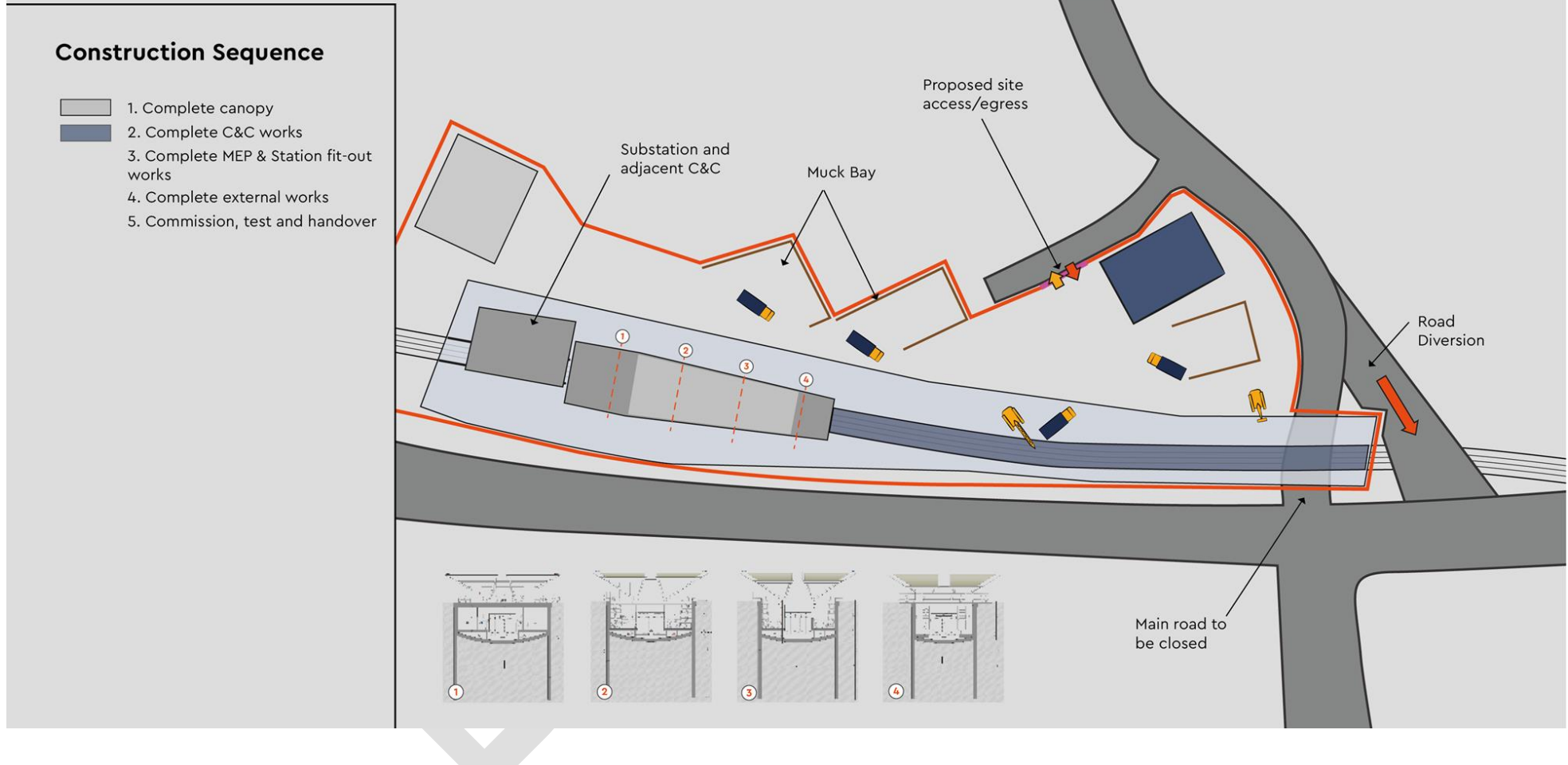


Figure 4-19 Fosterstown Stage 4 - Cut and Cover



Fostertown Station – Construction Sequence

Stage 5 – Road diversion

Construction Sequence

1. Road diversion to the permanent condition
2. Piling works to the south of Nevinstown Lane
3. Complete C&C works to south of Nevinstown Lane

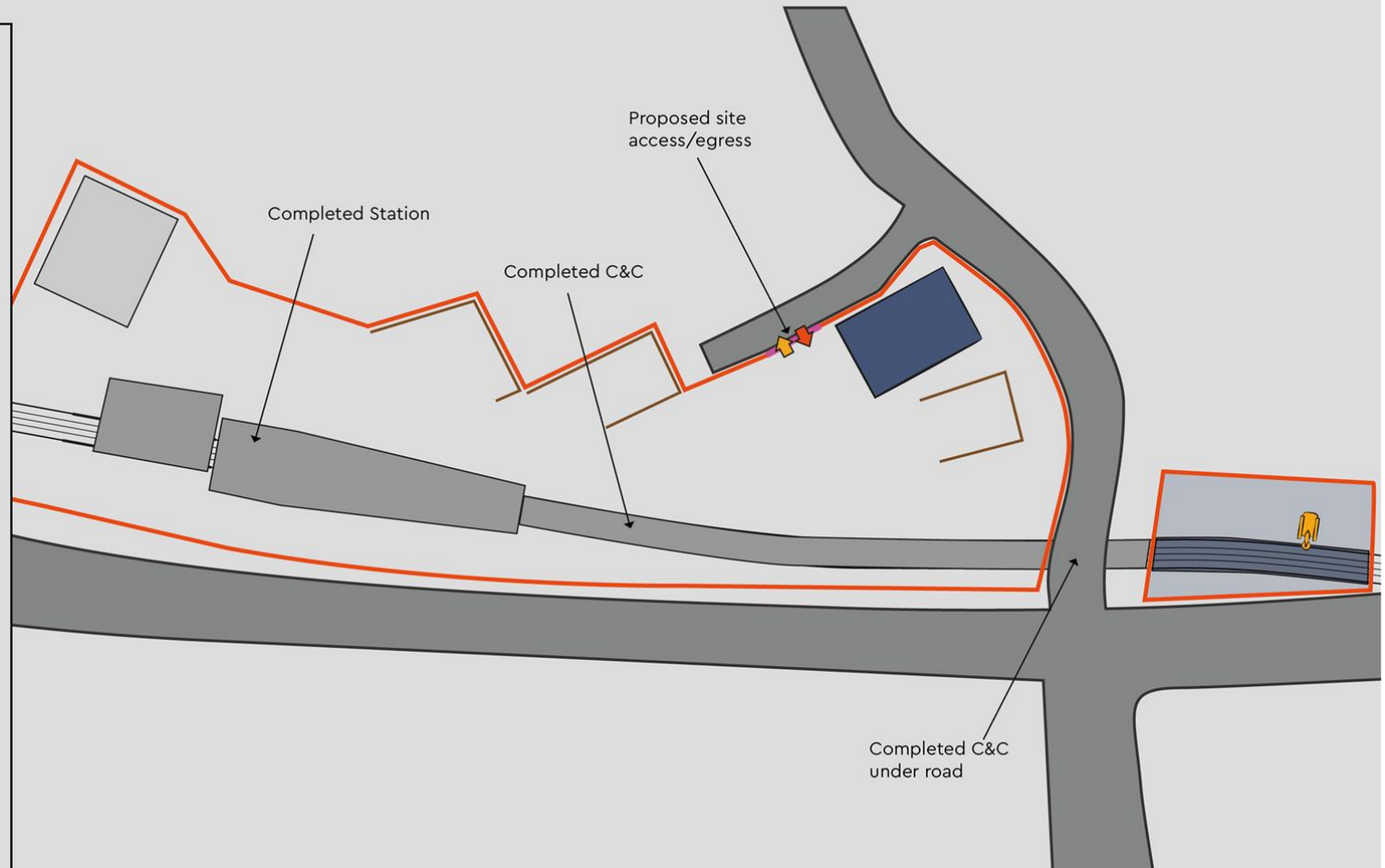


Figure 4-20 Fosterstown Station Stage 5 Road Diversion

4.5. Cut & Cover, Retained Walls and Cutting

Location on Route	Chainages	Construction Technique	Approx Length
Estuary Park and Ride Estuary to Seatown Station (Including approaches either side of the Broadmeadow Viaduct)	1,238.422 - 2,798.92	At-Grade	196.01
		Elevated	261.16
		At-Grade	152.63
		Retain cut	60.00
		U Section	183.62
		Retain cut	27.15
		C&C 1	90.00
		Retain cut	99.00
		C&C 2	425.92
Seatown Station to Swords Central Station	2,798.92- 3,792.05	C&C 3	42.45
		Retain cut	58.24
		C&C 4	70.00
		Retain cut	112.91
		C&C 5	8.03
		Retain cut	56.19
		C&C 6	366.71
		Retain cut	55.48
		C&C 7	99.25
Swords Central to Fostertown Station	3,792.05 - 4,736.19	C&C 8	35.32
		Retain cut	79.25
		C&C 9	48.45
		Retain cut	90.00
		C&C 10	20.00
		Retain cut	138.72
		C&C 11	165.51
		Retain cut	48.46
		C&C 12	27.00
		Retain cut	148.71
		C&C 13	69.34
	4,736.19 - 6,065.52	C&C 14	60.32

Location on Route	Chainages	Construction Technique	Approx Length
Fostertown Station to Dublin Airport North Portal		Retain cut	101.29
		C&C 15	36.79
		Retain cut	70.61
		C&C 16	83.09
		Retain cut	178.06
		U Section	227.14
		At-Grade	405.54
		Retain cut	27.59
		C&C 17	43.48
Airport South Portal to Dardistown Depot	8,408.30 - 9,021.91	C&C 18	172.34
		U Section (C&C)	104.60
		U Section	57.02
		U Section	211.91
Dardistown to Northwood Station (Including approaches either side of the M50 Crossing, plans detailed in section 7 below)	9,021.91 - 10,251.14	C&C 19 Depot	62.94
		C&C 19	183.83
		U Section	192.00
		At-Grade	89.46
		Elevated	99.00
		At-Grade	236.54
		Retain cut	91.33
		C&C 20	167.81

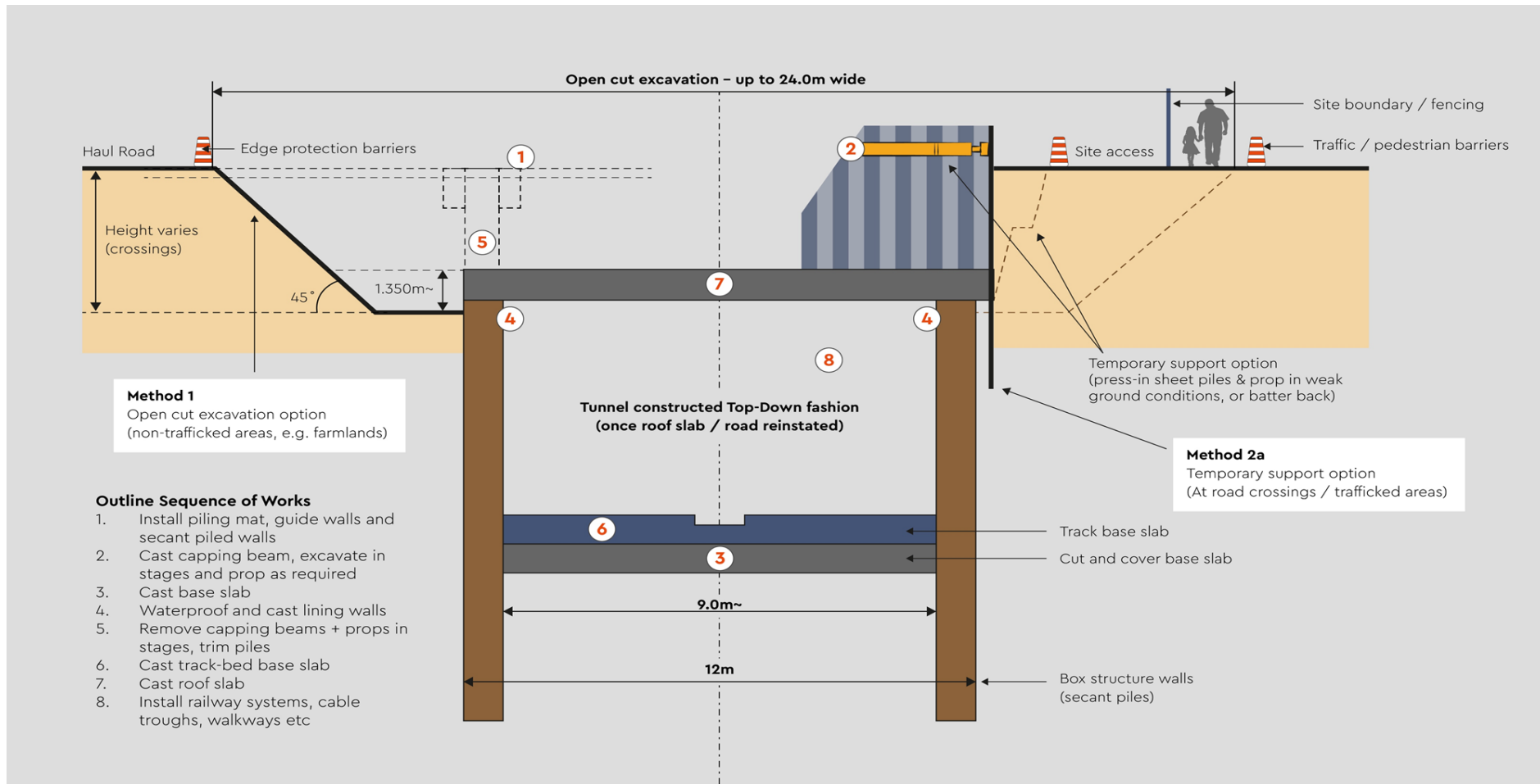


Figure 4-21 Typical Cut and Cover Construction sequence

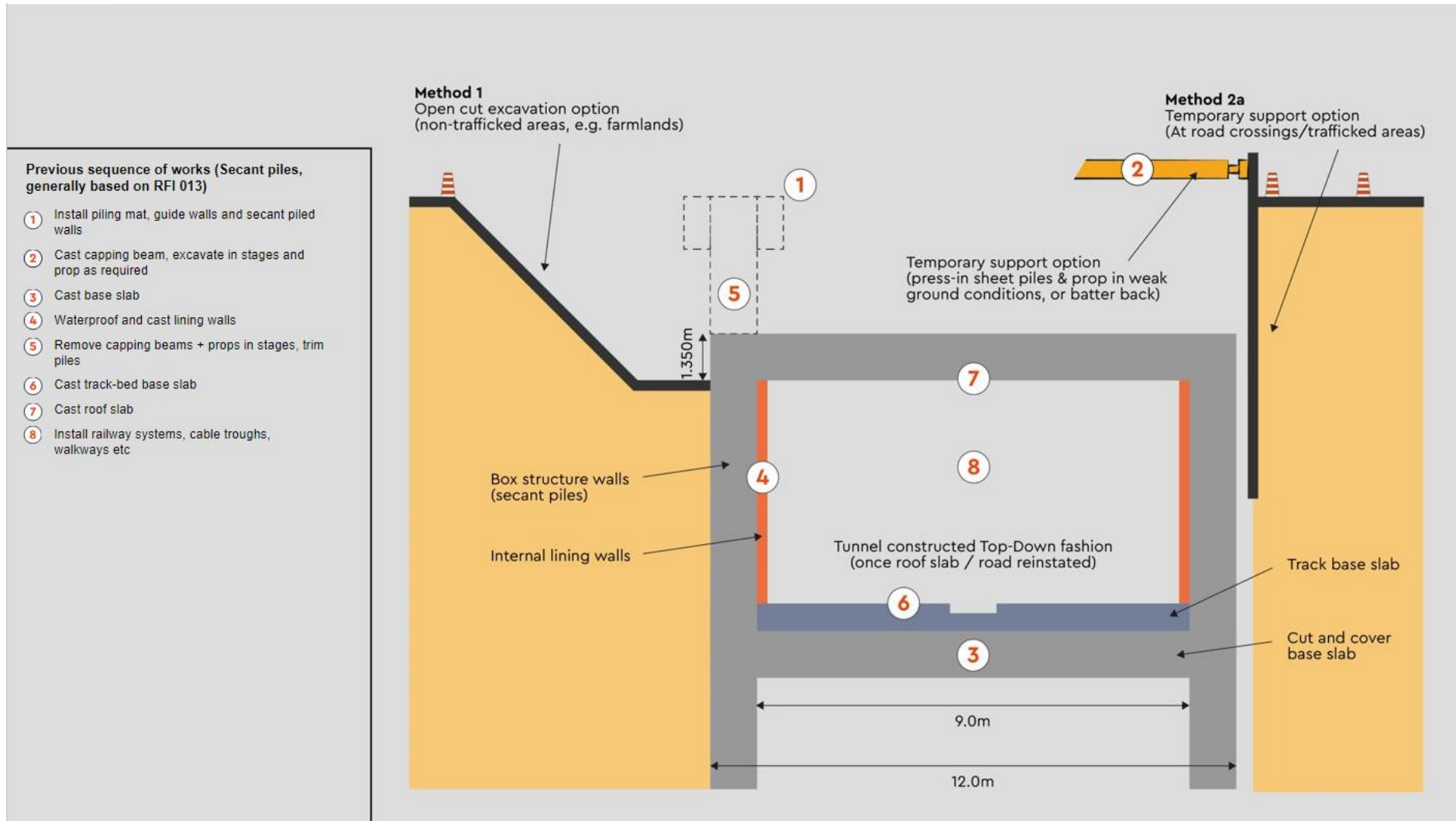


Figure 4-22 Open cut excavation – up to 24.0m wide

4.6. Typical U-Sections

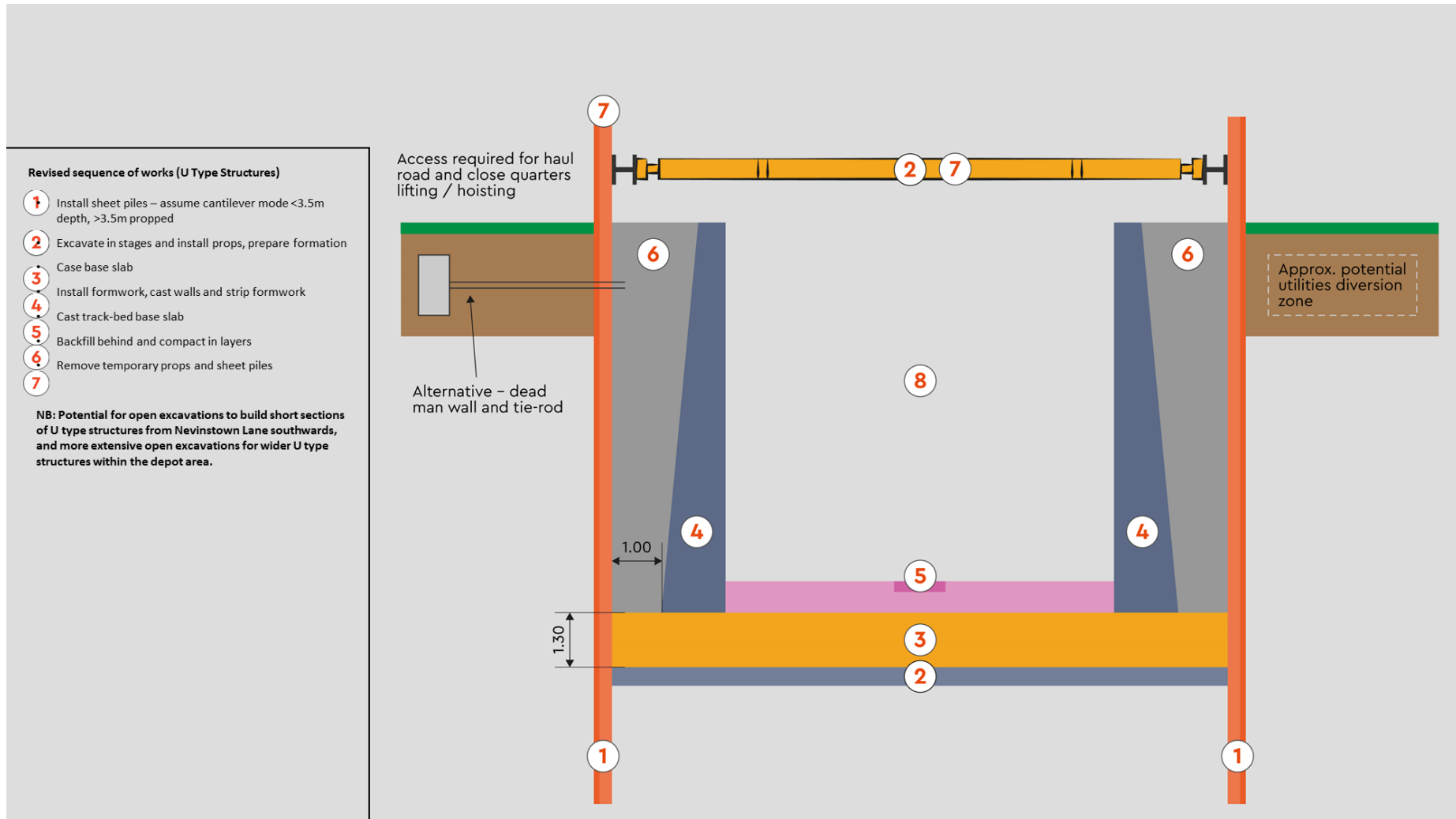


Figure 4-23 U - Section Type - 3.8M < TOR / TERRAIN < 5.8M

5. Dublin Airport

5.1. Overview

The construction of Metrolink at Dublin Airport includes two portals, linked by a tunnel with deep level station at Dublin Airport. At the North Portal site there is an area designated for a new substation, and the TBM will be launched from the South Portal.

5.2. North Portal Construction Plan

Figure 5-1 illustrates the site layout at North Portal. The layout is not expected to be changed during the construction of the portal.

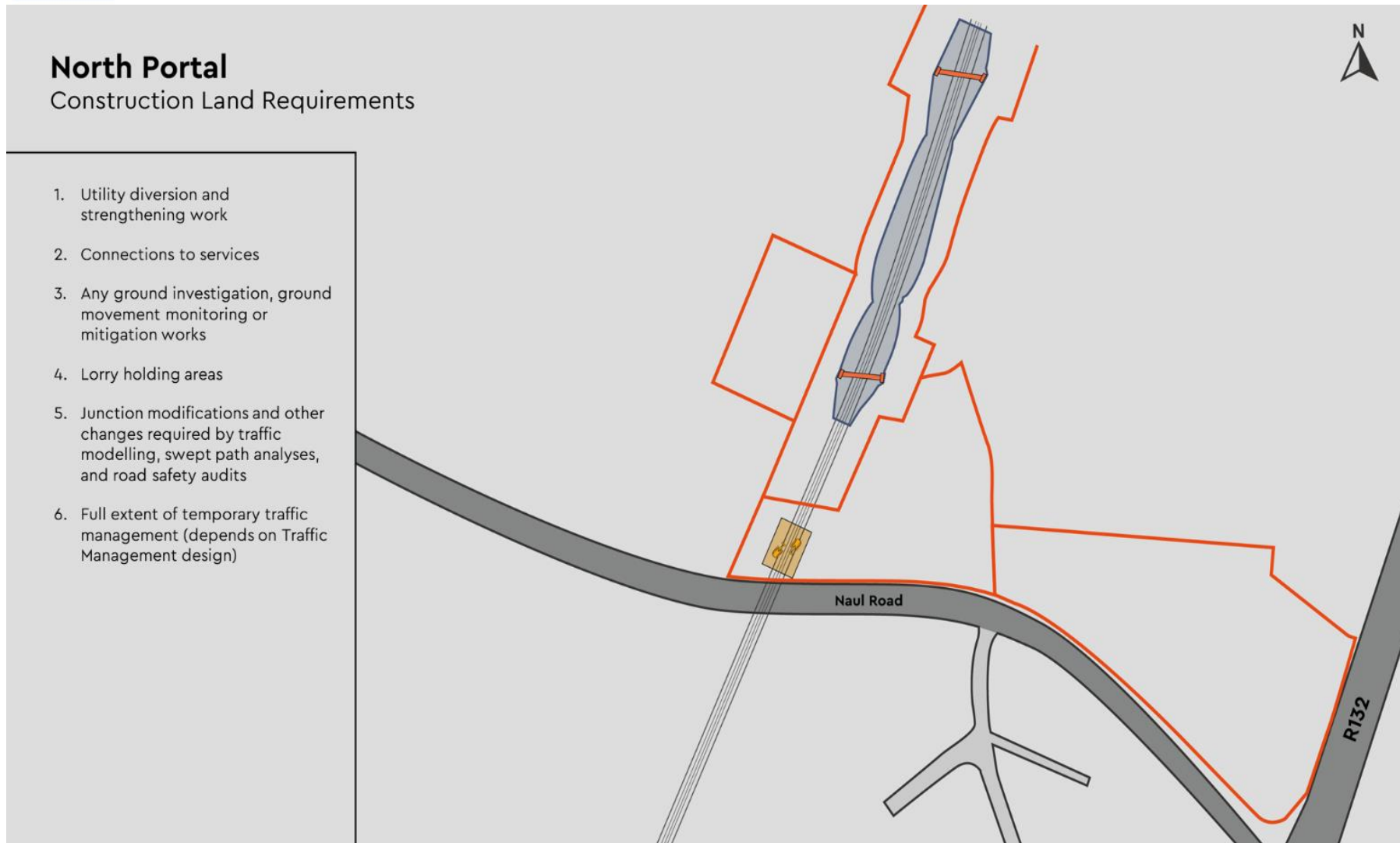


Figure 5-1 Dublin Airport North Portal Layout

5.3. Dublin Airport Station

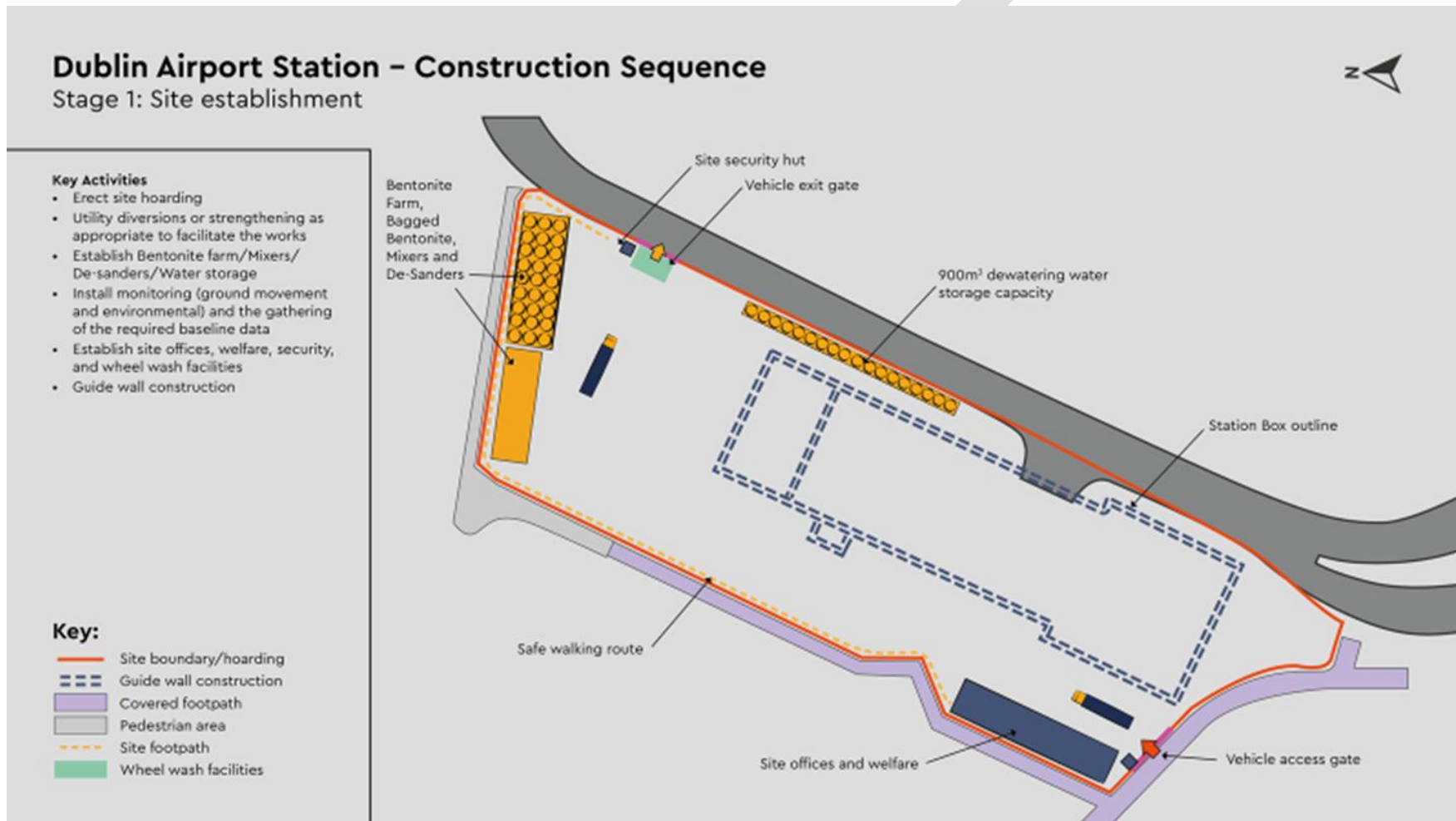


Figure 5-2 Dublin Airport Station Stage 1 - Site Establishment

Dublin Airport Station – Construction Sequence

Stage 2: Diaphragm walling – Cross section A-A

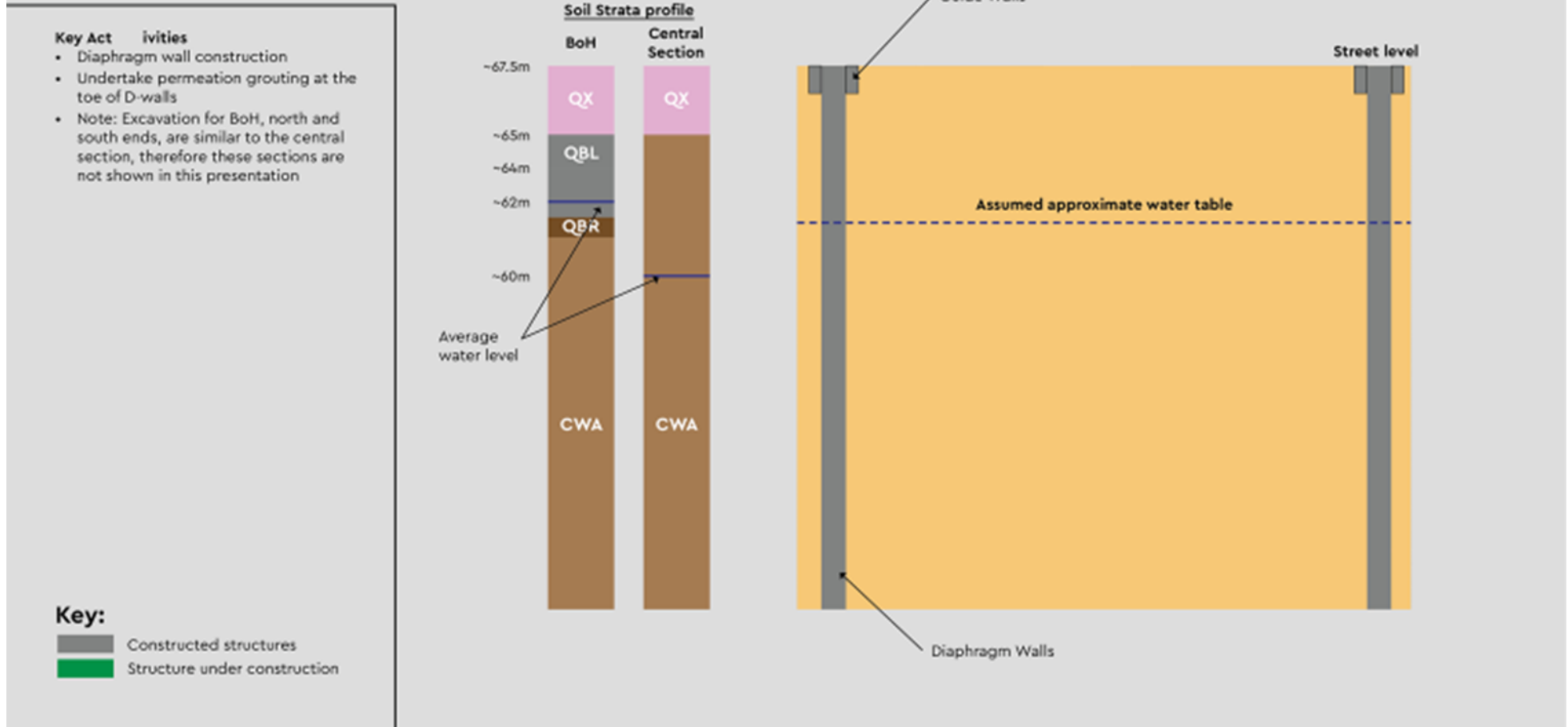


Figure 5-3 Dublin Airport Station Stage 2 - Diaphragm Walling



Dublin Airport Station – Construction Sequence

Stage 3: Excavate to formation of roof slab

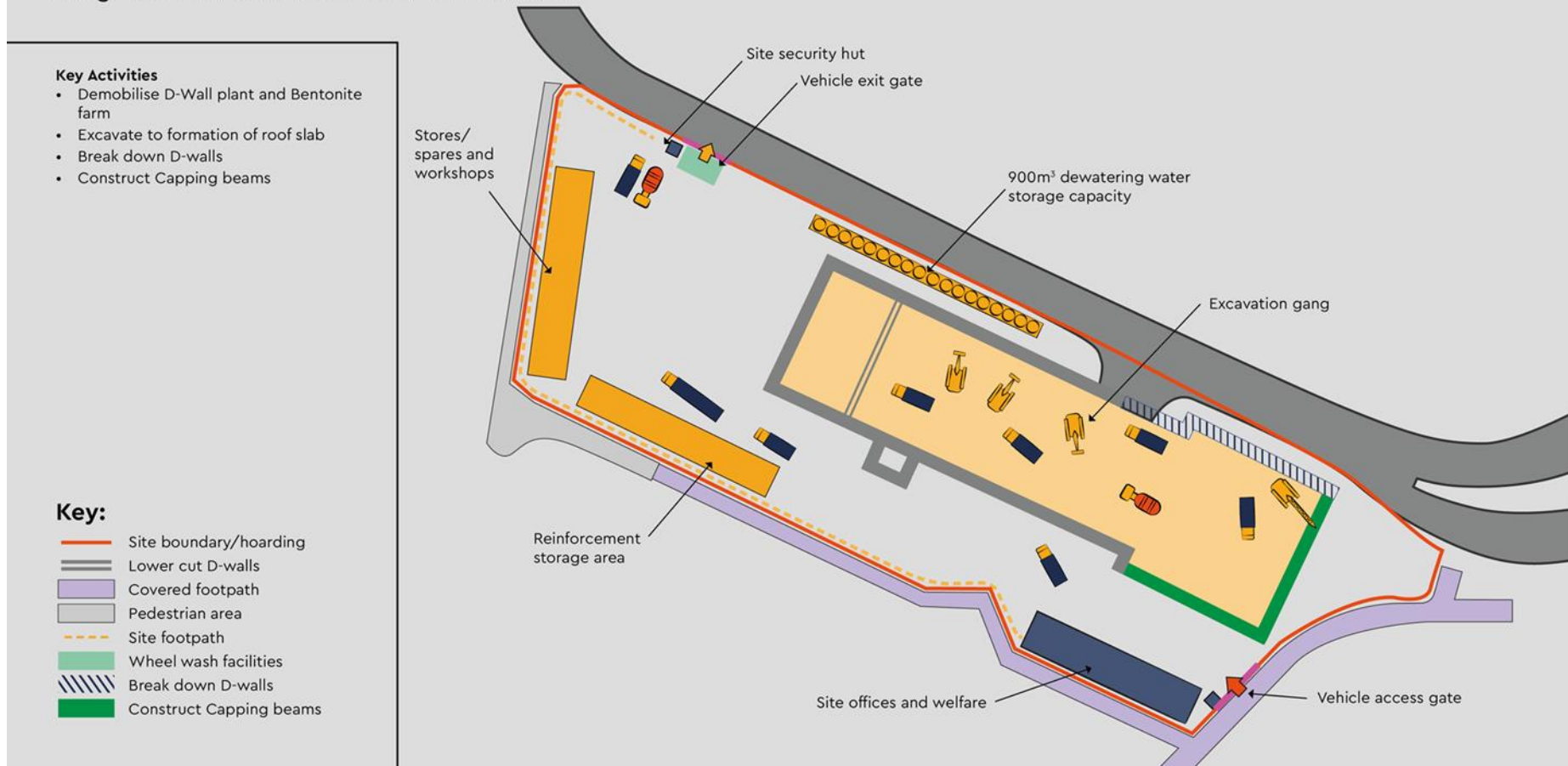


Figure 5-4 Dublin Airport Station Stage 3 - Excavate to Formation of Roof Slab

Dublin Airport Station – Construction Sequence

Stage 4: Roof slab construction

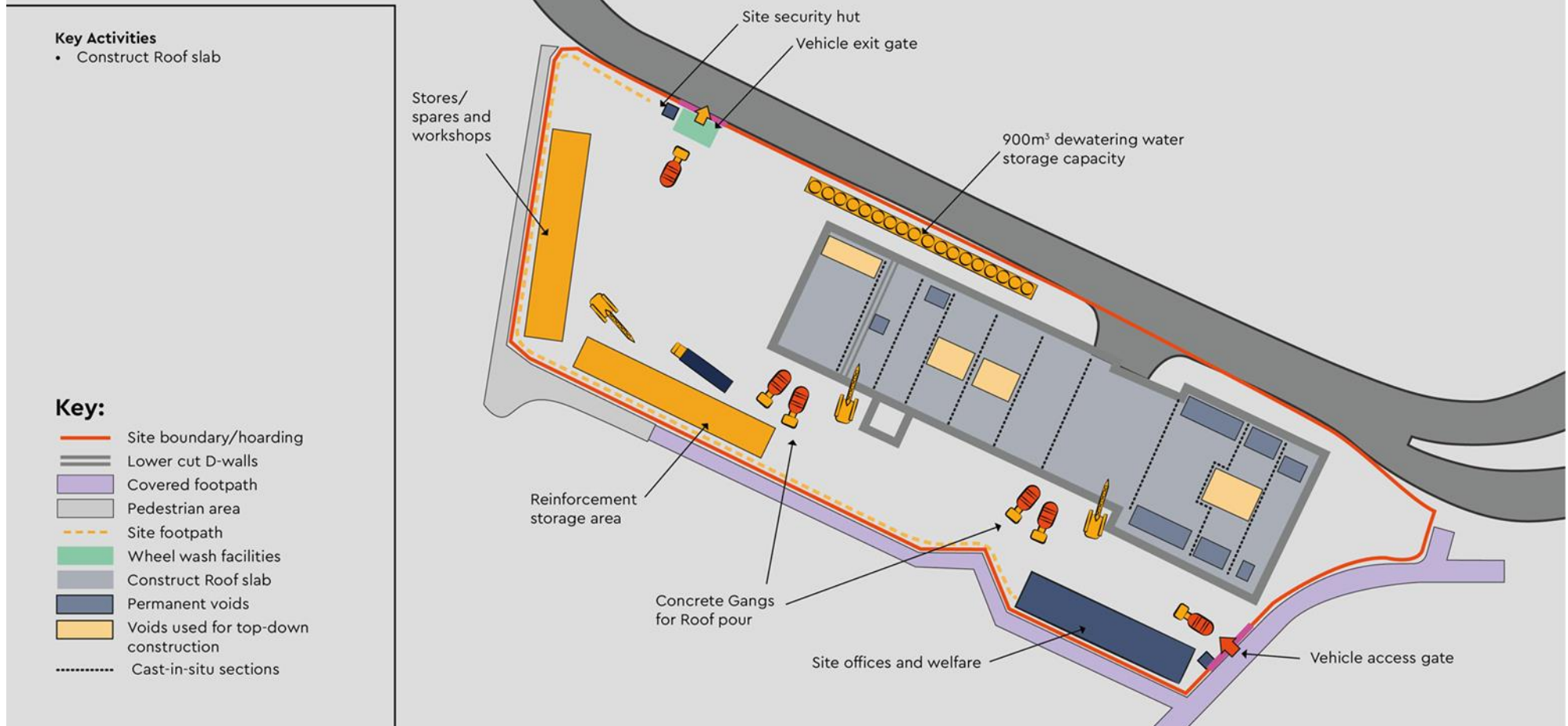


Figure 5-5 Dublin Airport Station Stage 4 - Roof Slab Construction Begins

Dublin Airport Station – Construction Sequence

Stage 5: Top-Down Station construction begins

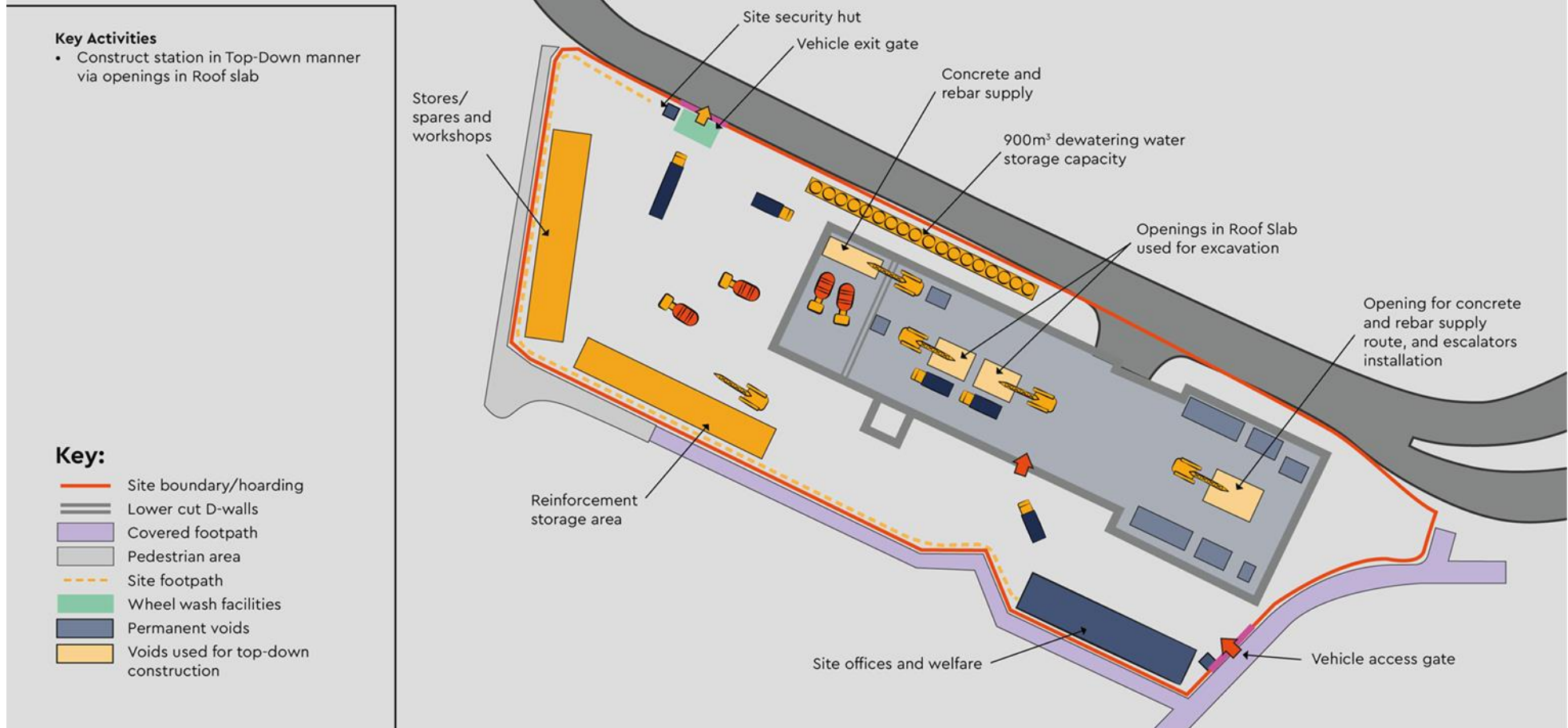


Figure 5-6 Dublin Airport Station Stage 5 - Top-Down Station Construction Begins

5.4. South Portal

Figure 5-7 illustrates the site layout at South Portal. The layout is not expected to be changed during the construction period.

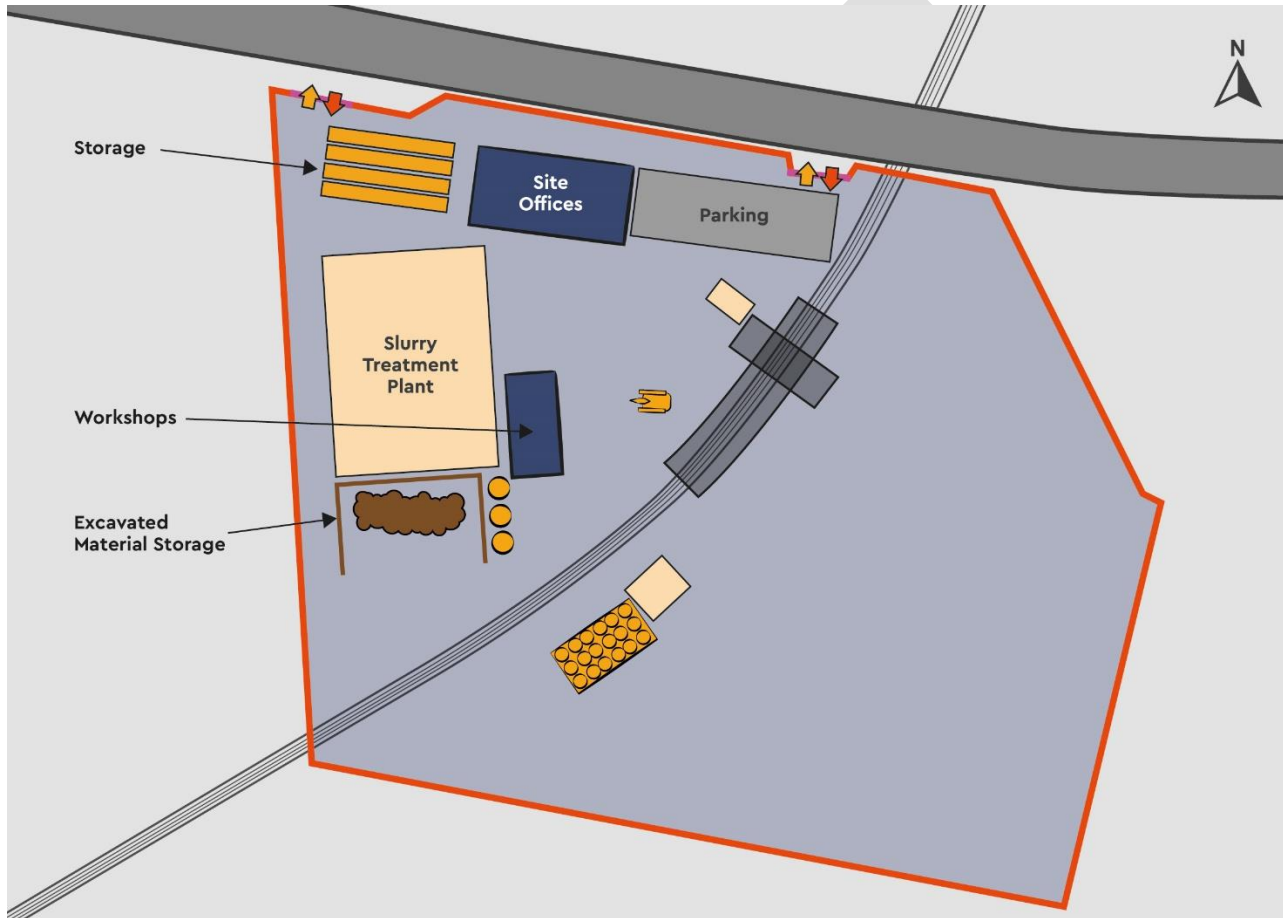


Figure 5-7 Dublin Airport South Portal - Site Layout

6. Dardistown Station and Depot

6.1. Overview

The construction of Dardistown Station and Depot is a surface built construction consisting of retained U-sections cut and cover works.

6.2. Station and Approaches Construction

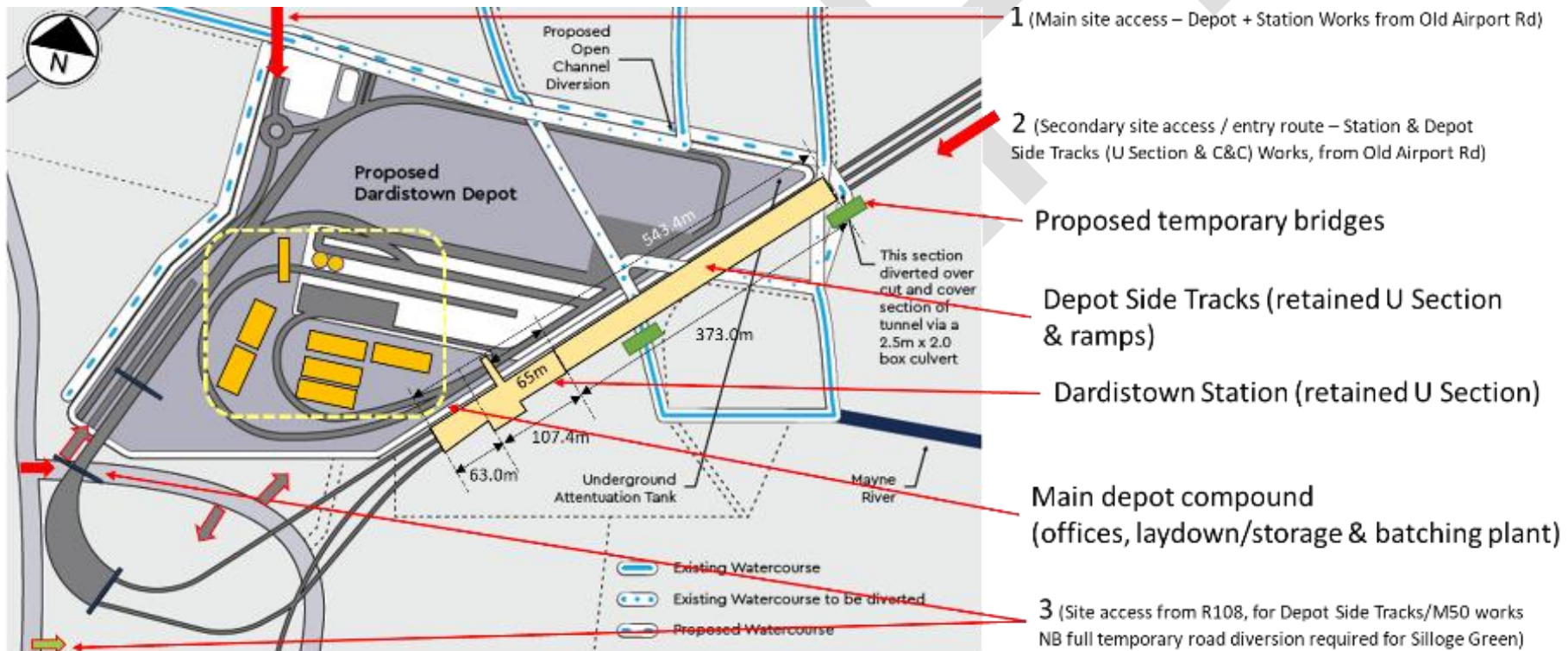


Figure 6-1 Dardistown Station Stage 1- Site Access & Compound

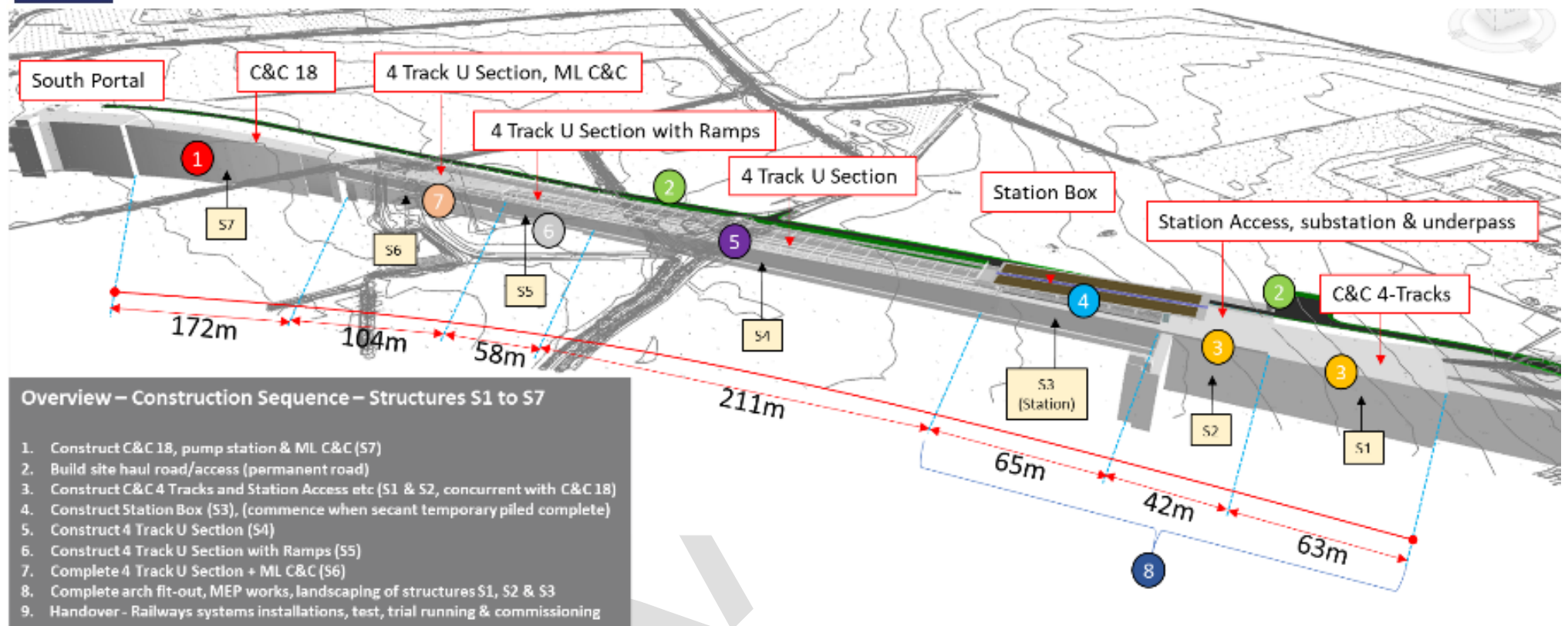


Figure 6-2 Dardistown Station Overview

Dardistown Station

Construction Staging - Overview

Depot Worksite (Separate construction sequence)



Key:

- Site Boundary
- Secant Piles
- U Section (Open Cut + Soil Nailing + Shotcrete)
- Station works and or advanced/enabling C&C
- Temporary bridge
- General linear works sequence (deeper section - traction sub-station first)
- Ex. Watercourse diverted
- 10.0m wide haul/internal site access road

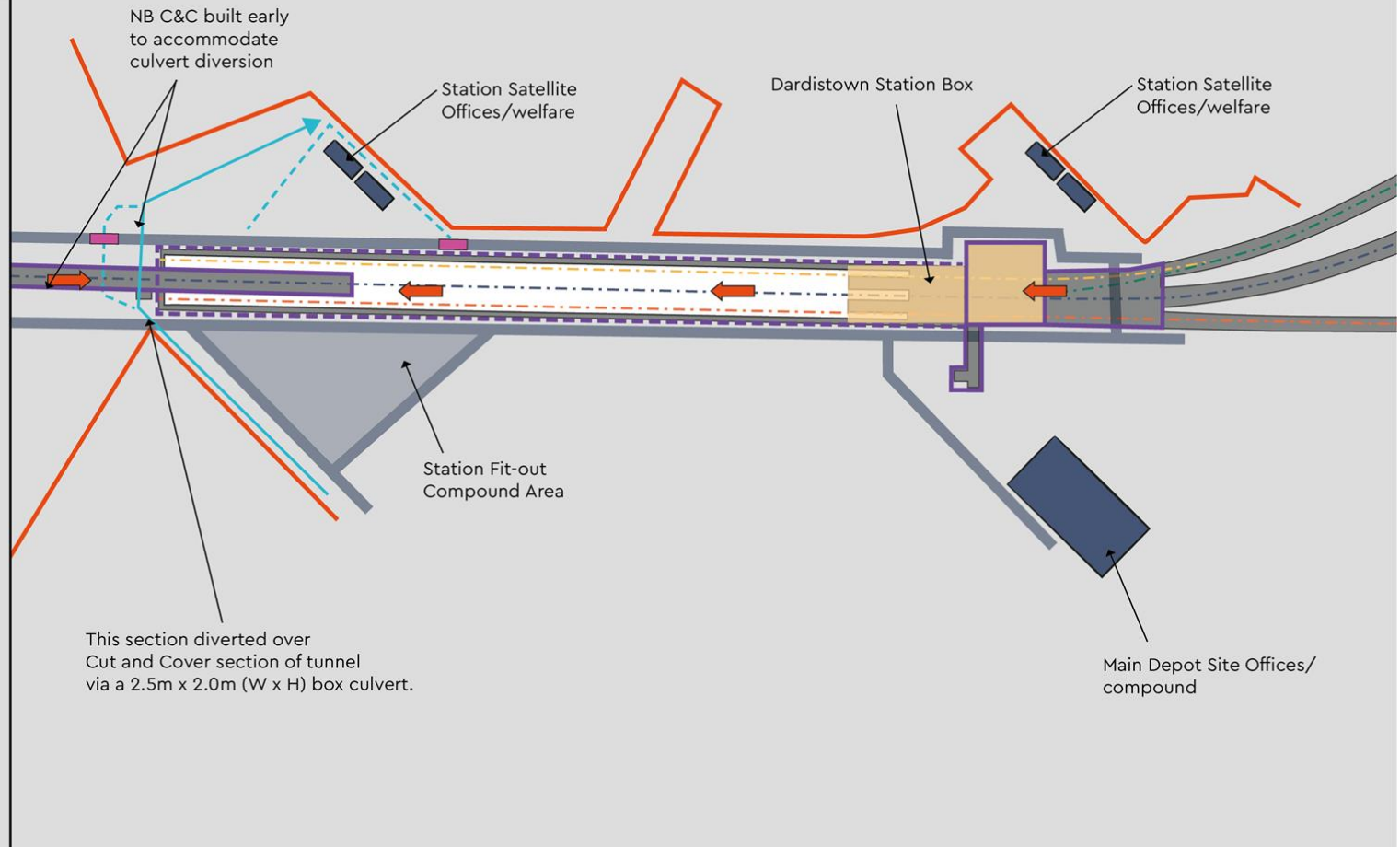


Figure 6-3 Dardistown Station Overview (section S3 below)

Dardistown Station

Site Location Map – Structures S1 to S7

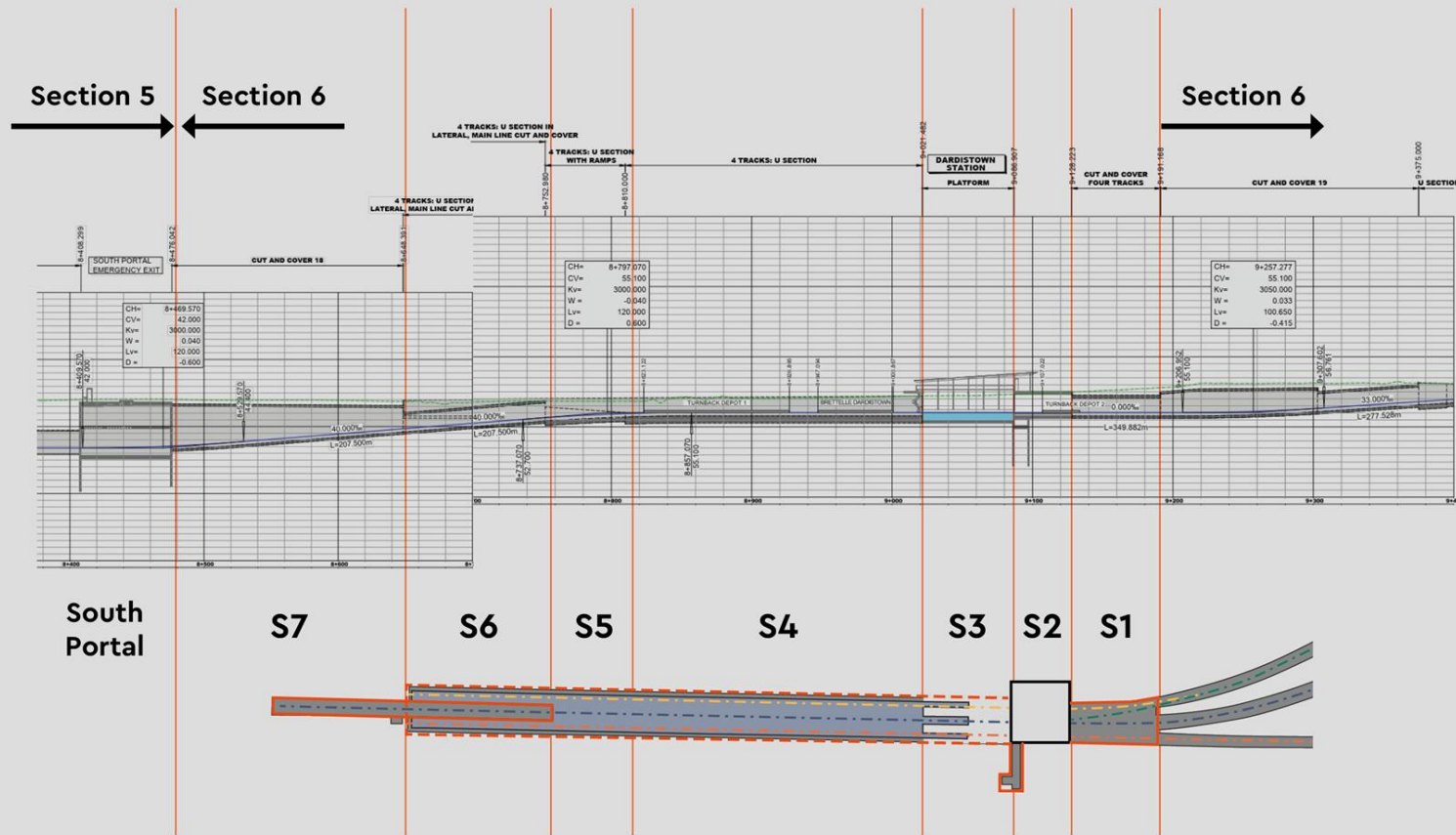


Figure 6-4 Dardistown Station Site Location Map

Dardistown Station

S1 Structure – Construction Sequence

1. Topsoil strip
2. Install piling platform & plate test
3. Install secant piling
4. Install bored piles
5. Excavate cut and cover to -4.0m bgl
6. Install ground anchors
7. Excavate to formation and form shear key
8. Pour blinding + waterproofing
9. Cast base slab
10. Cast track slab
11. Trim piles, install falsework and cast roof slab
12. Backfill over 4 track C&C

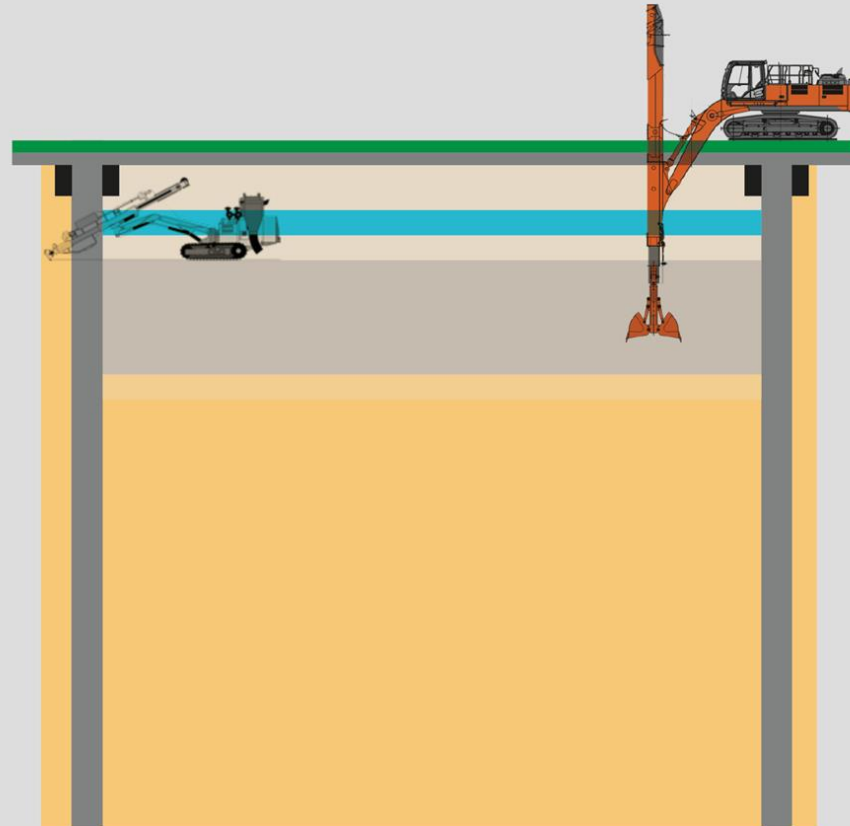


Figure 6-5 Dardistown Station S1 Structure Sequence

Dardistown Station

Structure S2 – Station Access/Substation/Staff Underpass

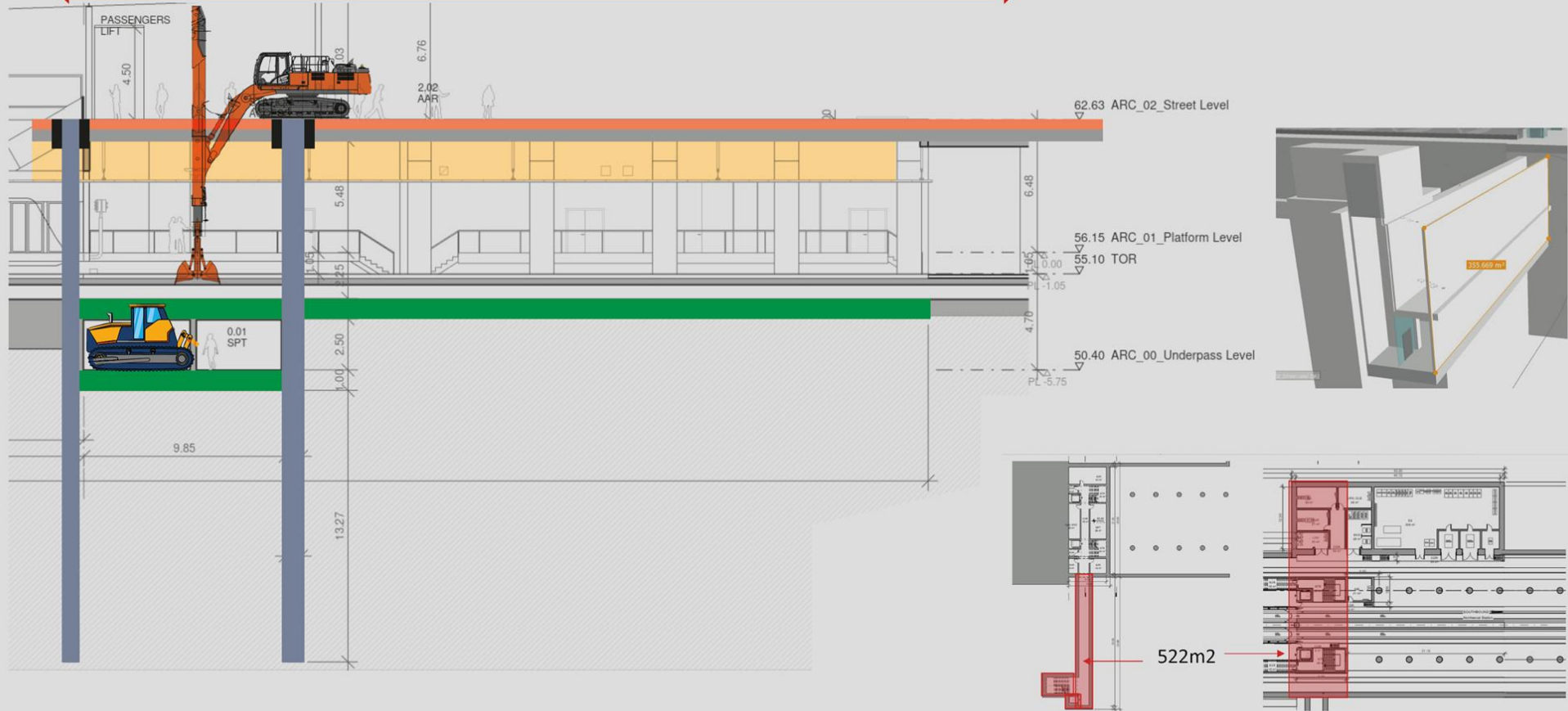


Figure 6-6 S2 Structure Construction Sequence

Dardistown Station

Construct platforms, lift shafts & stairs

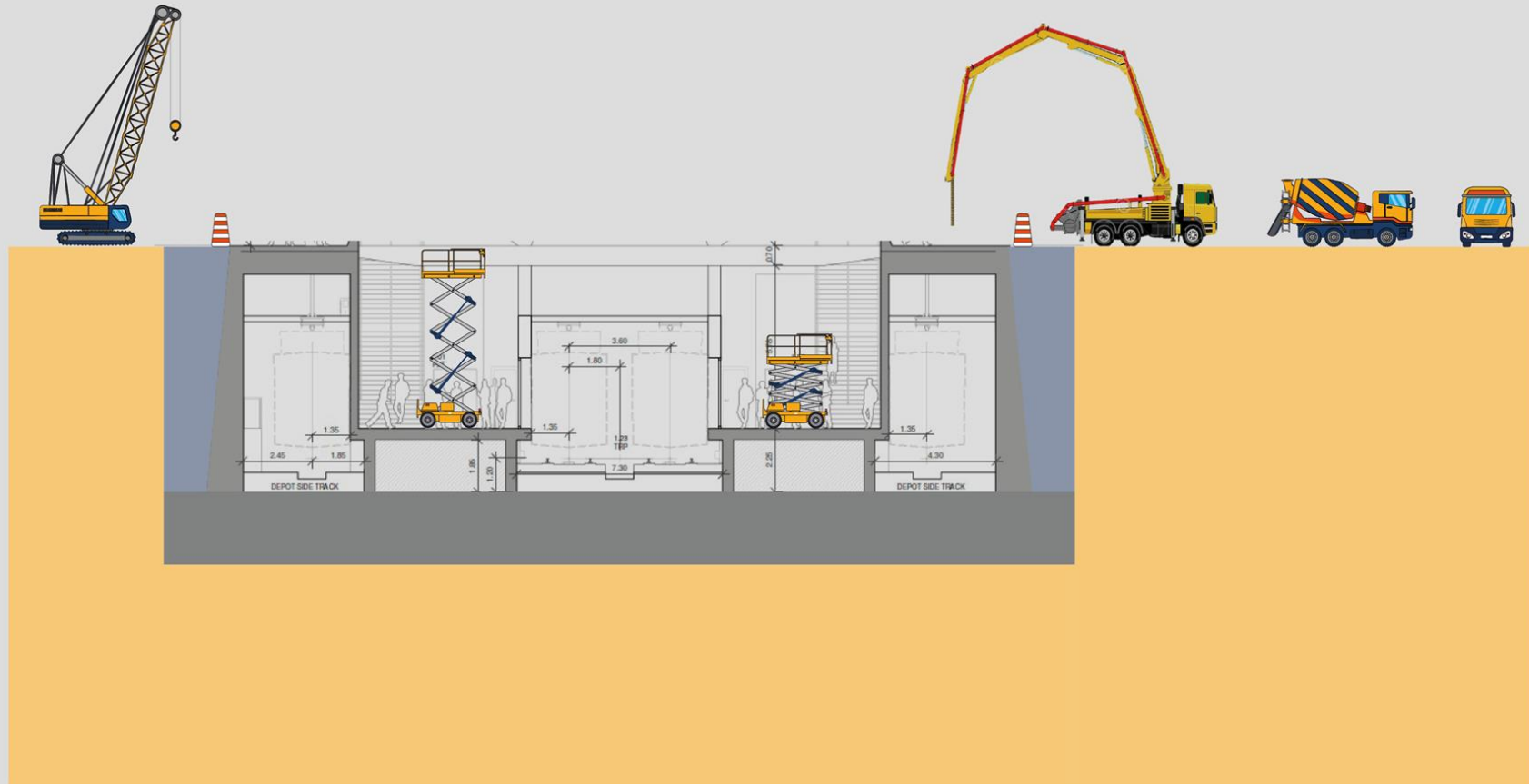


Figure 6-7 Dardistown Station Construction Platforms, Lift Shafts and Stairs

Dardistown Station

Complete roof, MEP & fit-out

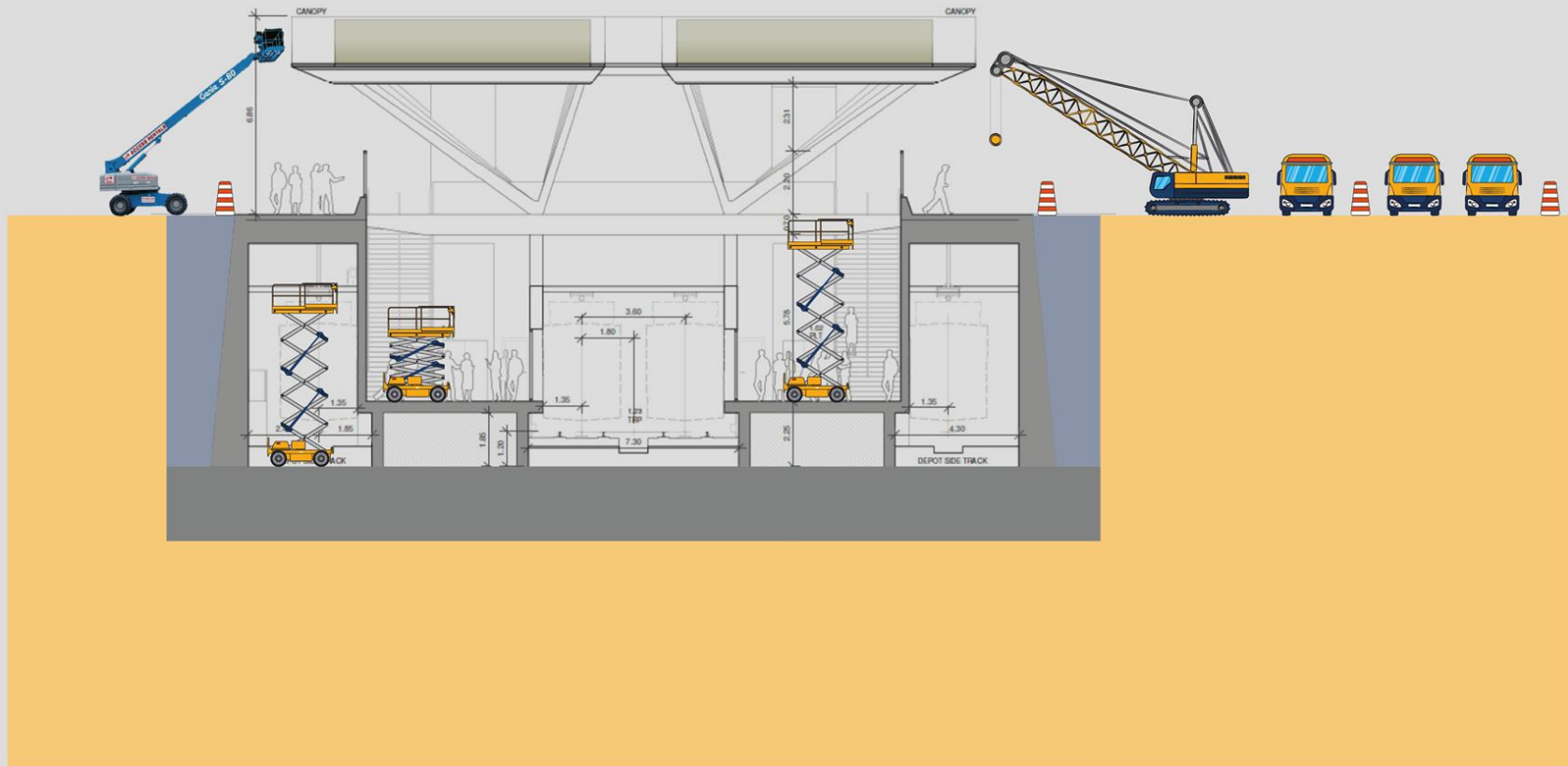


Figure 6-8 Dardistown Station Complete Roof, MEP & Fit-out

S3 Construction Sequence

1. Lift 1 excavation
2. Lift 1 soil nailing & shotcrete (3 vertical rows x 8m long)
3. Lift 2 excavation
4. Lift 2 soil nailing & shotcrete
5. Lift 3 excavation
6. Lift 3 soil nailing & shotcrete
7. Base slab blinding & waterproofing
8. Cast base slab (2.5m deep x 32.4m x 65m), including rebar and formwork
9. Retaining walls
10. Track slabs
11. Backfill behind retaining walls
12. Platforms (assuming PCC components)
13. Lift shafts and elevators
14. Install stairs
15. Construct internal walls and slabs, structural works
16. Architectural Finishes
17. Site clearance
18. Site reinstatement and landscaping

Dardistown Station
 Typical Long Section – Station Box

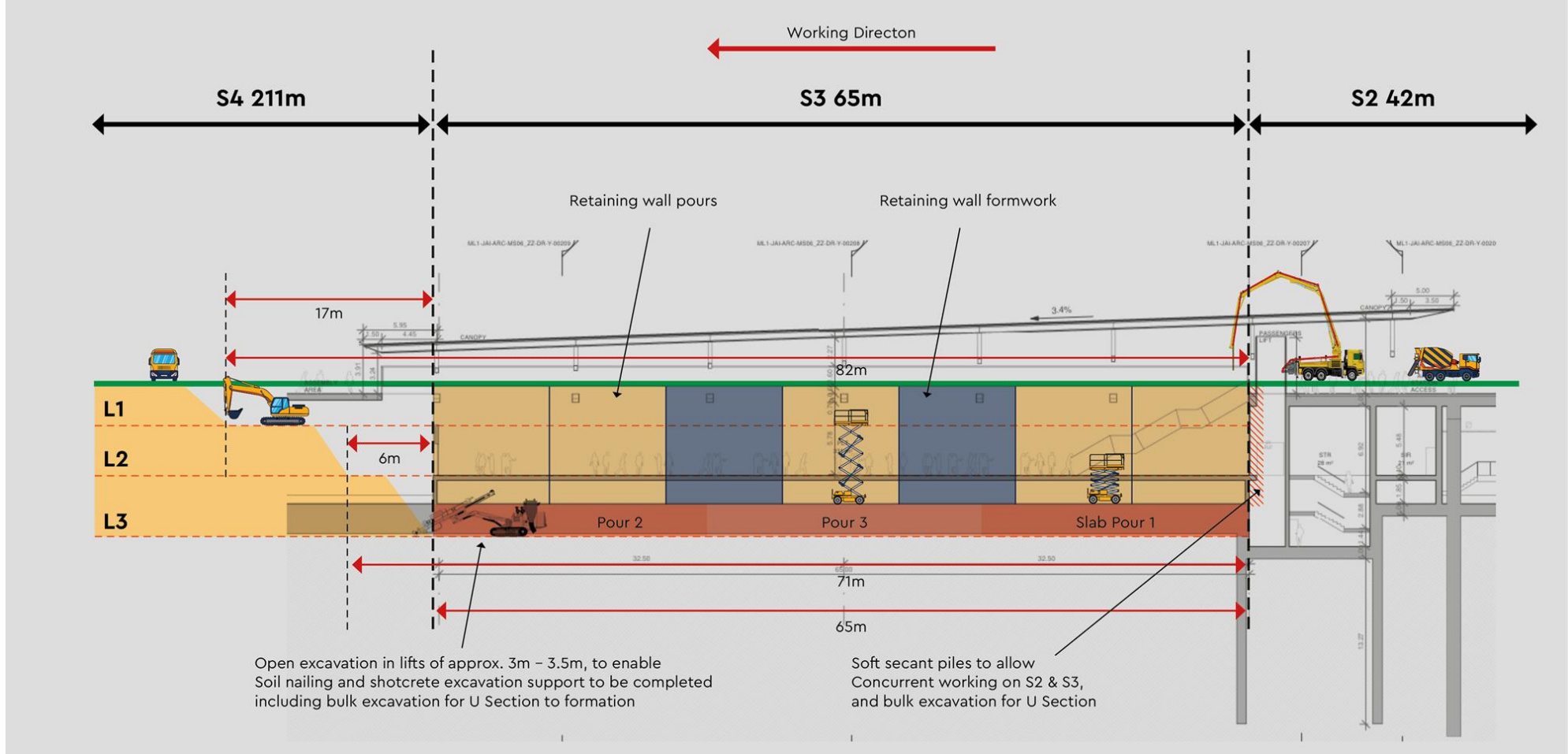


Figure 6-9 Dardistown Station - Station Box Construction

Dardistown Station

Typical Cross Section – Open Cut – U Section

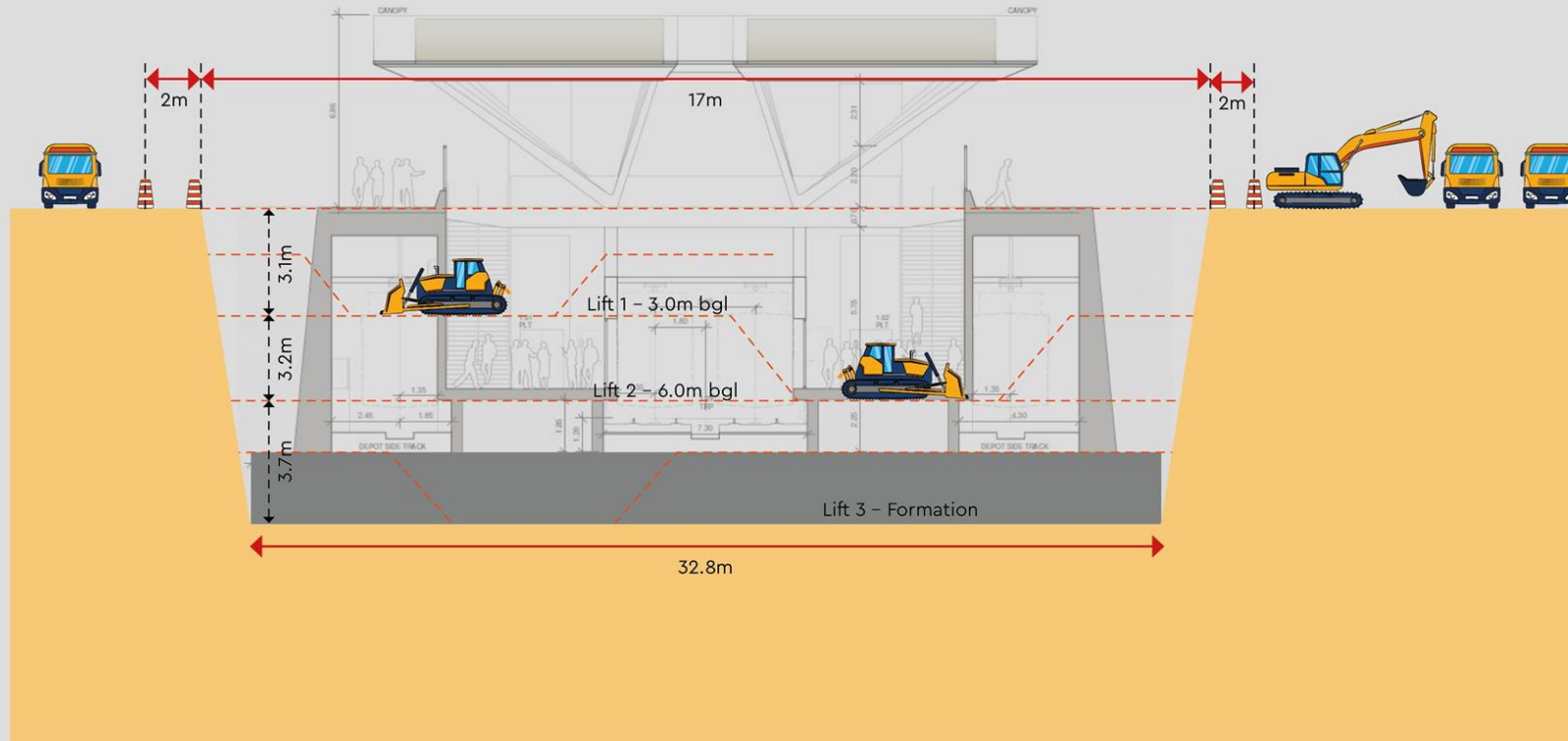


Figure 6-10 Dardistown Station Structure S3 Construction Sequence

Dardistown Station

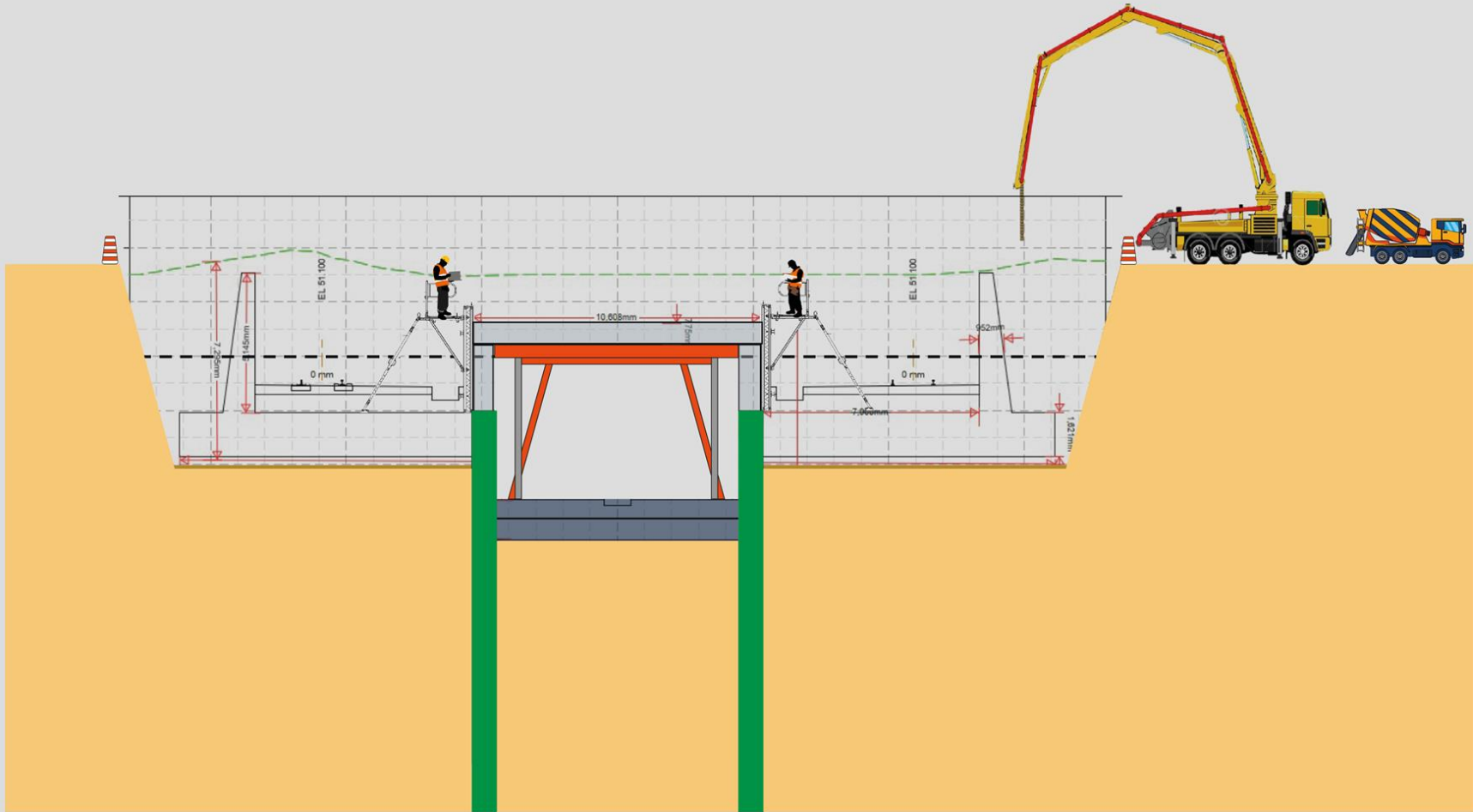


Figure 6-11 Dardistown Station - 4 Track U Section Construction Sequencing

Construction Sequence – Structure S7

1. Construct haul roads
2. Topsoil Strip
3. Construct piling platform & plate test
4. Install guide walls
5. Install 1.2m diameter secant piles
6. Install temp sheet pile support & temporary props
7. Excavate Lift 1 -5m level
8. Cut down piles and install 1.2m sq capping x 132.4m, includes formwork + rebar
9. Excavate Lift 2 -4.2m
10. Cast RC waling beams
11. Cast .8m sq x 6.6m lg x 10No RC struts
12. Install guide rails for to top of waling beams for roof slab falsework
13. Excavate Lift 3 -4.2m
14. Cast RC waling beams
15. Cast .8m sq x 6m lg x 10No RC struts
16. Remove temporary propping
17. Excavate Lift 4 - formation
18. Blinding and waterproofing
19. Cast base slab (9m x 1m x 66.2m) = 596m³, allow for exposing shear key etc
20. Cast track slab
21. Install falsework system, rebar and cast .3m deep x 6.0m x 66.2m RC slab above rail level
22. Install MSS (moving scaffold system) at Lift 1 level and cast .8m deep roof, allow for 12m x 2 running slab forms
23. Cast roof slab includes time allowance for MSS
24. Remove sheet piles
25. Backfill over roof slab
26. Reinstate landscaping

Dardistown Station

Construction Sequence – Area 1

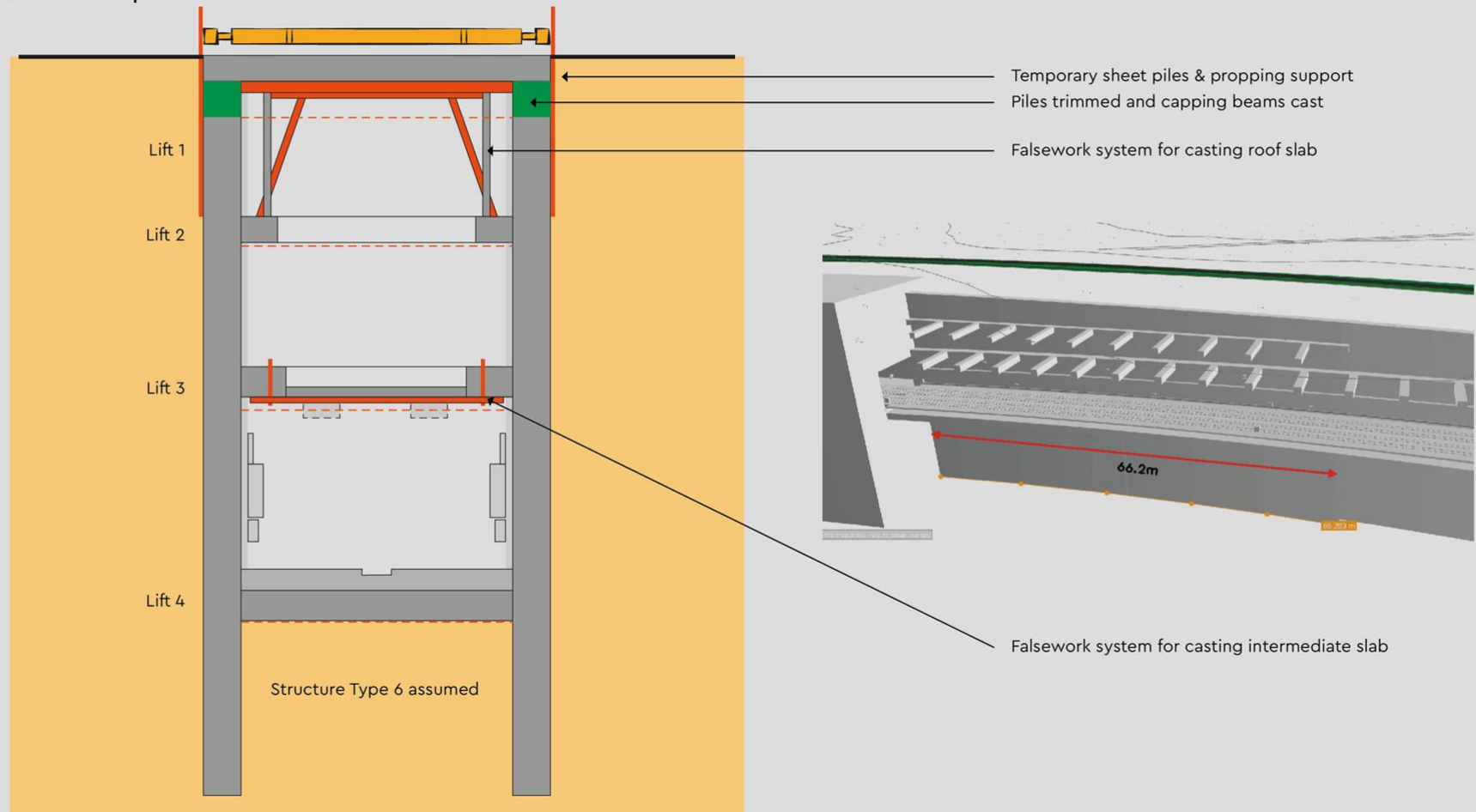


Figure 6-12 Dardistown Station Structure S7 Area 1 Construction Sequence

Construction Sequence – Structure S7

Area 2

1. Install temp sheet pile support & temporary props
2. Excavate Lift 1 -5m
3. Cut down piles and install 1.2m sq capping beams
4. Excavate Lift 2 -4.2m
5. Cast RC waling beams, 1.2m wide x .8m deep
6. Cast .8m sq x 6.0m lg x 18No RC struts
7. Install guide rails for to top of waling beams for roof slab falsework
8. Remove temporary propping
9. Excavate Lift 3 - formation
10. Blinding and waterproofing
11. Cast base slab
12. Cast track slab
13. Install falsework system, rebar and cast .3m deep x 6.0m x 105.8m RC slab above rail level
14. Install MSS (moving scaffold system) at Lift 1 level for roof slab
15. Cast roof slab (1521m² x .8m=1217m³) includes time allowance for MSS
16. Remove sheet piles
17. Pump Station
18. Backfill over roof slab
19. Reinststate landscaping

Dardistown Station

Construction Staging – Overview

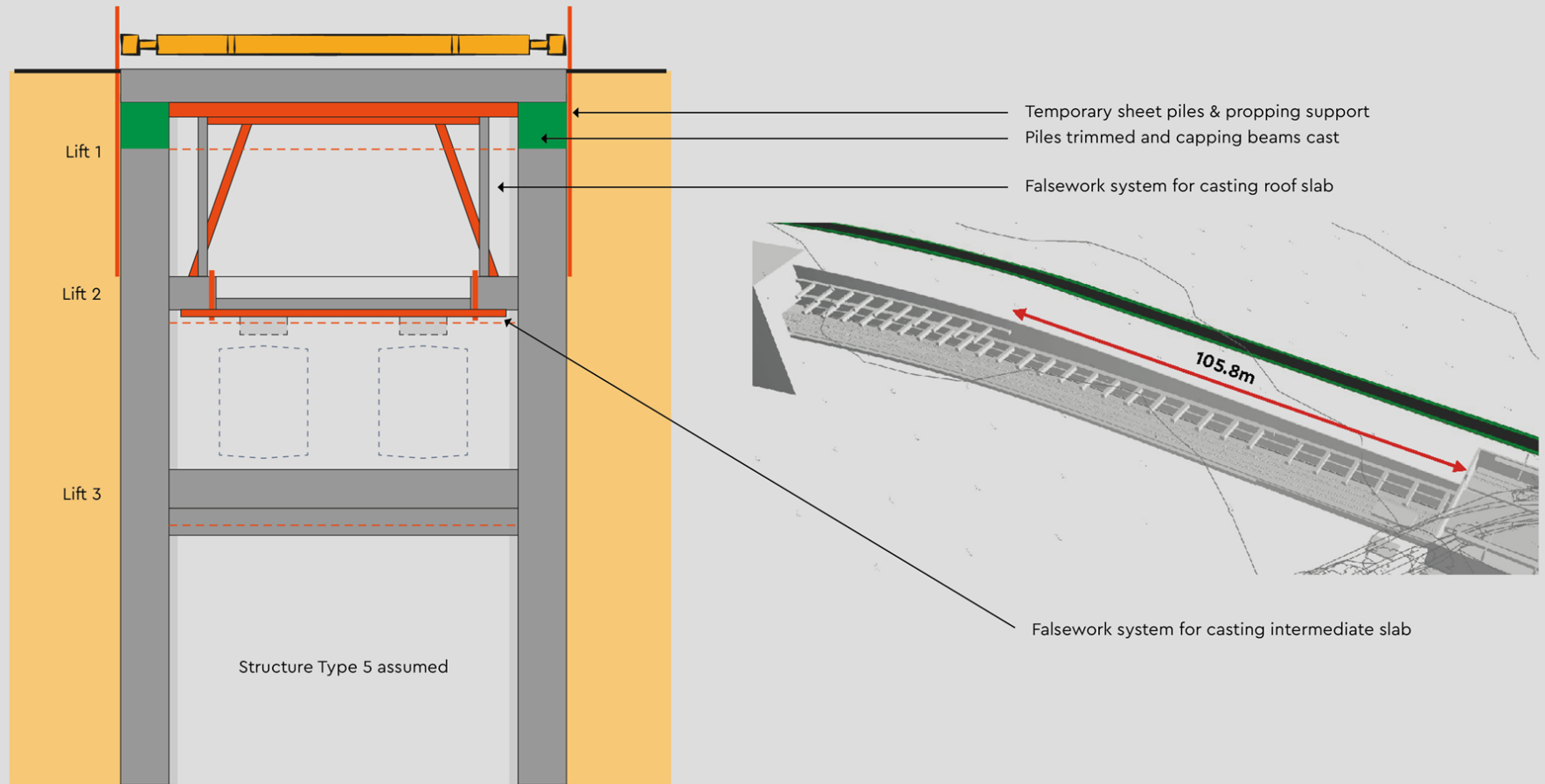


Figure 6-13 Dardistown Station Structure S7 Area 2 Construction Sequence

6.3. Dardistown Depot Construction Sequence

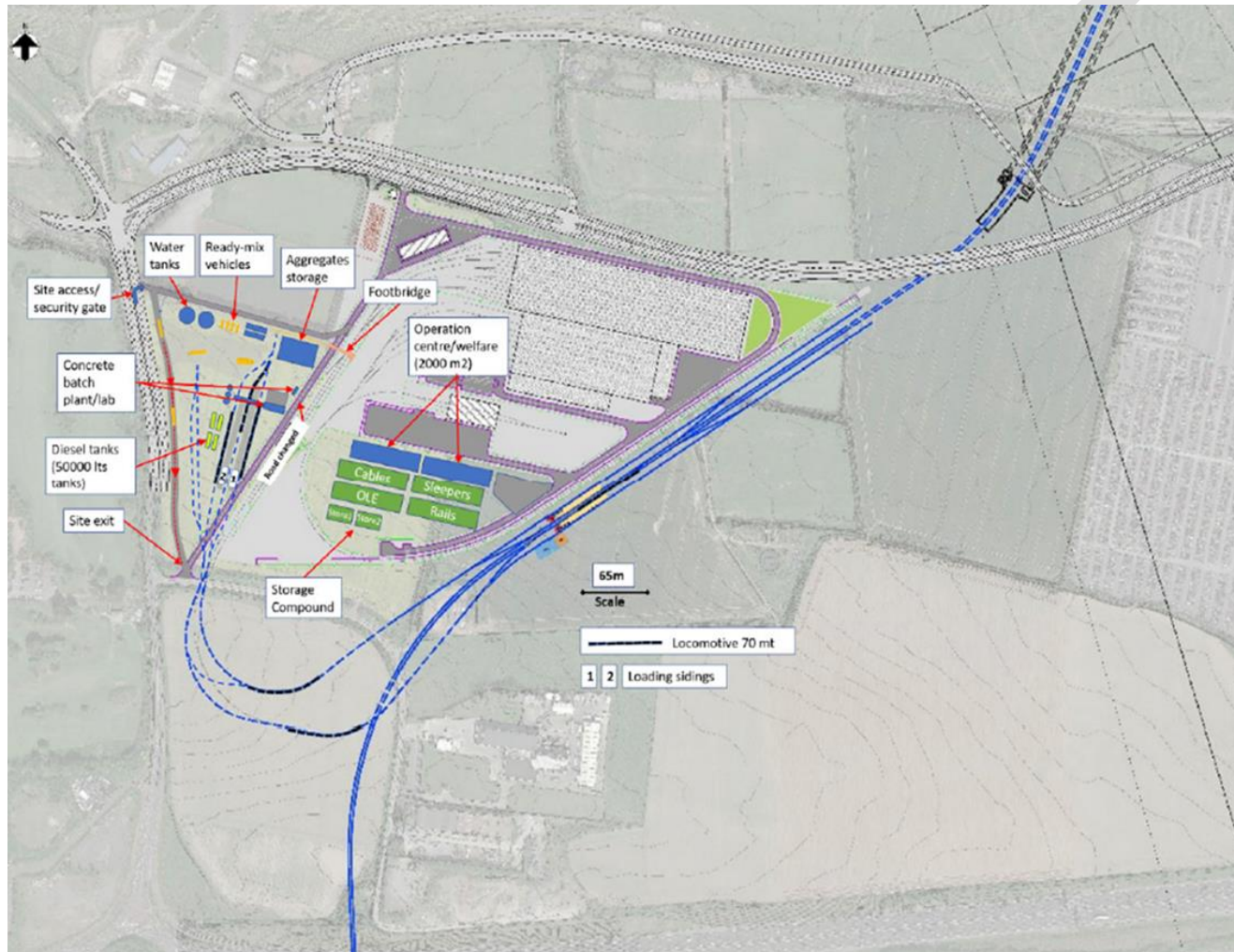


Figure 6-14 Dardistown Depot Site Layout



Figure 6-15 Dardistown Depot - Building Layout

Depot Buildings

Building G – Construction Sequence

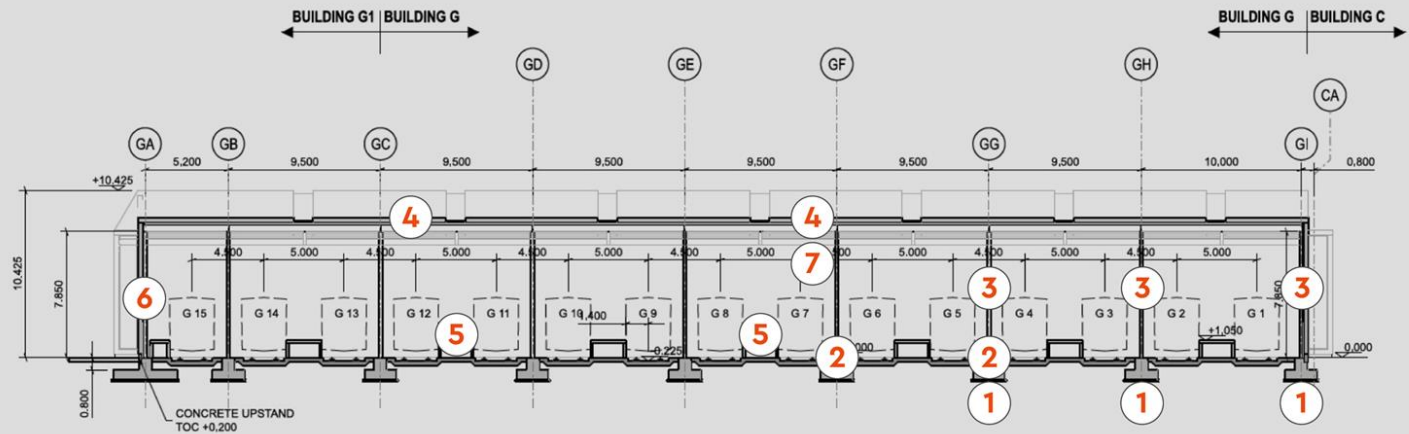


Figure 6-16 Dardistown Depot Building G Construction Sequence – Cross Section

Depot Buildings

Typical Steelwork Erection Sequence

Typical Steelwork Erection Sequence

Stage 1

1. Erect columns (red) along Gridlines GB to GC / G28 to G34 including temporary props along P1 and P2
2. Erect WB members on Grids GB and GC, including rafters
3. Erect cross-bracing (green)
4. Snug tighten all bolts and tension bracing
5. HOLD POINT #1 inspect after 4) is completed
6. Remove prop line P1, P2 prop line remains

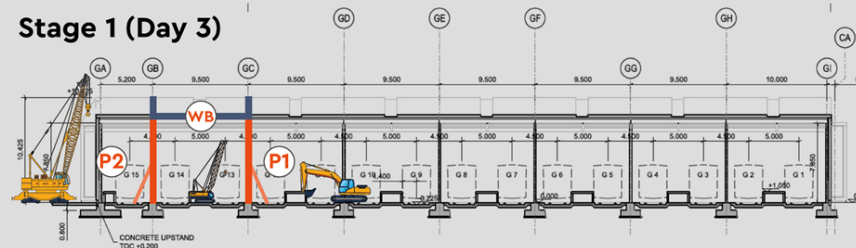
Stage 2

1. Erect columns (red) along Gridlines GD to GE / G28 to G34 including temporary props along P3 and P4
2. Erect WB members on Grids GC to GE, including rafters
3. Erect cross-bracing (green)
4. Snug tighten all bolts and tension bracing
5. HOLD POINT #2 inspect after 4) is completed
6. Remove prop line P2 & P3, P4 prop line remains

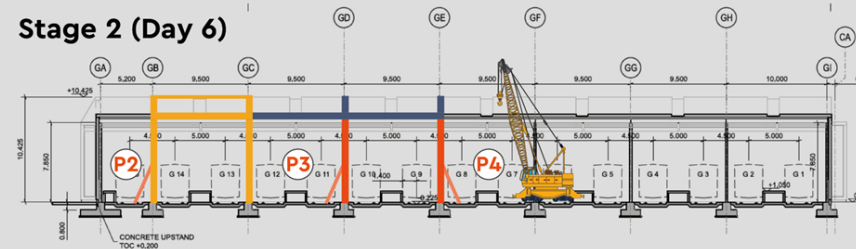
Stage 3

1. Erect columns (red) along Gridlines GF to GG / G28 to G34 including temporary props along P5
2. Erect WB members on Grids GE to GG, including rafters
3. Erect cross-bracing (green)
4. Snug tighten all bolts and tension bracing
5. HOLD POINT #3 inspect after 4) is completed
6. Remove prop line P4, P5 prop line remains
7. Repeat the process and sequence between Grid lines G22 to G28, G22 to G28, G16 to G22, G10 to G16, G04 to G10 and from G01 to G04

Stage 1 (Day 3)



Stage 2 (Day 6)



Stage 3 (Day 9)

(Approx 15 days per shed)

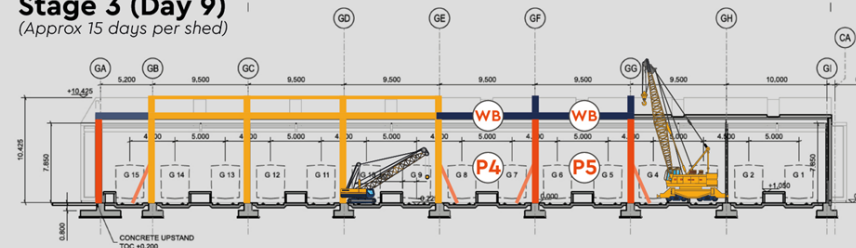


Figure 6-17 Dardistown Depot - Typical Steel Construction

Depot Buildings

Building C – Construction Sequence

Build Sequence

1. Excavate foundations & maintenance pits (140no)
2. Construct foundations/rising walls
3. Stand columns, prop & erect portal steelwork
4. Install roof cladding
5. Construct slab track/swimming pool & maintenance pits including under-slab services
6. Install fire walls & gable cladding
7. Complete MEP & fit-out

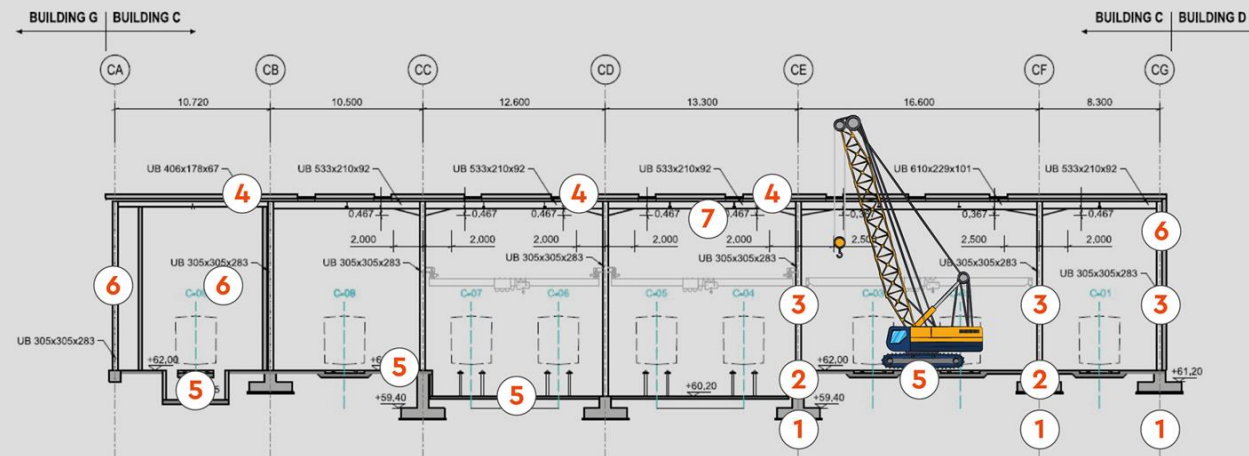


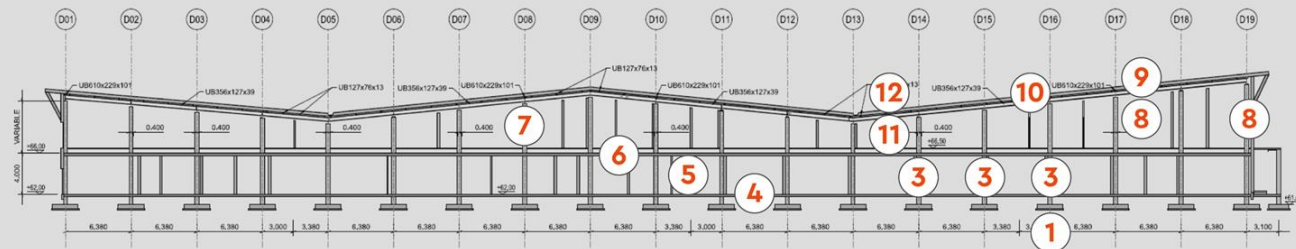
Figure 6-18 Dardistown Depot Building C Construction Sequence

Depot Buildings

Building D – Construction Sequence

Build Sequence

1. Excavate formation and pad foundations
2. Construct rc pad foundations
3. Fix rebar, formwork and cast ground floor RC columns
4. Install blinding, WPM, rebar & cast ground floor slab
5. Construct ground floor internal/concrete external walls
6. Fix formwork, rebar and cast first floor slab
7. Fix rebar, formwork and cast first floor RC columns
8. Construct first floor internal/external walls
9. Install structural steelwork roof members
10. Install ribbed steel sheeting to roof and walls
11. Internal finishes
12. Complete MEP & fit-out



FRAMING SECTIONS, SECTION A-A
SCALE 1:200

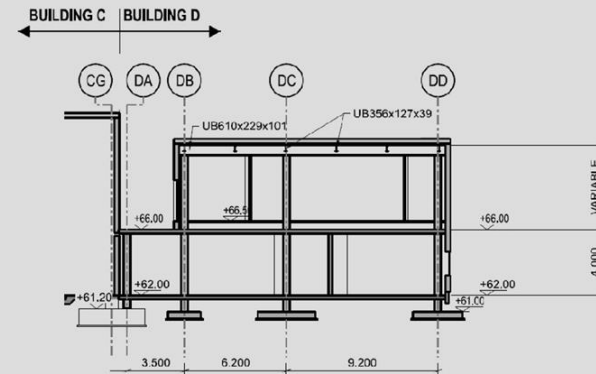


Figure 6-19 Dardistown Depot Building D Construction Sequence

Depot Buildings

Building P – Construction Sequence

Build Sequence

1. Excavate foundations
2. Construct foundations and upstands
3. Construct rc slab including under-slab services
4. Stand columns, prop & erect portal steelwork
5. Install roof cladding
6. Install façade cladding
7. Complete MEP & fit-out

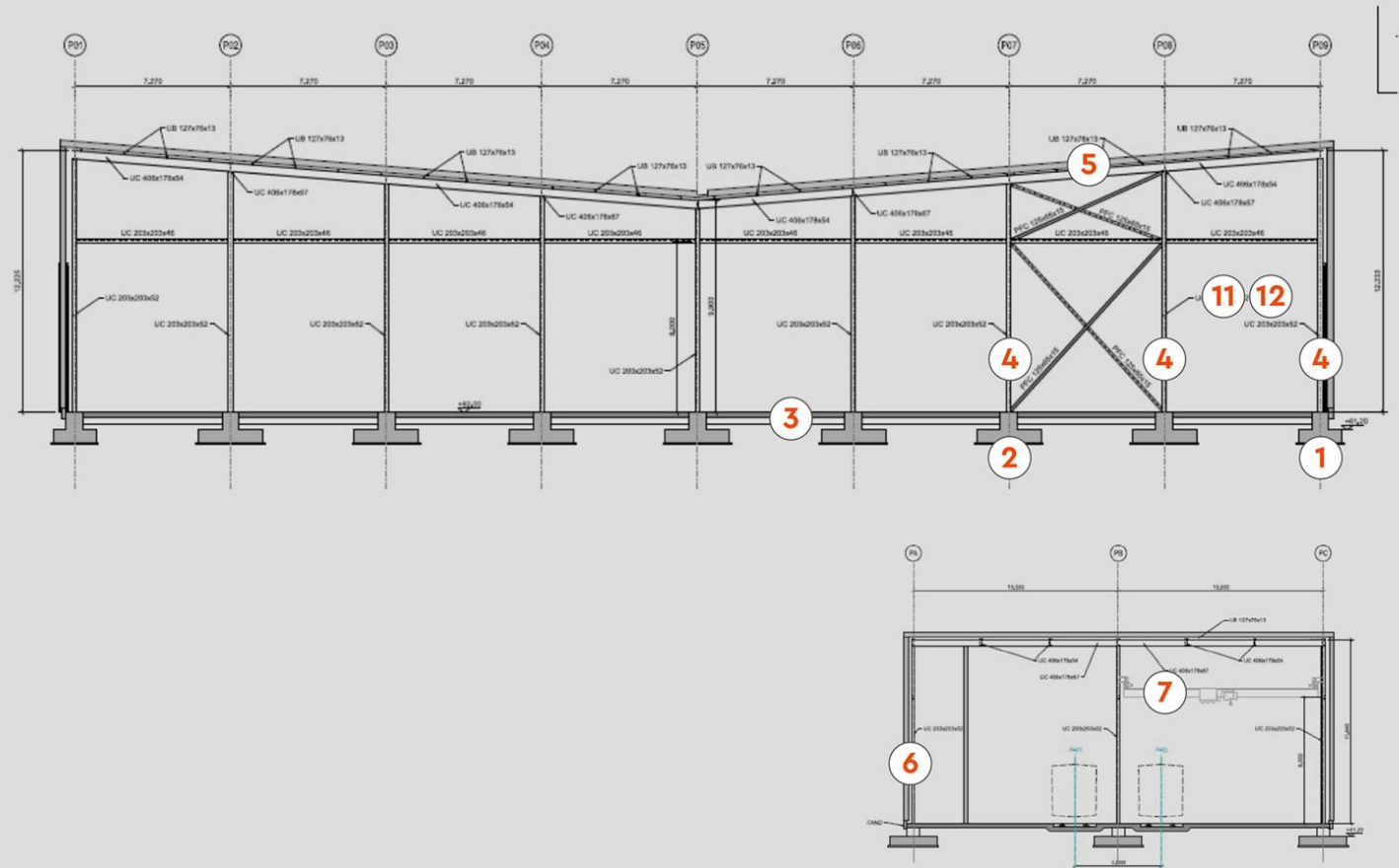


Figure 6-20 Dardistown Depot Building P Construction Sequence

Depot Buildings

Building E – Construction Sequence

Build Sequence

1. Excavate foundations
2. Construct foundations and upstands
3. Construct rc slab including under-slab services
4. Stand columns, prop & erect steelwork frame
5. Install roof cladding
6. Install rc concrete structure with ribbed steel sheeting envelop
7. Complete MEP & fit-out

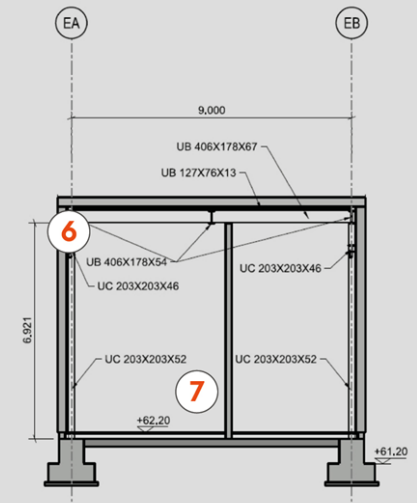
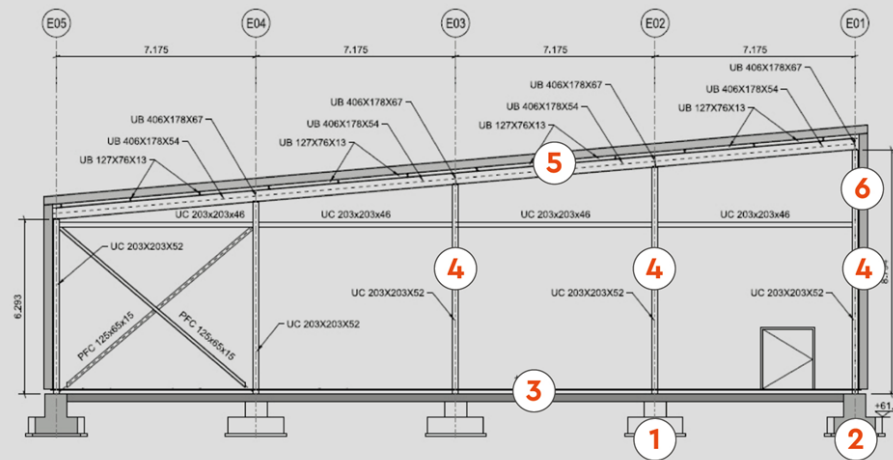


Figure 6-21 Dardistown Depot Building E Construction Sequence

7. M50 Crossing and Approaches

7.1. Overview

The construction of M50 crossing comprises of two abutments either side of the M50, with a reinforced concrete bridge over the motorway. The crossing will be constructed from two compounds which will be supported by adjustment station construction sites.

7.2. Construction Sequence

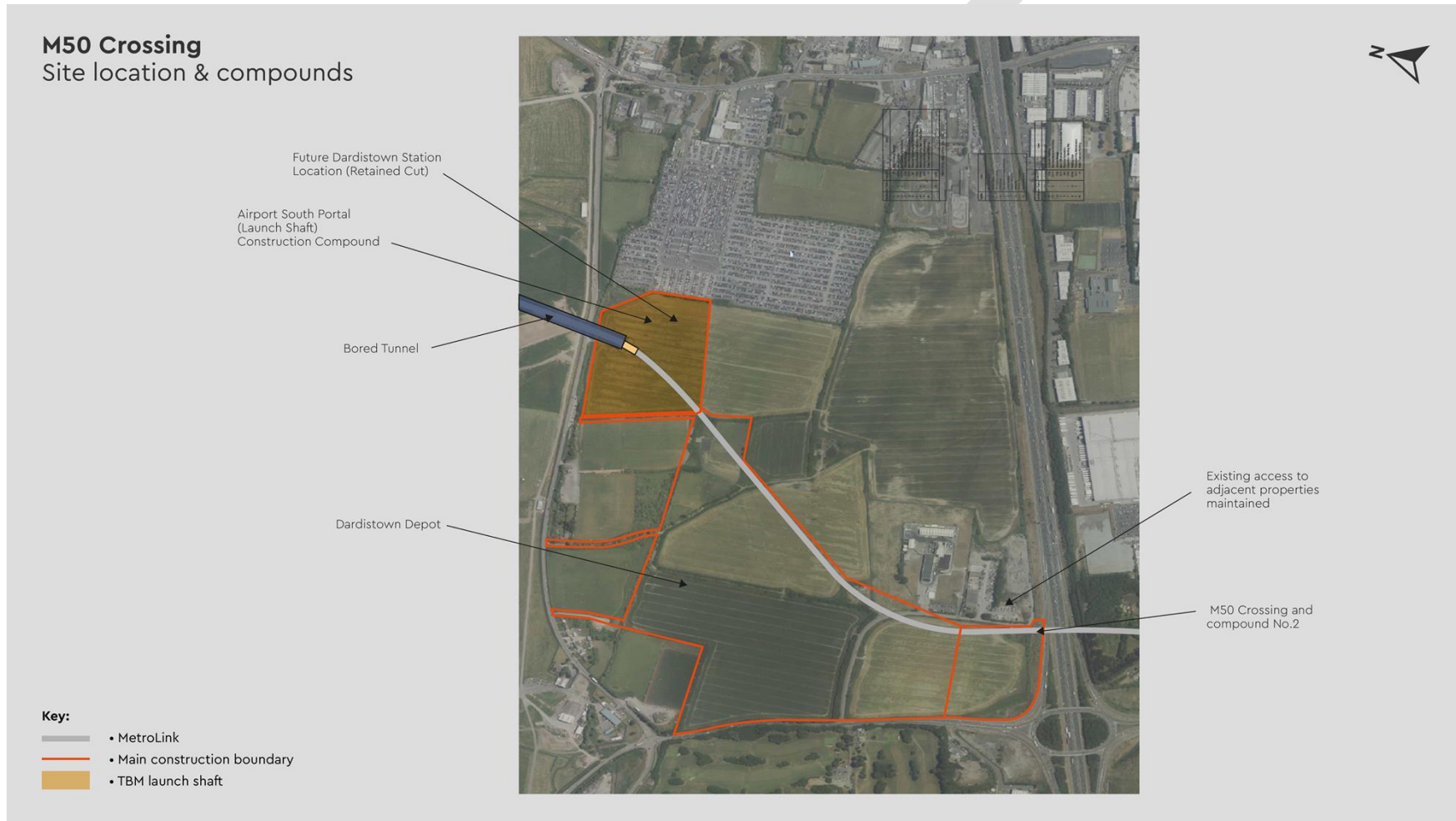


Figure 7-1 Crossing Over the M50 - Site location to the North

M50 Crossing Site location & compounds

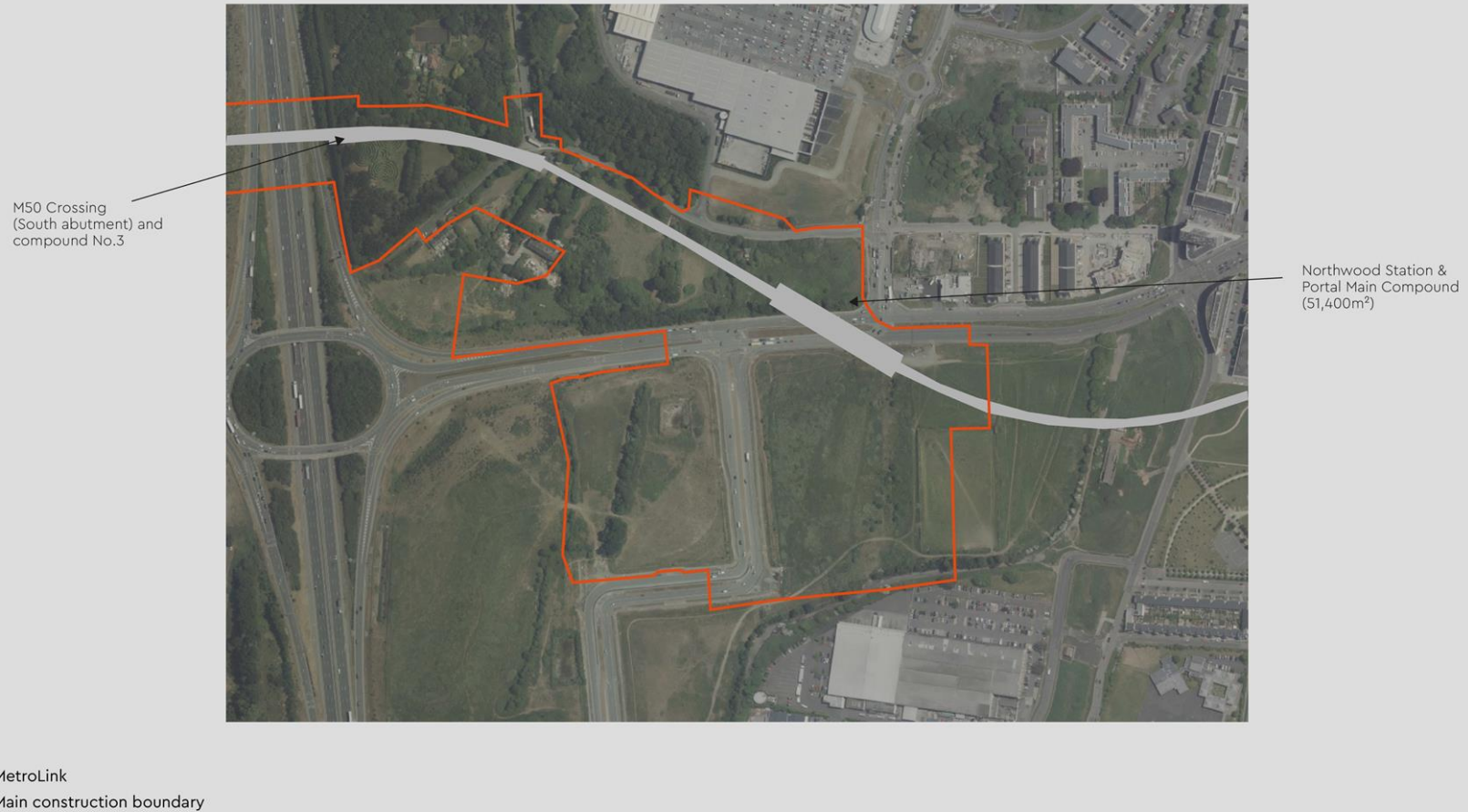


Figure 7-2 Crossing over the M50 - Site locations to the South

M50 Crossing
Bridge beam installation approach

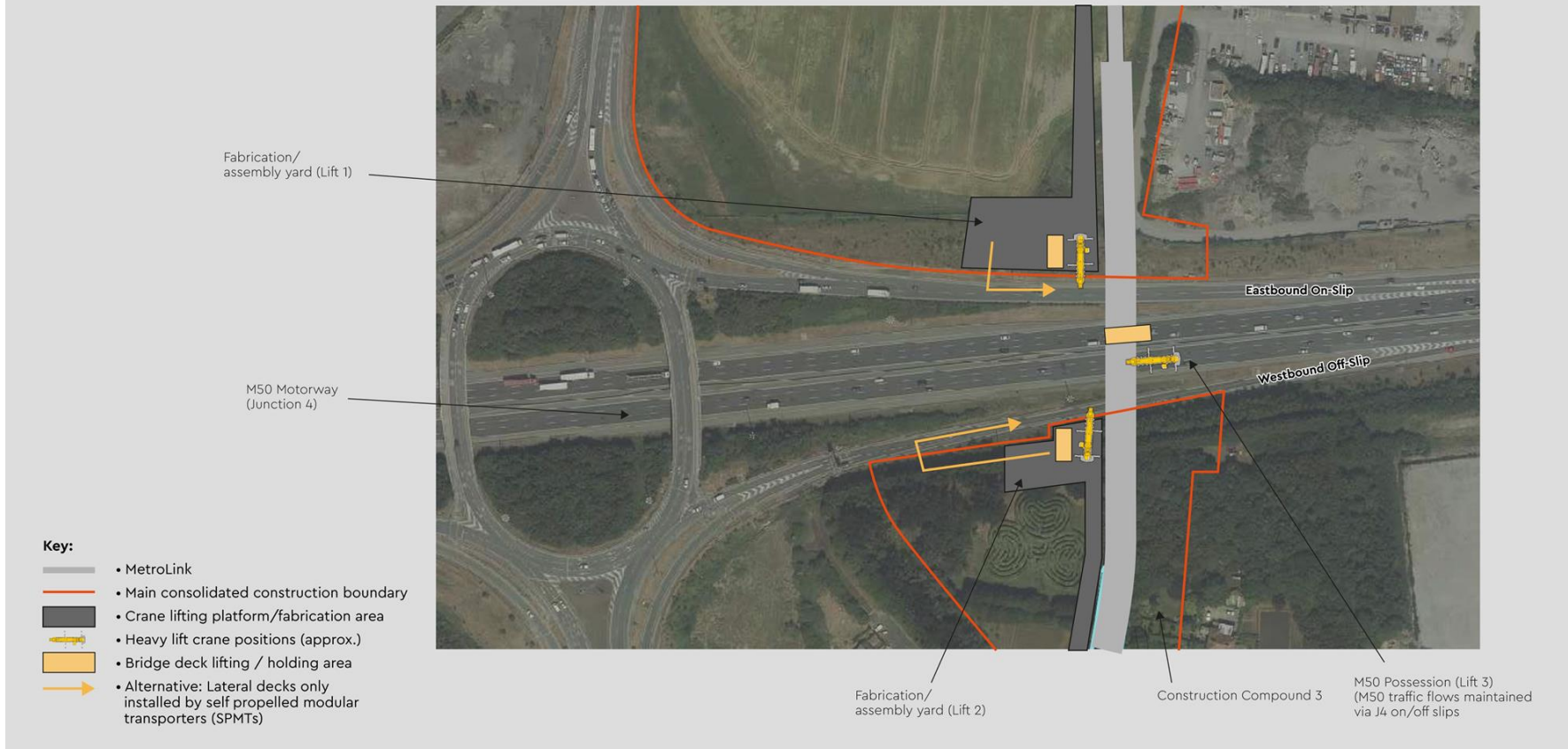


Figure 7-3 Crossing over the M50 - Bridge Beam Installation

Phase 1

1. J4 EB on-slip (1 x lane) occupied for up to 3 months (TTM)
2. M50 hard shoulder + hard strip occupied for up to 3 months (TTM)
3. Construct north & south abutments offline, and north pier
4. J4 EB on-slip - 1 night-time possession for steel bridge deck, and 1 night-time possession for PCC deck panels/edge protection

Phase 2

1. M50 hard shoulder + hard strip occupied for up to 3 months (TTM)
2. Construct south pier
3. J4 WB off-slip - 1 night-time possession for steel bridge deck, and 1 night-time possession for PCC deck panels/edge protection

Phase 3

1. **Scenario 1** - M50 running lanes; 1 night-time possession for steel bridge deck, and 1 separate night-time possession for PCC deck panels/edge protection (welding done offline)
2. **Scenario 2** - M50 running lanes; 2 night weekend possession for steel box girder, PCC deck panels/edge protection

Phase 4

1. Complete cast in-situ concrete topping -
2. M50 running lanes; Additional 1 x night-time possession to install OLE masts, and remove protective bridge soffit netting

Key:

-  • Steel box girder
-  • PCC Deck slabs
-  • Bridge handrail
-  • Protective netting

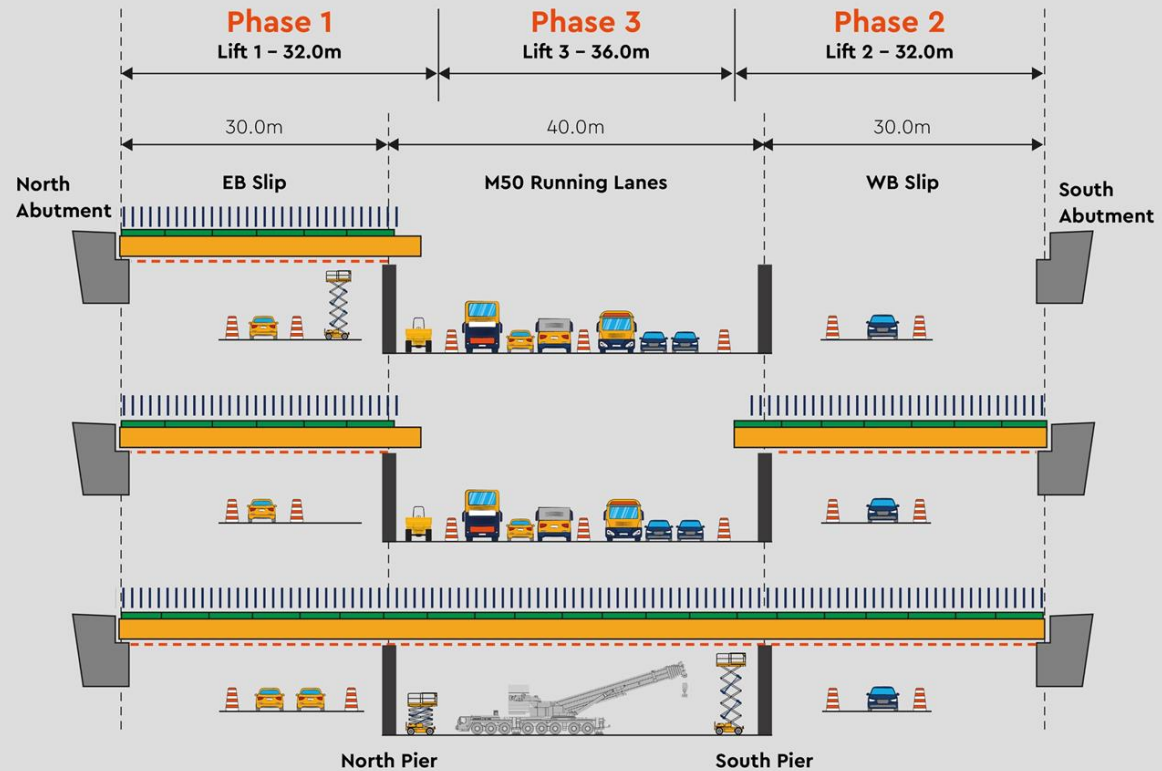
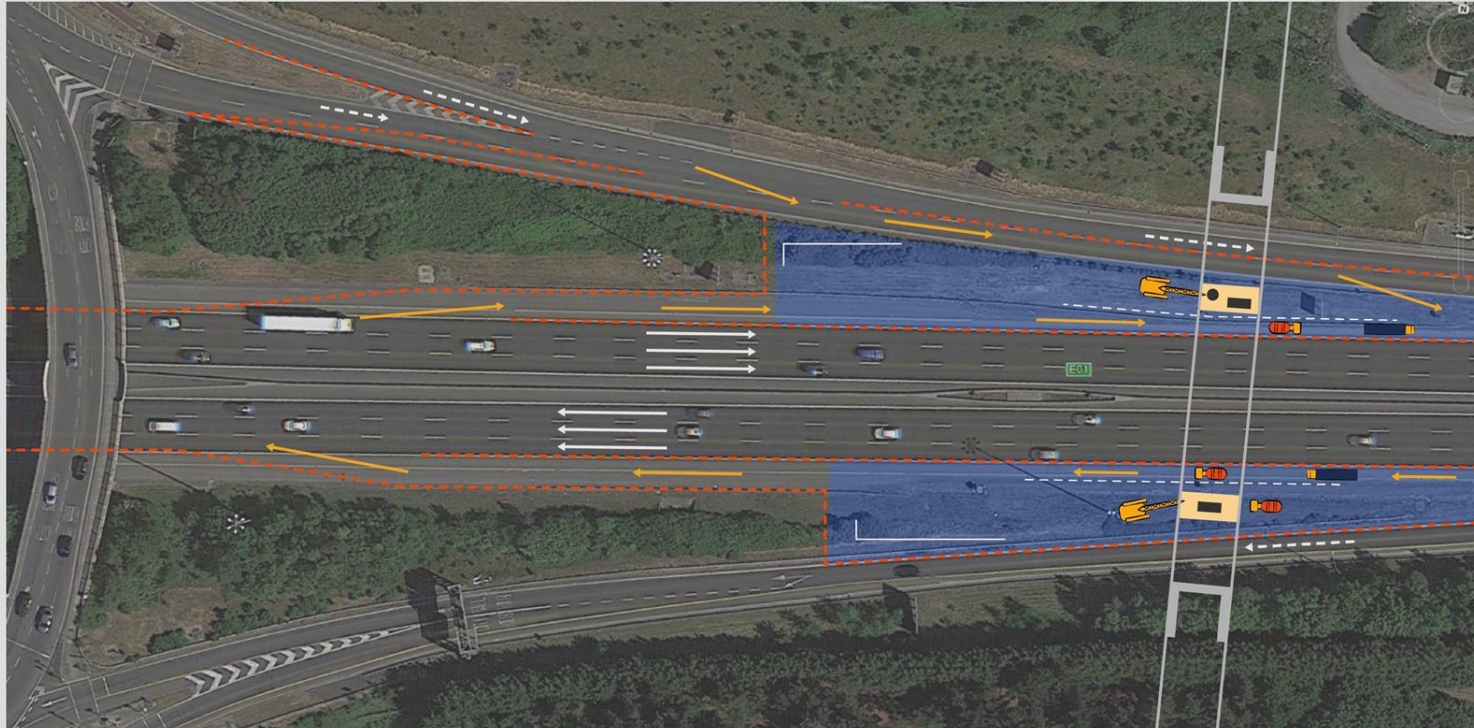


Figure 7-4 Crossing Over the M50 - Phases

M50 Traffic Management Scheme



- Key:**
- - - - • Vehicle restraint barrier/site fencing
 - M50 running lanes
 - M50 on/off slip lanes
 - • Construction traffic
 - Construction works/laydown area

Note : Final traffic management scheme to be designed by TTM Designer, and approved by Road Authority as per Chapter 8

Figure 7-5 Crossing Over the M50 - TTM in Plan

Phase 1

Activity	Highway Impacts	Length of diversion	Duration
North pier foundations/pile cap & pier.	Temporary closure of 1x lane of J4 EB on-slip. Temporary closure of M50 EB hard shoulder and hard strip. M50 running lanes maintained.	<500m approx.	Up to 3 months
Installation of North span (Bridge Lift 1)	2 x night-time possessions	Temporary diversions in place for approaches to M50 J4	Friday 22.00hrs – 6.00am x 2

Phase 2

South pier foundations/pile cap & pier.	Temporary closure of M50 WB hard shoulder and hard strip. M50 running lanes maintained.	<1200m approx.	Up to 3 months
Installation of Bridge Lift 2	2 x night-time possessions	Temporary diversions in place for approaches to M50 J4	Friday 22.00hrs – 6.00am x 2

Phase 3

Installation of Bridge Lift 3	Temporary closure of M50 WB and EB running lanes. Temporary diversion of M50 traffic flows maintained via EB on-slips and WB off-slips during possession only.	<1200m approx.	<p>Scenario 1 - 1 x night-time possession for steel bridge deck, and 1 separate night-time possession for PCC deck panels/edge protection (NB welding undertaken offline to carriageway)</p> <p>Scenario 2 - 2 - night weekend possession for both steel box girder, PCC deck panels / edge protection.</p>
-------------------------------	--	----------------	---

Phase 4

Complete cast in-situ concrete topping. Install OLE masts, and remove protective bridge soffit netting	M50 running lanes; 1 x night-time possession. Temporary diversions in place for approaches to M50 J4		Friday 22.00hrs – 6.00am x 1
--	--	--	------------------------------

8. Deep Stations/Structures: Northwood to Charlemont

8.1. Overview

From the Northwood to Charlemont Station the route is in within a TBM bored tunnel. The TBM will be launched from the Northwood Portal and be driven south and will be buried past Charlemont.

Within the tunnelled section of the route there is 10 deep level station, and at Albert College Shaft an intervention shaft and ventilation tunnel will be mined. These deep stations are either built in a sequence to suit a TMB first or Station first construction scenario, the details of which are outline in section 8.14 below.

TBM First Construction	Station First Construction
Ballymun Station	Northwood Station
Colins Avenue Station	Mater Station
Griffith Park Station	O'Connell Street Station
Glasnevin Station	St Stephen's Green Station
Tara Station	Charlemont Station

8.2. Northwood Station and TBM Portal

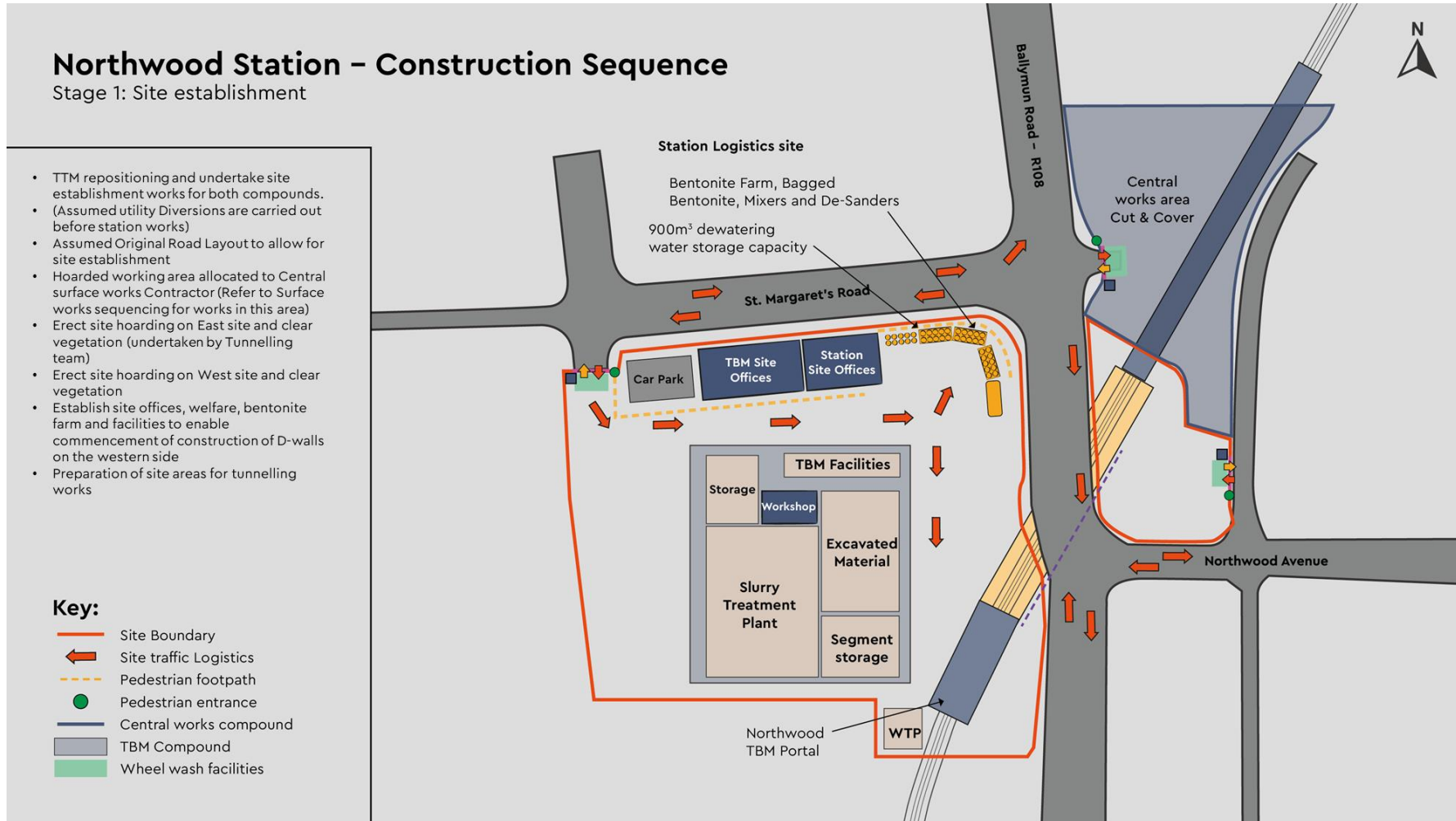














Figure 8-1 Northwood Station and Portal Stage 1 - Site Establishment

Northwood Station – Construction Sequence

Stage 2: Diaphragm & Piling works – Station South

- Commence Diaphragm wall complete for the TBM station box including the southern d-wall.
- Complete temporary traffic diversion works and divert traffic as shown
- Extend Site hoarding to encompass station box under Existing Ballymun Road
- Impact barriers to be installed to protect site boundary from traffic collision.
- Continue D-Wall construction towards south of Station/plunge columns to support played section of roof slab where support required.
- Construction shallow foundations for ventilation adits

Key:

-  Site Boundary
-  Site traffic Logistics
-  Pedestrian footpath
-  Pedestrian entrance
-  Central works compound
-  TBM Compound
-  Wheel wash facilities
-  D-wall Piles
-  Shallow Piles
-  Impact Barriers
-  Temporary Sheet Piles
-  Plunge columns

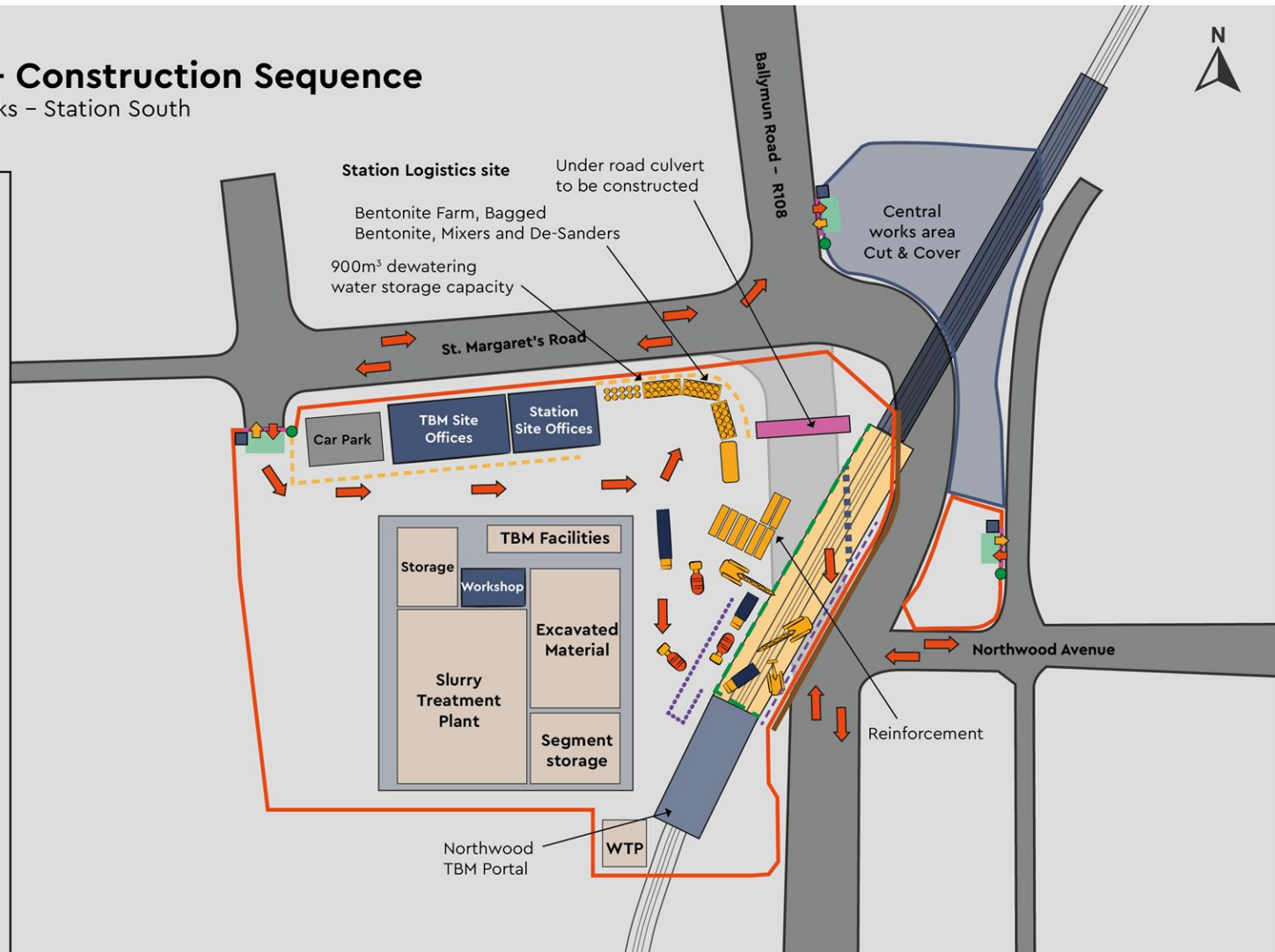


Figure 8-2 Northwood Station and Portal Stage 2 - Diaphragm and Piling Works













Northwood Station – Construction Sequence

Stage 3: Commence station box roof slab construction – South Section

- TBM excavation has commenced and TBM compound running in full capacity.
- Commence construction of Station Roof Slab, including opening for Top Down Construction
- Construct cover slab over the vent shaft roof/passageway
- Construct under road services culvert

Key:

-  Site Boundary
-  Site traffic Logistics
-  Pedestrian footpath
-  Pedestrian entrance
-  Central works compound
-  TBM Compound
-  Wheel wash facilities
-  Temporary Sheet Piles
-  Cast Station Box Roof Slab
-  Voids in roof slab for top down construction

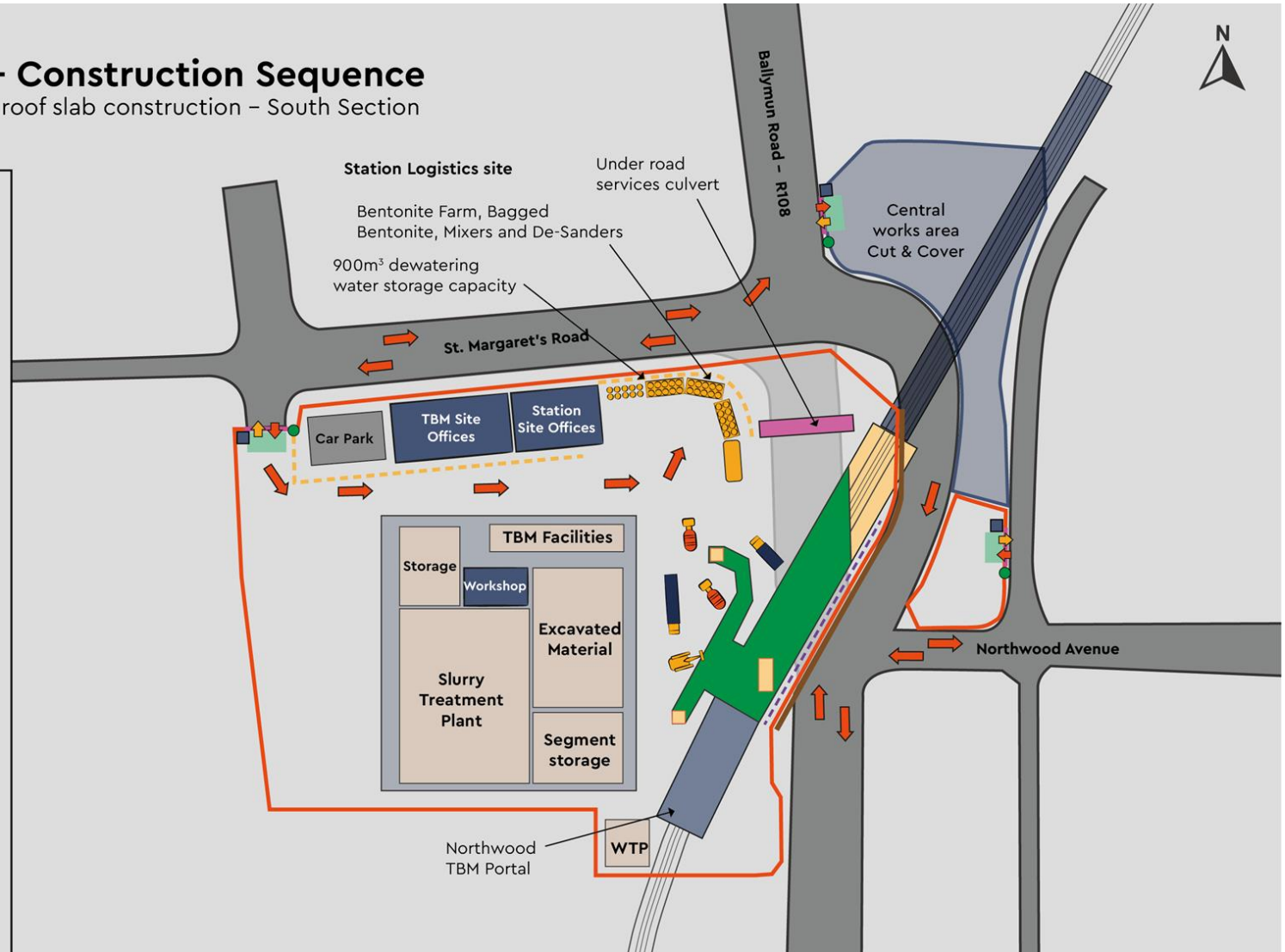











Figure 8-3 Northwood Station and Portal Stage 3 - Commence Station Box Roof Construction

Northwood Station – Construction Sequence

Stage 4: TTM realignment to be undertaken and piling works for NE side of station box

- (Assumed utility Diversions are carried out before station works commence)
- Traffic to be diverted over the station roof so construction works can start on the NE side of the compound.
- Adjust Hoarding as necessary to both East and West sites
- Establish & connect services (inc bentonite ducts) from the main compound in the under road culvert for the commencement of construction of D-walls
- Commence Excavation of Top-Down Station on South side of station box.

Key:

-  Site Boundary
-  Site traffic Logistics
-  Pedestrian footpath
-  Pedestrian entrance
-  Central works compound
-  TBM Compound
-  Wheel wash facilities
-  Station Box Roof Slab
-  Voids in roof slab for top down construction

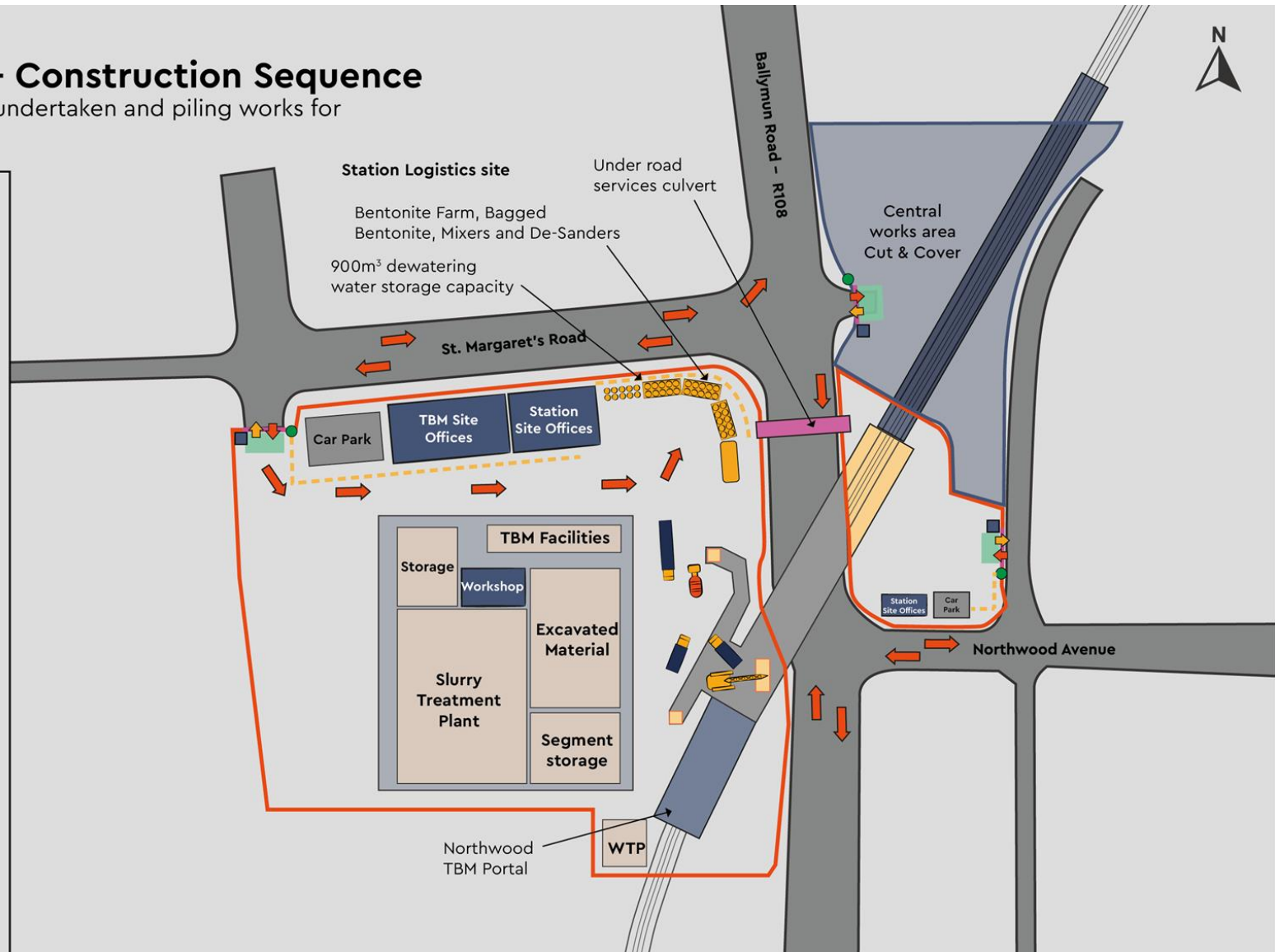











Figure 8-4 Northwood Station and Portal TTM Realignment

Northwood Station – Construction Sequence

Stage 5: Diaphragm walling, piling and pour roof slab of the NE section of the compound whilst continuing with top down construction on the south side

- Commence construction of construction of D-walls
- Continue Excavation of Top-Down Station on south side of station box.
- TBM Works to continue

Key:

-  Site Boundary
-  Site traffic Logistics
-  Pedestrian footpath
-  Pedestrian entrance
-  Central works compound
-  TBM Compound
-  Wheel wash facilities
-  Station Box Roof Slab
-  Voids in roof slab for top down construction

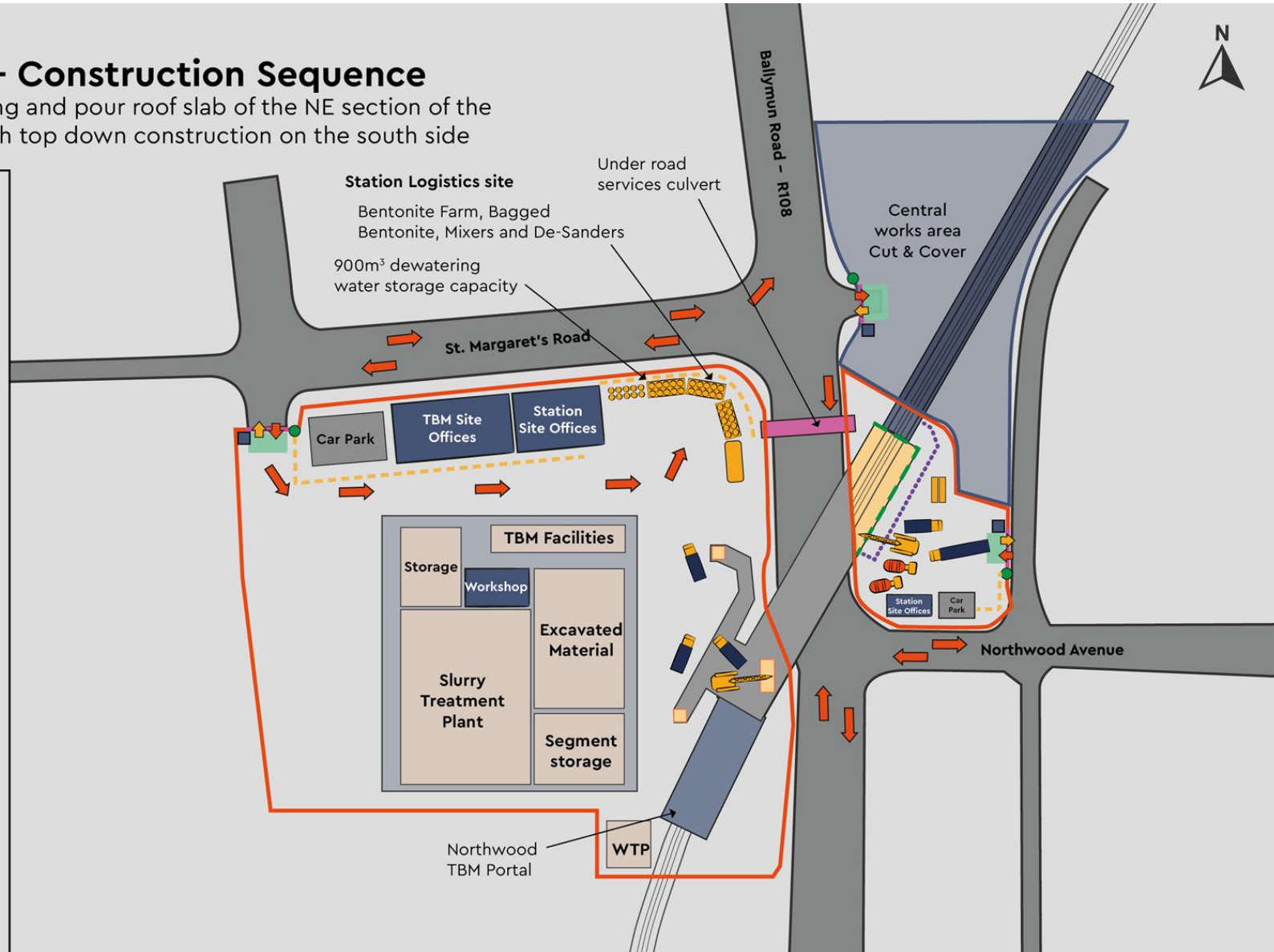


Figure 8-5 Northwood Station and Portal Stage 5- Diaphragm Walling

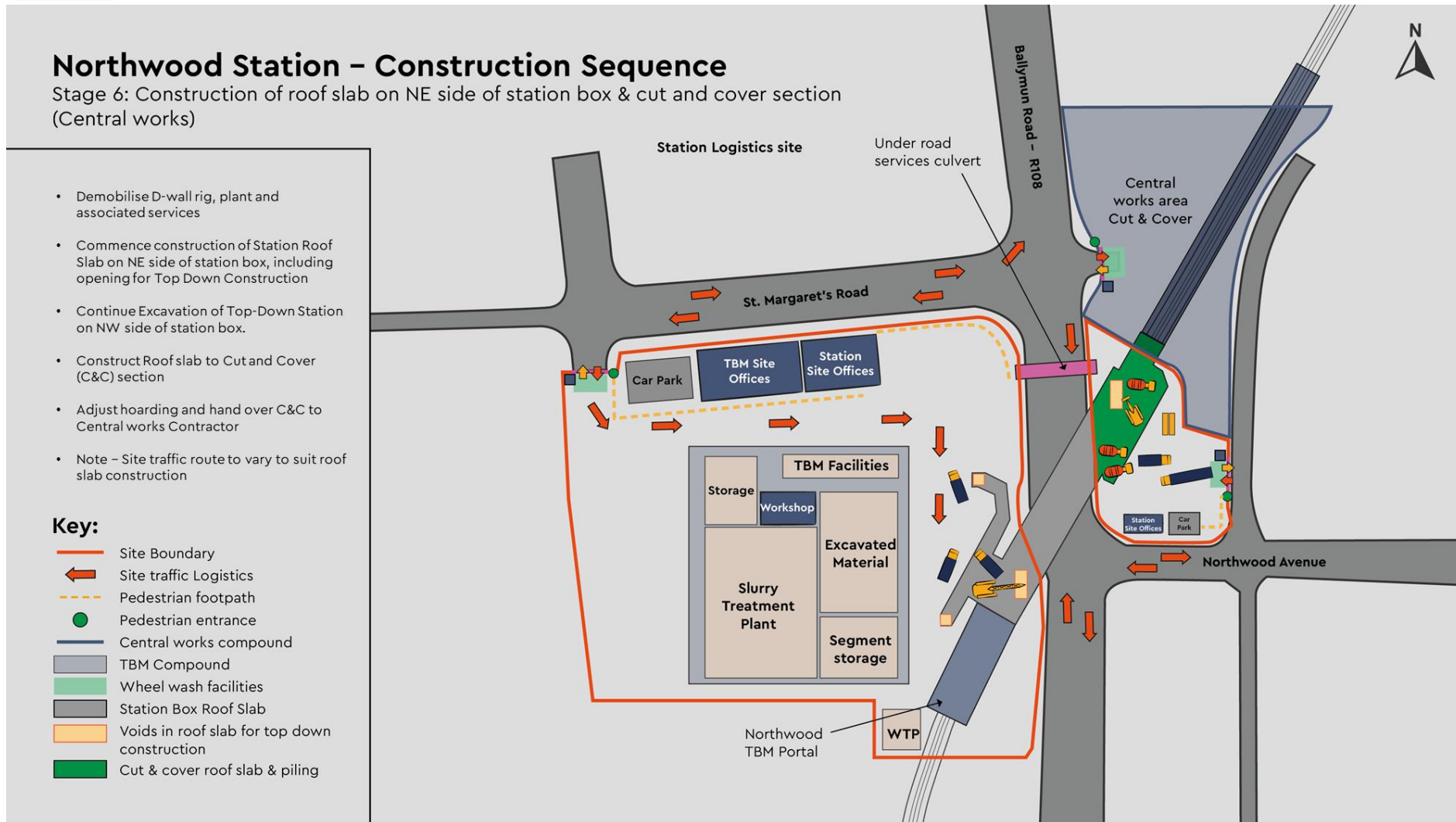


Figure 8-6 Northwood Station and Portal Stage 6 - Construction of Roof Slab

Northwood Station – Construction Sequence

Stage 7: Allow excavation of station box and station box fit out on both South & NE sections.

- Continue construction of Station Roof Slab on NE side of station box
- Continue Excavation of Top-Down Station on south side of station box
- Undertake station box fit out works

Key:

- Site Boundary
- ← Site traffic Logistics
- - - Pedestrian footpath
- Pedestrian entrance
- Central works compound
- ▭ TBM Compound
- ▭ Wheel wash facilities
- ▭ Station Box Roof Slab
- ▭ Voids in roof slab for top down construction

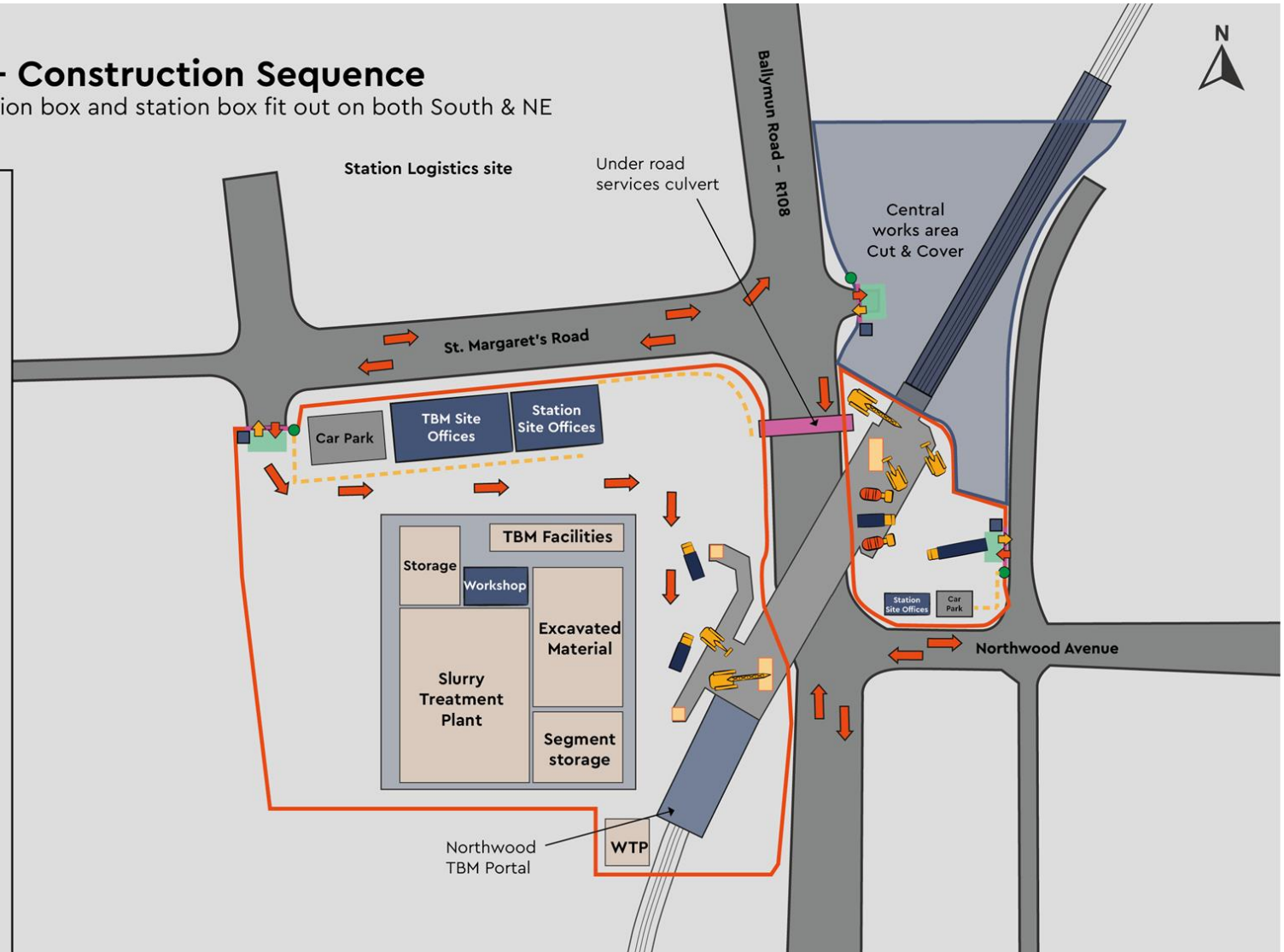











Figure 8-7 Northwood Station and Portal Stage 7 - Excavation of Station Box

Northwood Station – Construction Sequence

Stage 7: Allow excavation of station box and station box fit out on both South & NE sections.

- Continue construction of Station Roof Slab on NE side of station box
- Continue Excavation of Top-Down Station on south side of station box
- Undertake station box fit out works

Key:

-  Site Boundary
-  Site traffic Logistics
-  Pedestrian footpath
-  Pedestrian entrance
-  Central works compound
-  TBM Compound
-  Wheel wash facilities
-  Station Box Roof Slab
-  Voids in roof slab for top down construction

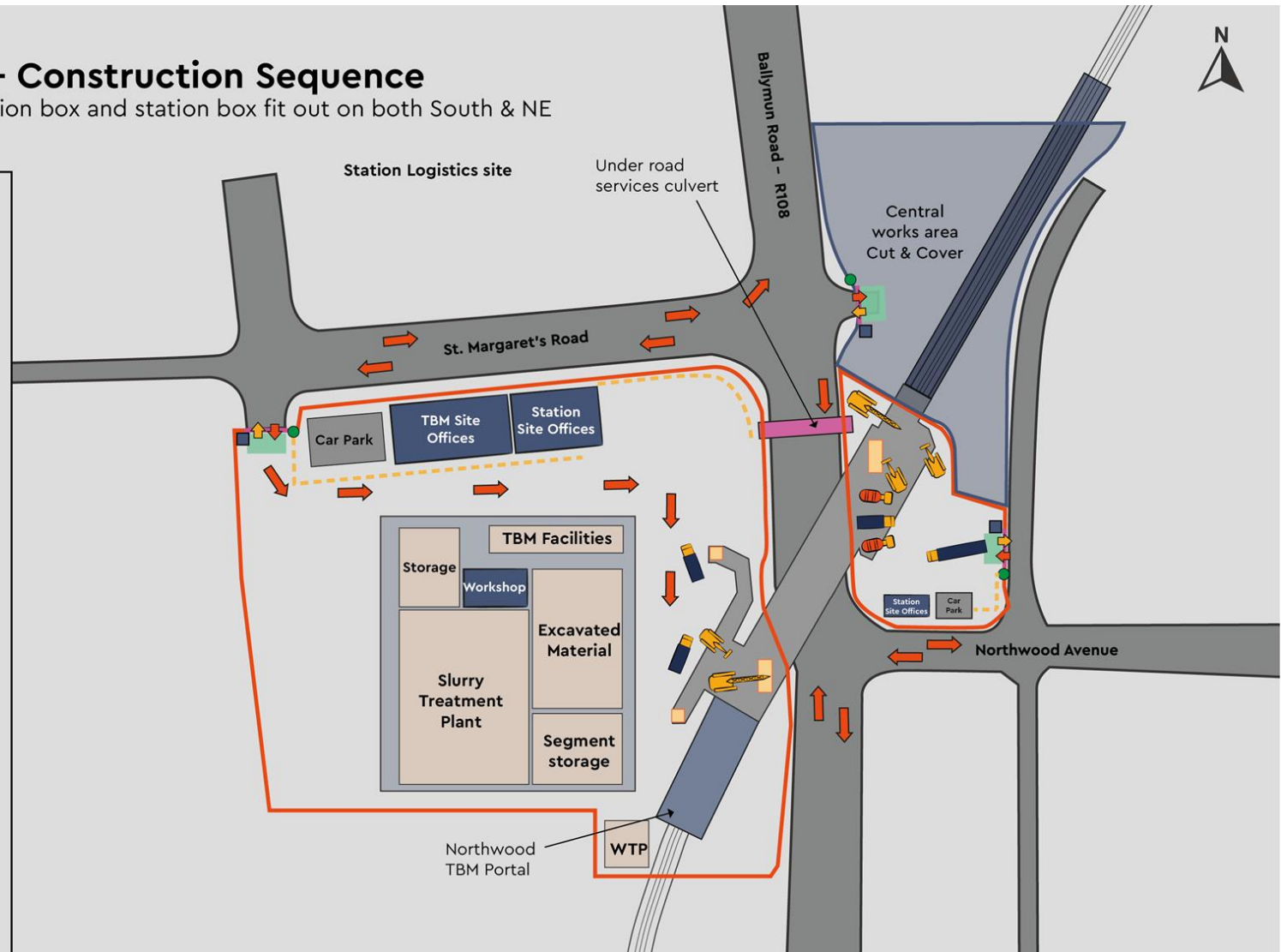


Figure 8-8 Northwood Station and Portal Stage 8 - Handover of TTM

8.3. Ballymun Station

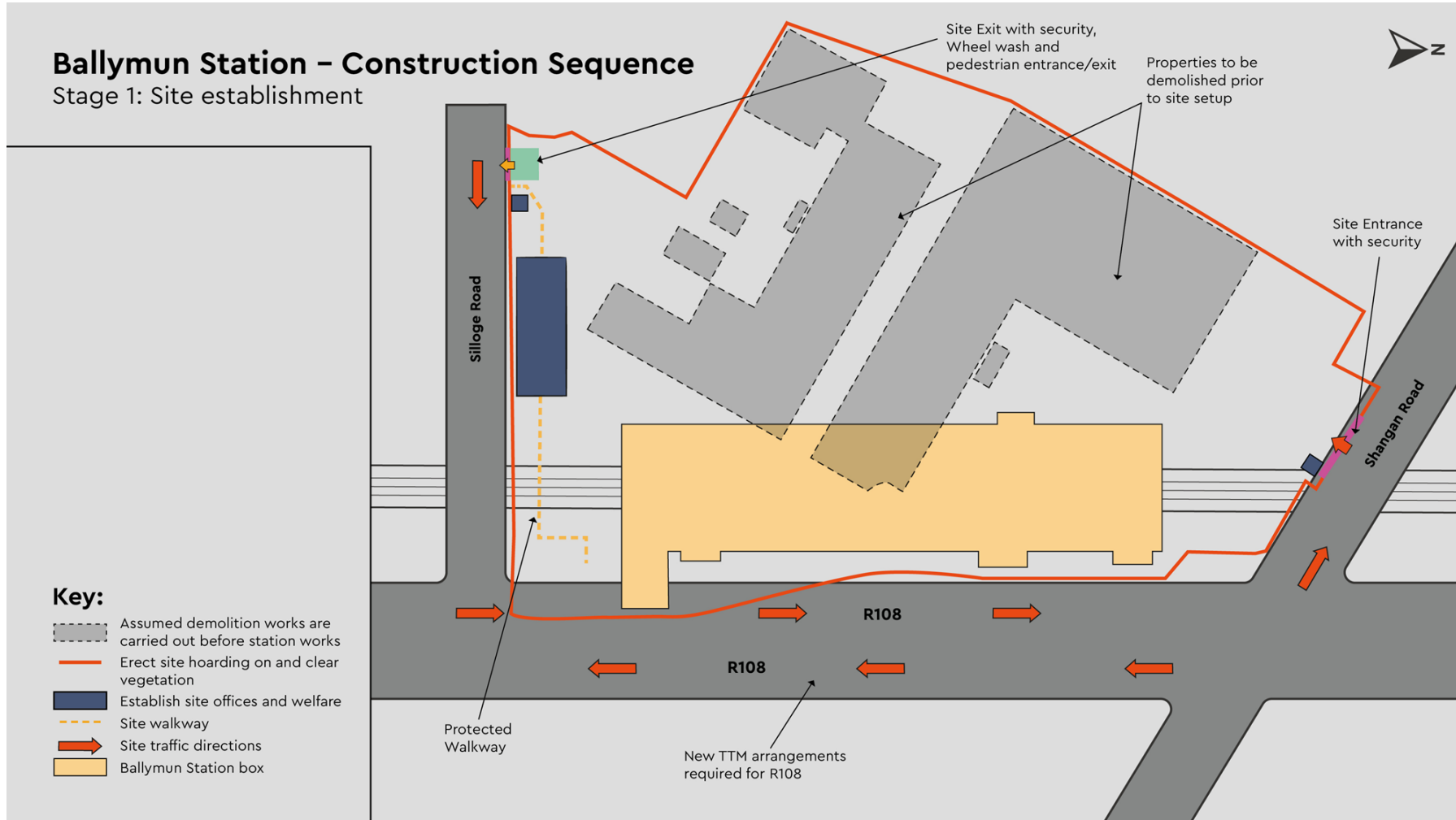


Figure 8-9 Ballymun Station Stage 1 – Site Establishment

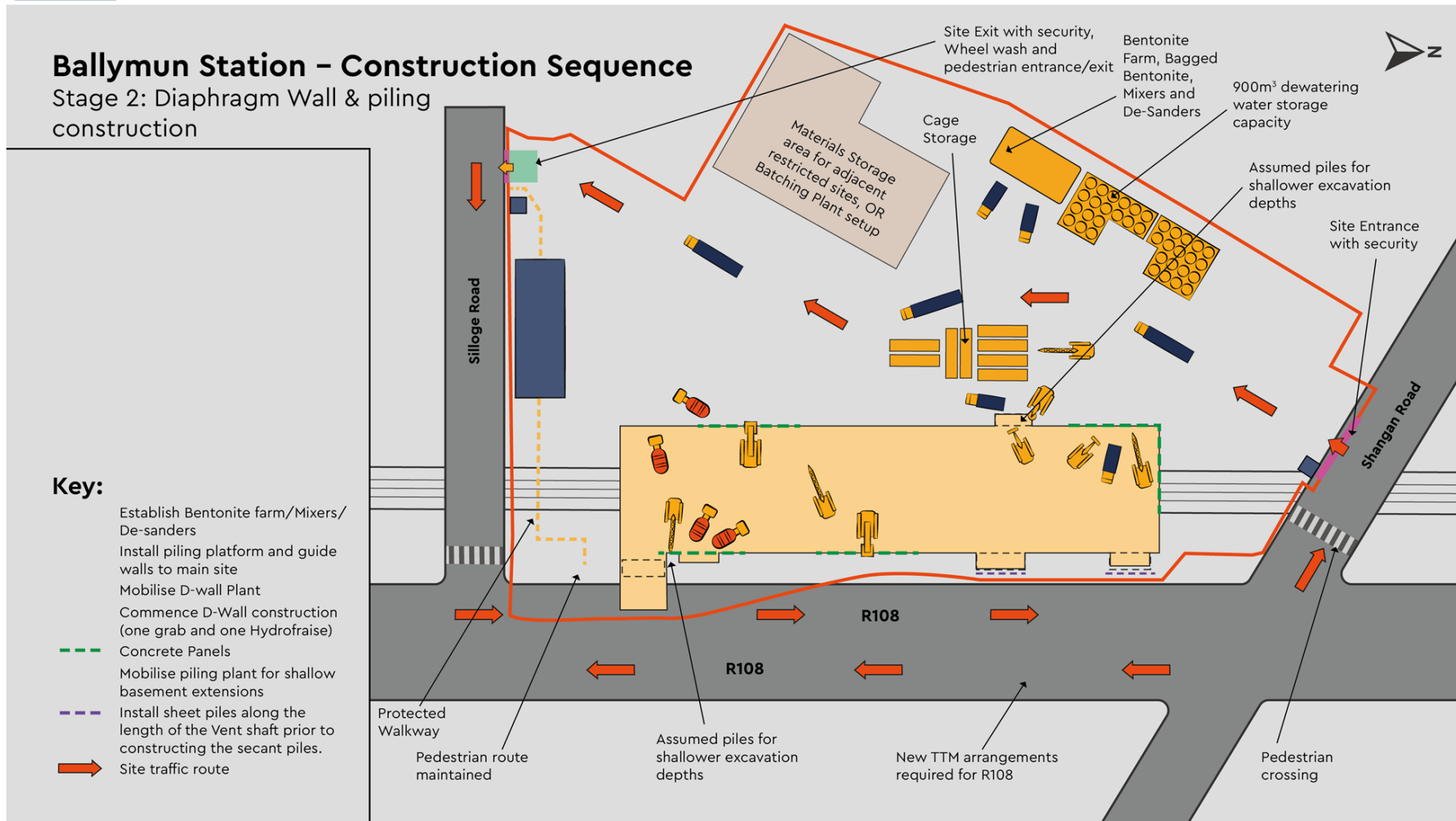


Figure 8-10 Ballymun Station Stage 2 – Diaphragm Wall and Piling Construction

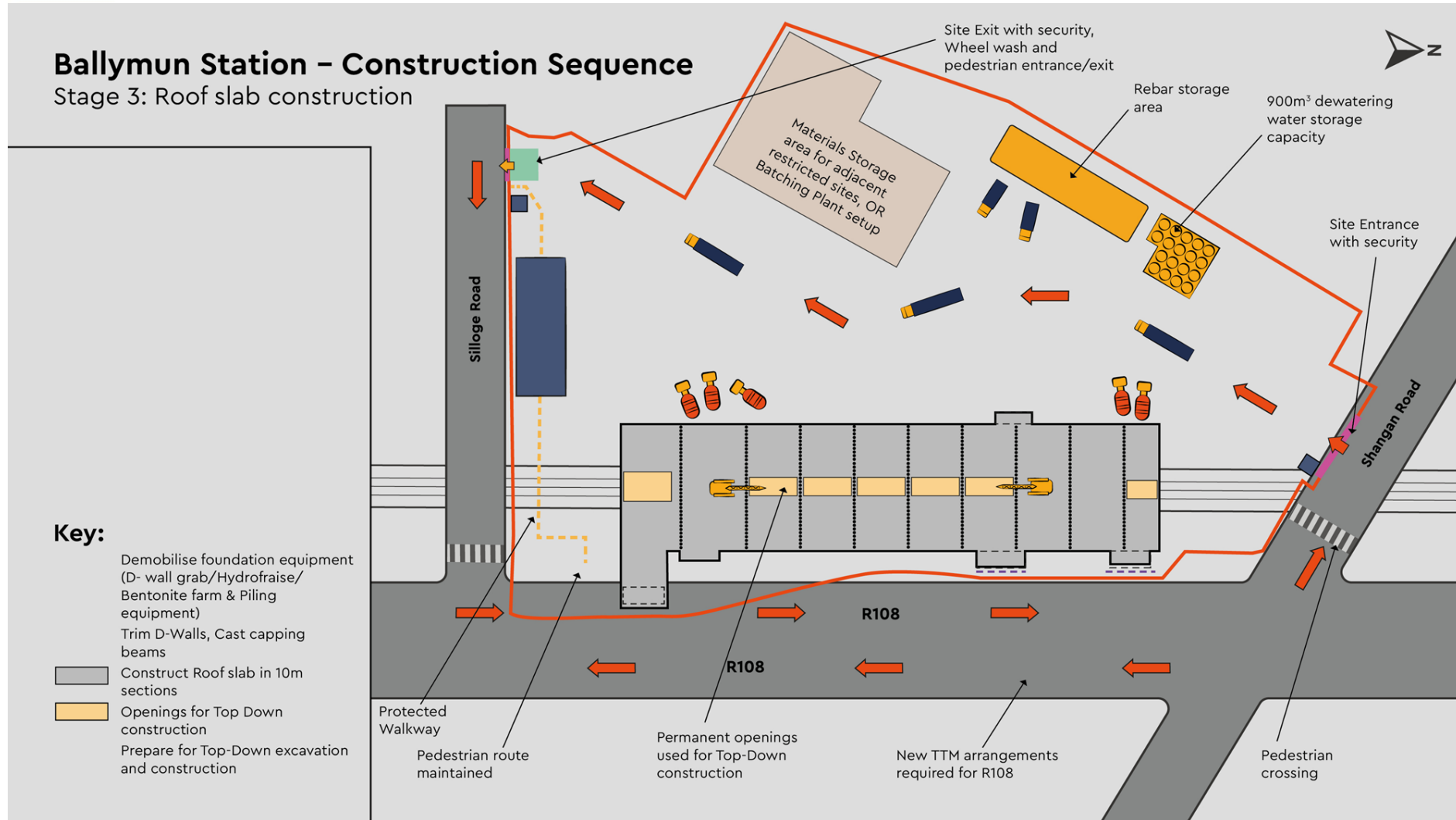


Figure 8-11 Ballymun Station Stage 3 – Roof Slab Construction

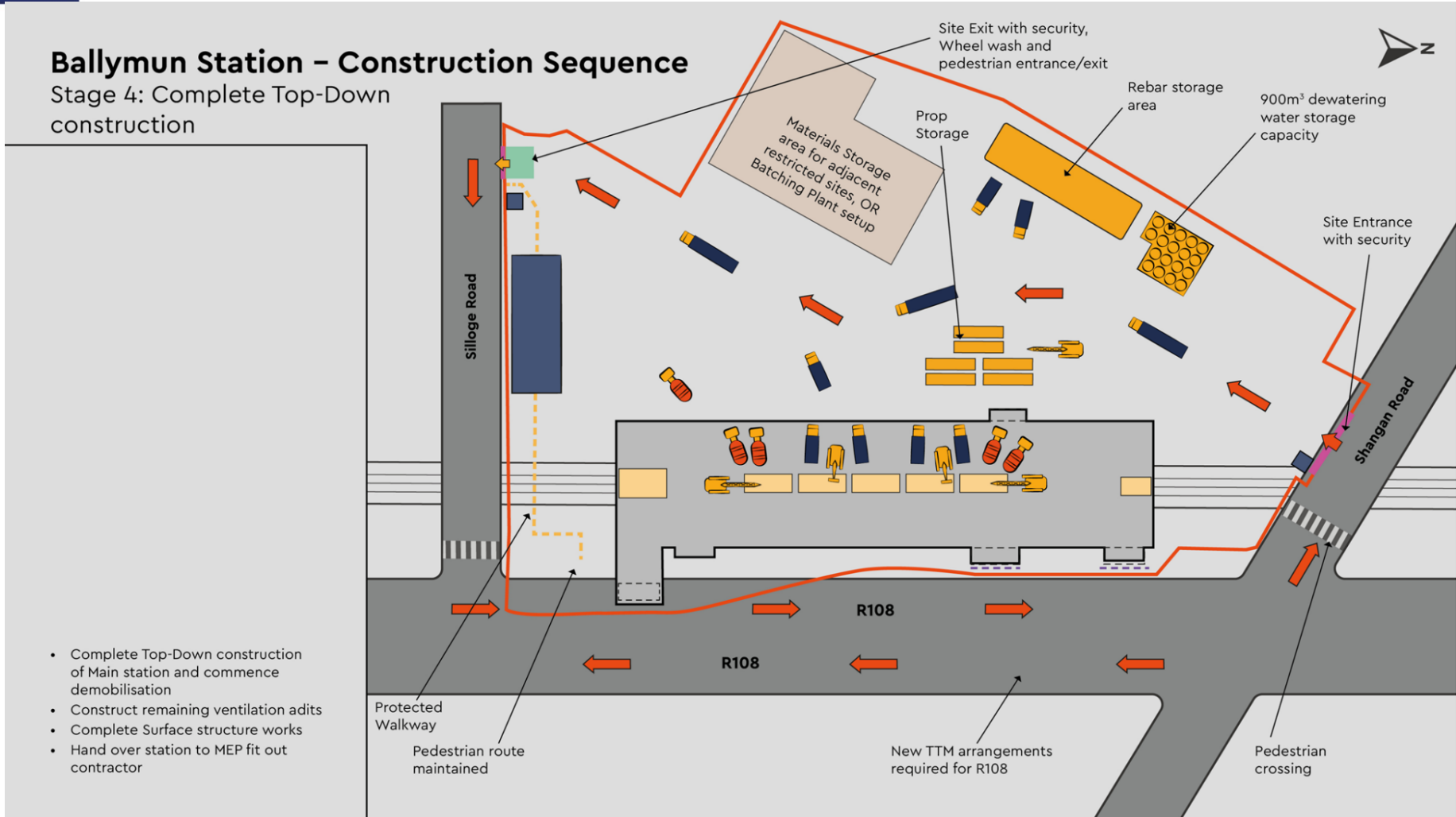


Figure 8-12 Ballymun Station Stage 4 – Complete Top-Down Construction

8.4. Collins Avenue Station

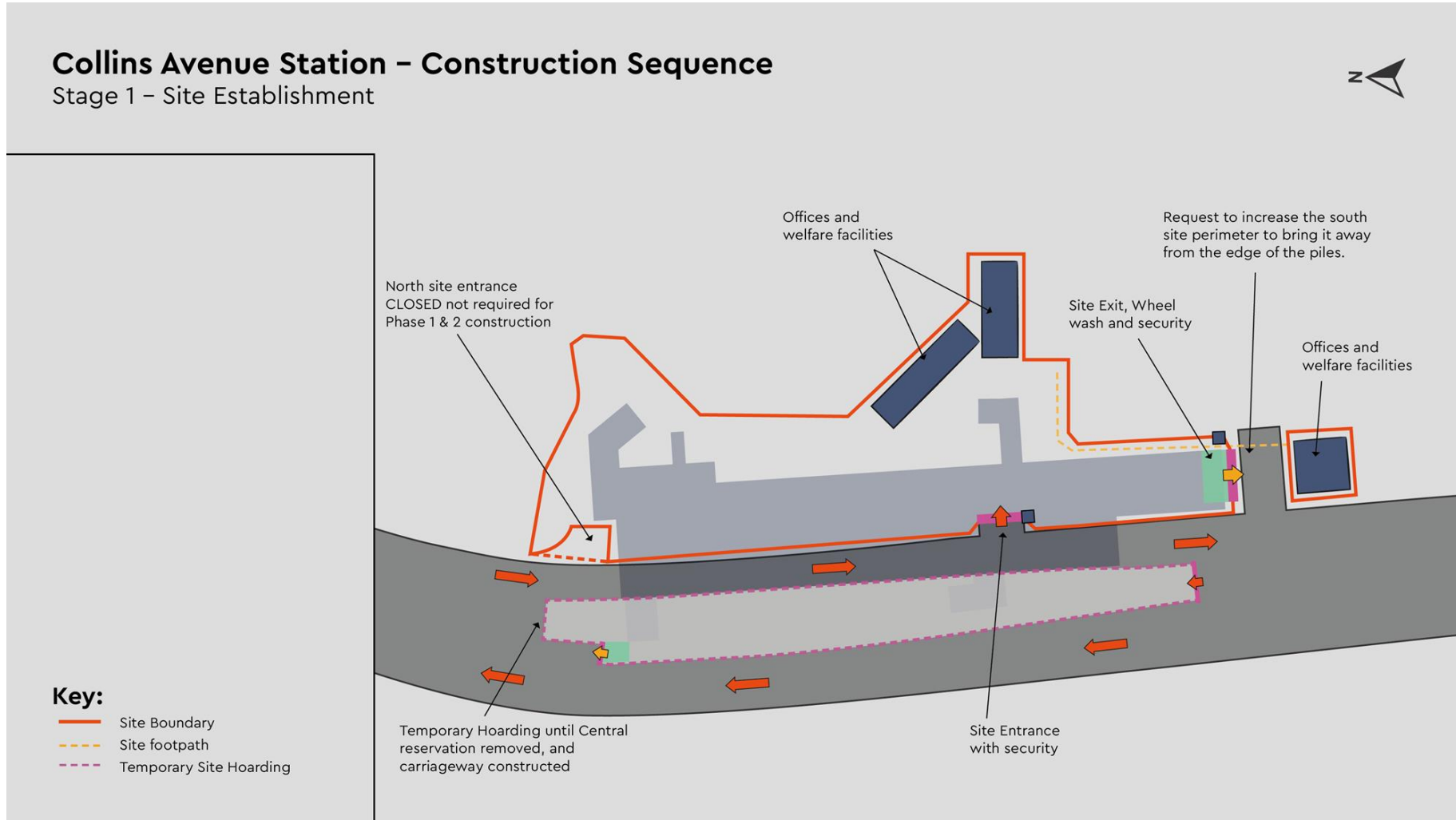


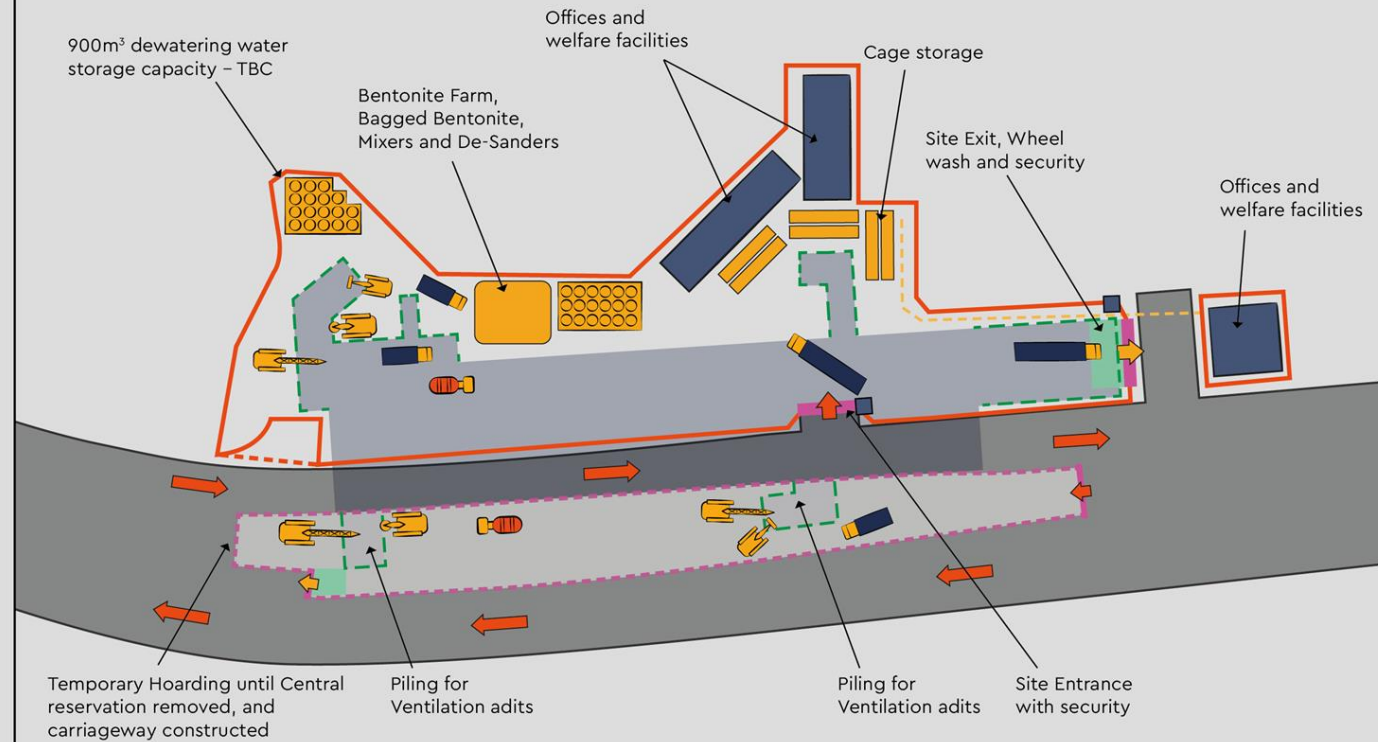
Figure 8-13 Collins Avenue Station – Stage 1 - Site Establishment

Collins Avenue Station – Construction Sequence

Stage 2 – Central reservation excavation works & shallow foundations



- Establish site & Mobilise piling equipment for shallow foundations & ventilation shaft adits including Bentonite mixing plant, desander and dewatering facilities.
- Foundations that are to be constructed consist of the western vent shafts within the central reservation, the north vent adit and the east ventilation adit.
- Piling of the western D-wall to commence before reconfiguration of the central reservation to allow for access to the compound to be maintained through bell mouth on western boundary.



Key:

- Site Boundary
- - - Site footpath
- - - Temporary Site Hoarding
- - - Foundation being constructed

Figure 8-14 Collins Avenue Station Stage 2 – Central Excavation and Piling Works

Collins Avenue Station – Construction Sequence

Stage 3 – Diaphragm Wall & main piling construction



- Reconfigure Traffic on Ballymun Road and adjust site hoarding to suit the "current" phase 2 TTM drawings
- Install piling platform and guide walls to main site
- Mobile D-wall Plant
- Commence D-Wall construction (one grab and one Hydrofraise)
- Concrete Panels
- Construction programme to be reviewed in light of new Construction Sequence due to limitation of tree removal and available space along the predetermined northern access. This may have a programme impact.

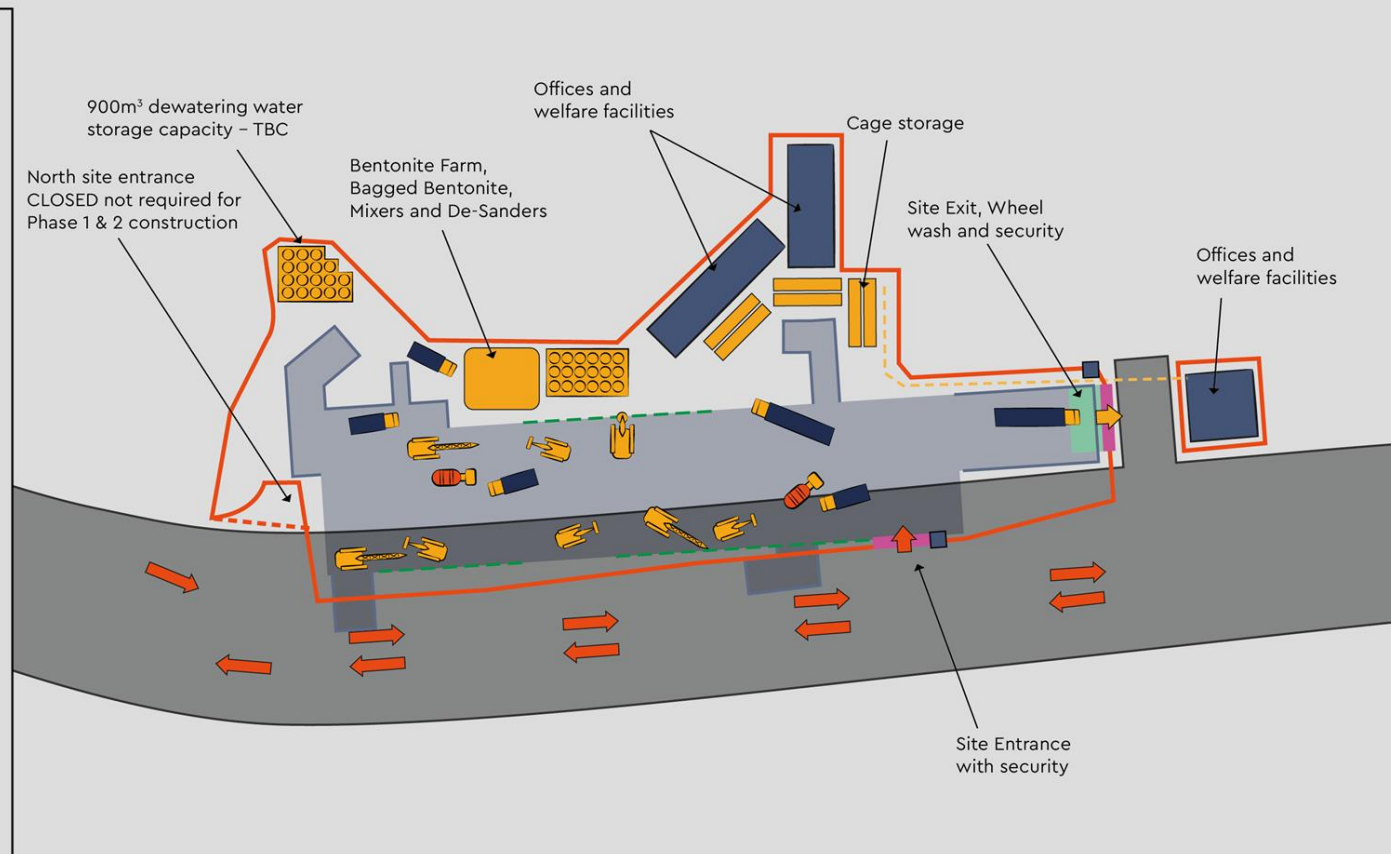


Figure 8-15 Collins Avenue Station Stage 3 - Diaphragm Wall and Main Piling Construction

Collins Avenue Station – Construction Sequence

Stage 4 – Roof slab construction



- Demobilise foundation equipment (D- wall grab and Hydroraise and Bentonite farm
- Trim D-Walls, Cast capping beams
- Construct Roof slab (with openings for Top Down construction) – incorporating the eastern ventilation shafts.
- Access to site to be shifted south as per "current Phase 1" to allow for access to the north of the compound. See inset image in top right.

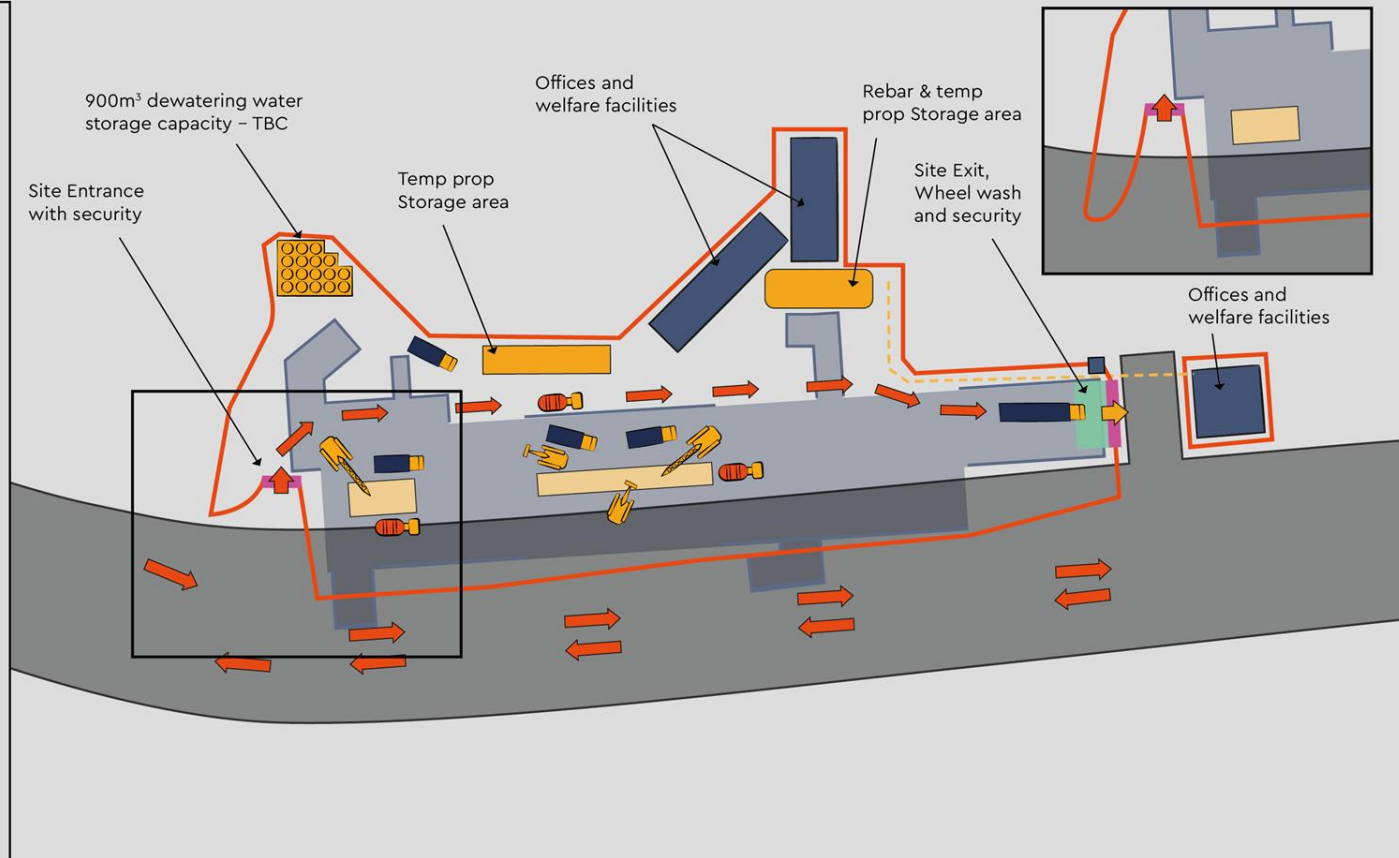


Figure 8-16 Collins Avenue Stage 4 - Roof Slab Construction

8.5. Albert College Park Shaft

The construction site layout and is illustrated in Figure 8-17 and Figure 8-18: Aerial View of Albert College Park Shaft Site below. The site layout is expected to be the same for the whole construction period.

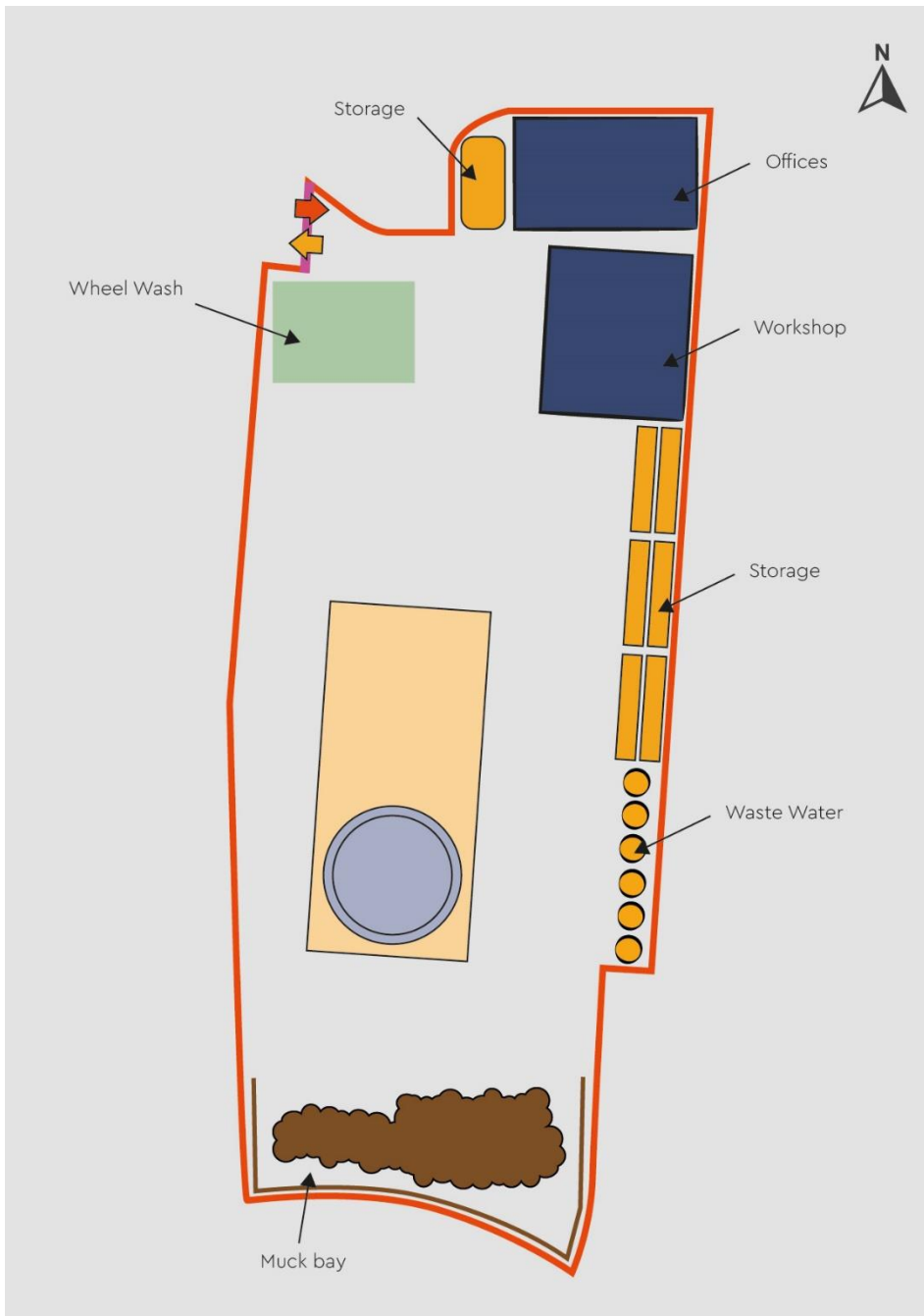


Figure 8-17: Albert College Park Shaft Layout



Figure 8-18: Aerial View of Albert College Park Shaft Site

8.6. Griffith Park Station

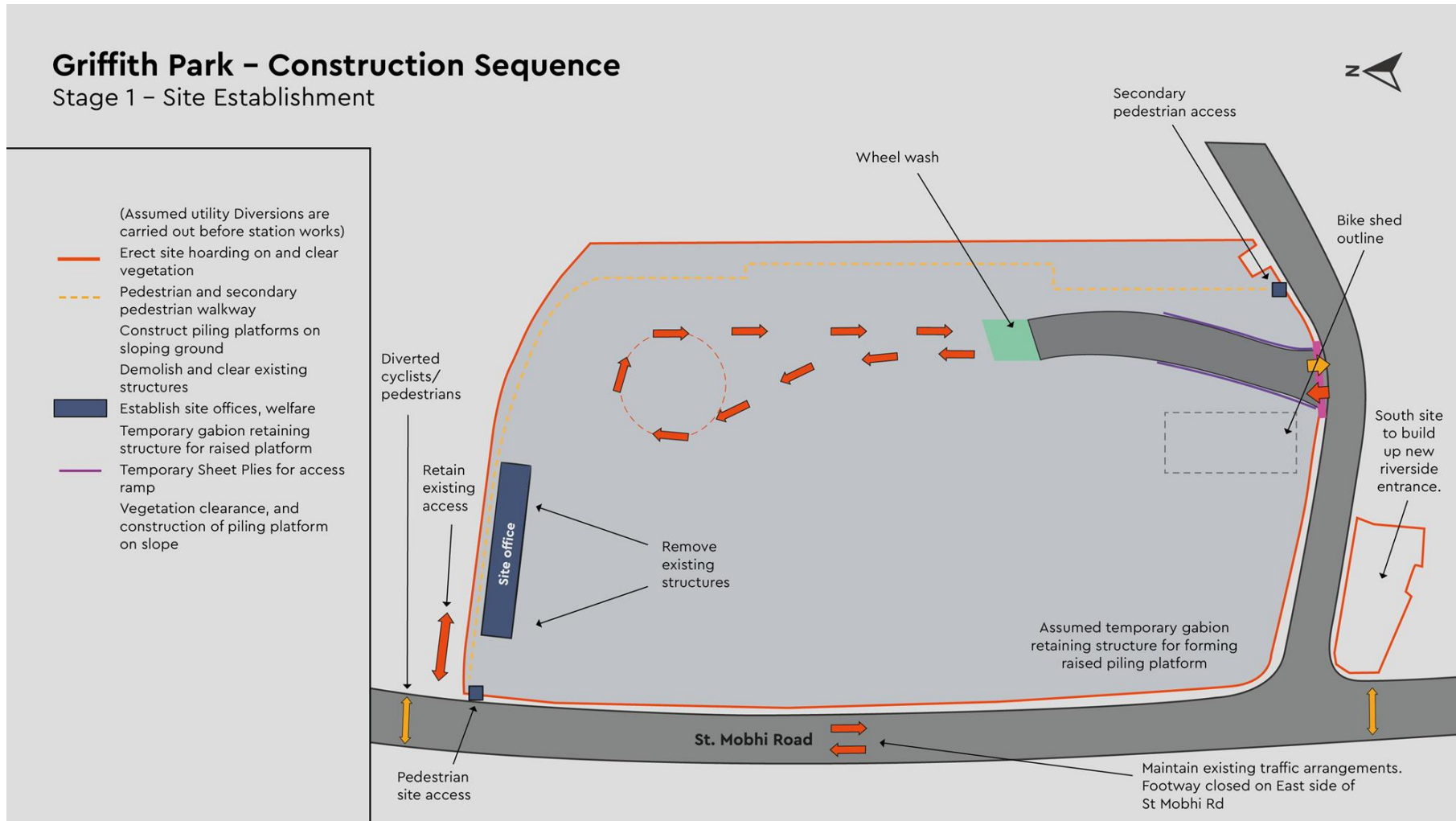


Figure 8-19 Griffith Park Station Stage 1 - Site Establishment

Griffith Park – Construction Sequence

Stage 2 – Diaphragm Wall & piling construction

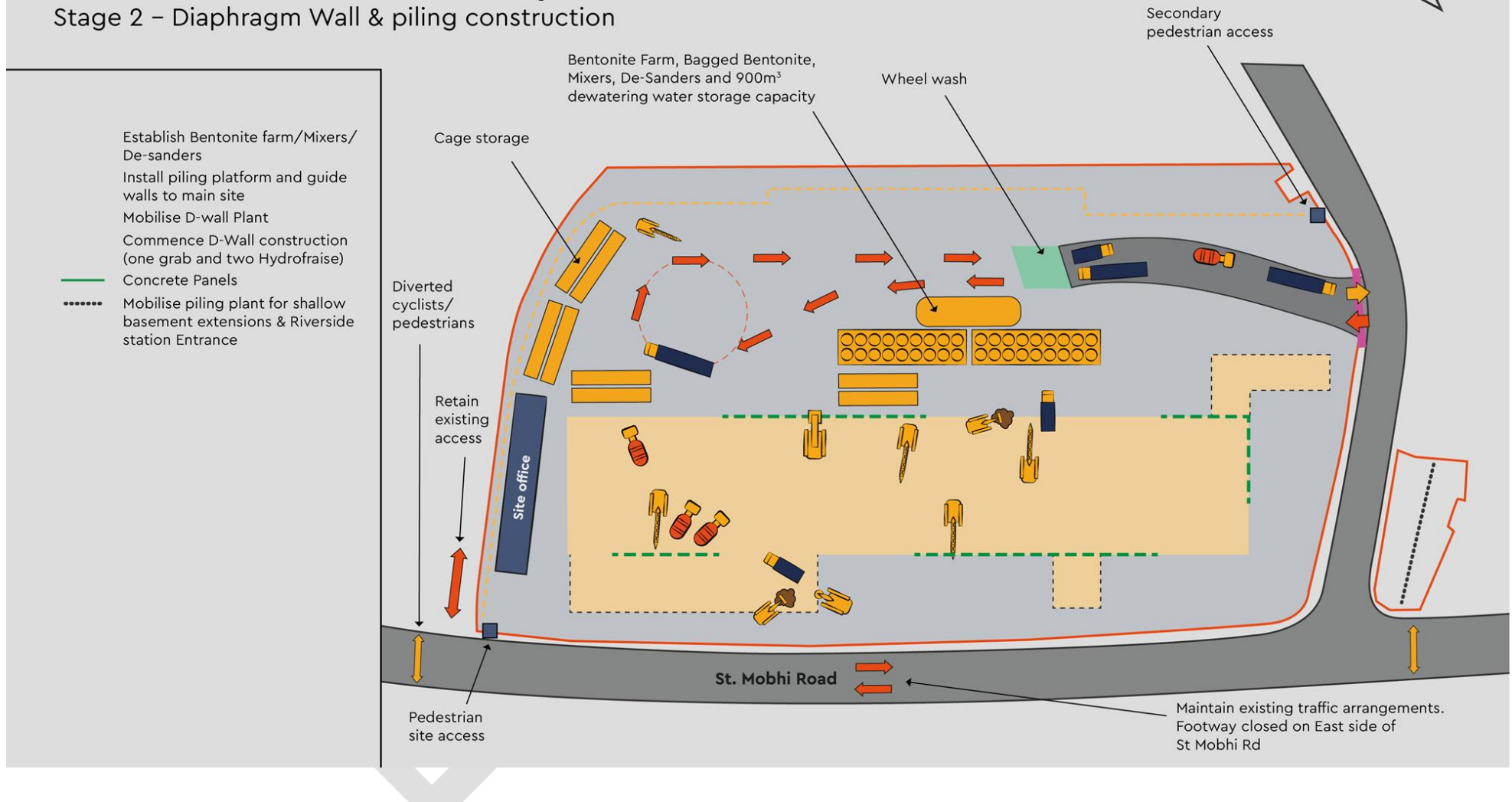


Figure 8-20 Griffith Park Station - Stage 2 - Diaphragm Wall and Piling Construction

Griffith Park – Construction Sequence

Stage 3 – Roof slab construction

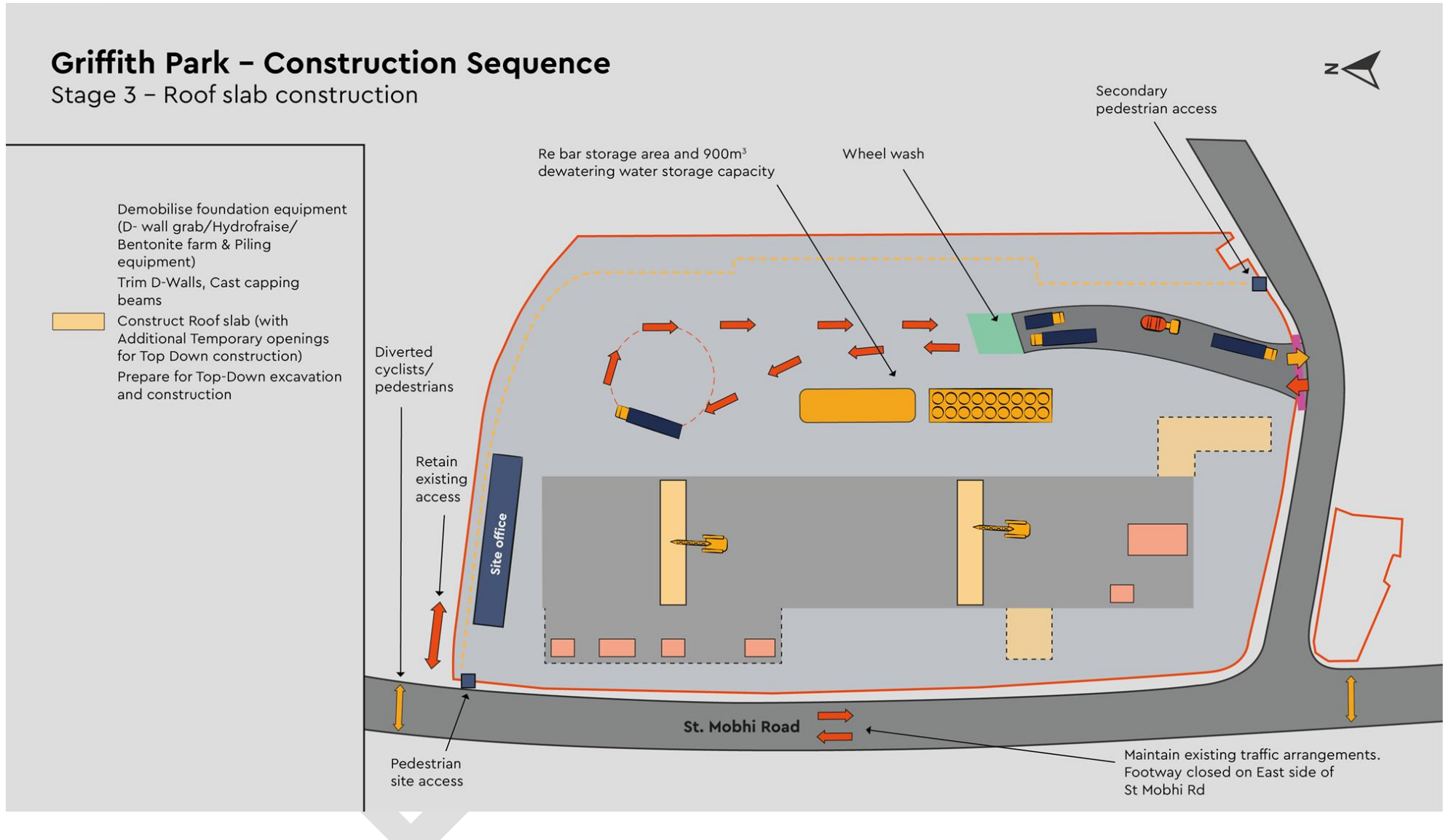


Figure 8-21 Griffith Park Station Stage 3 Roof Slab Construction

Griffith Park – Construction Sequence

Stage 4 – Complete Top-Down construction

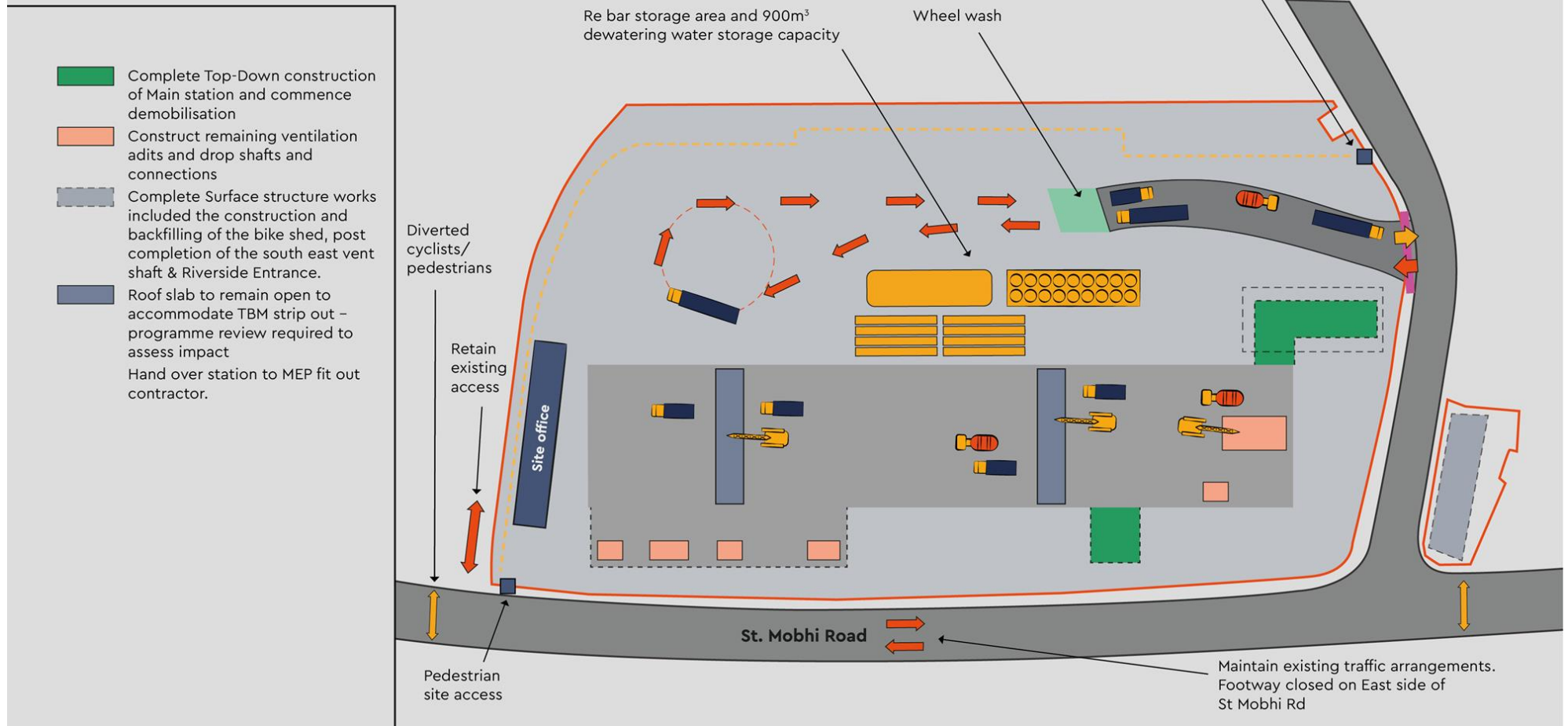


Figure 8-22 Griffith Park Station Stage 4 - Complete Top-Down Construction

8.7. Glasnevin Station – Extended Closure Option (ECO)

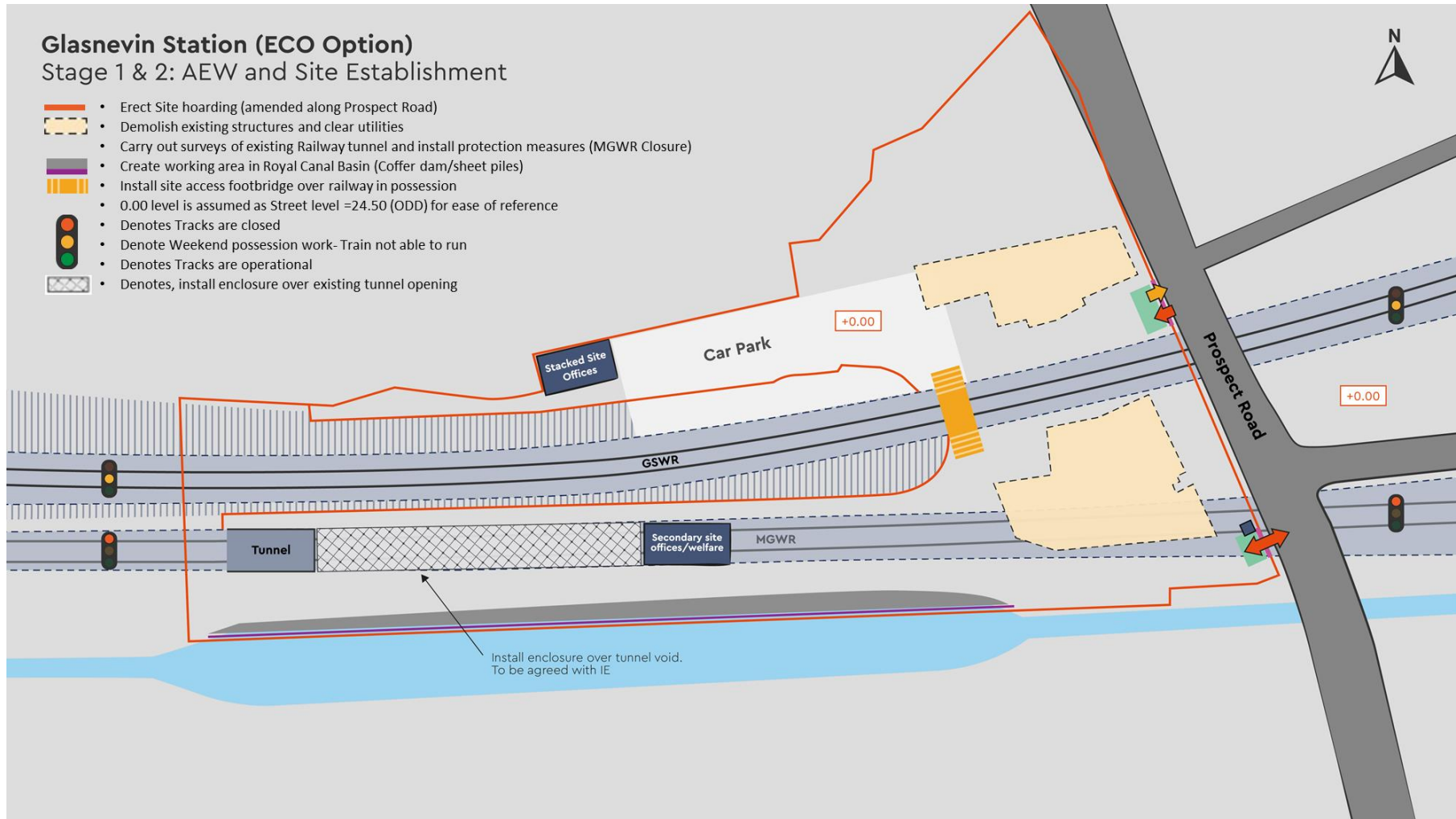


Figure 8-23 Glasnevin Station - Stage 1 & 2 AEW and Site Establishment

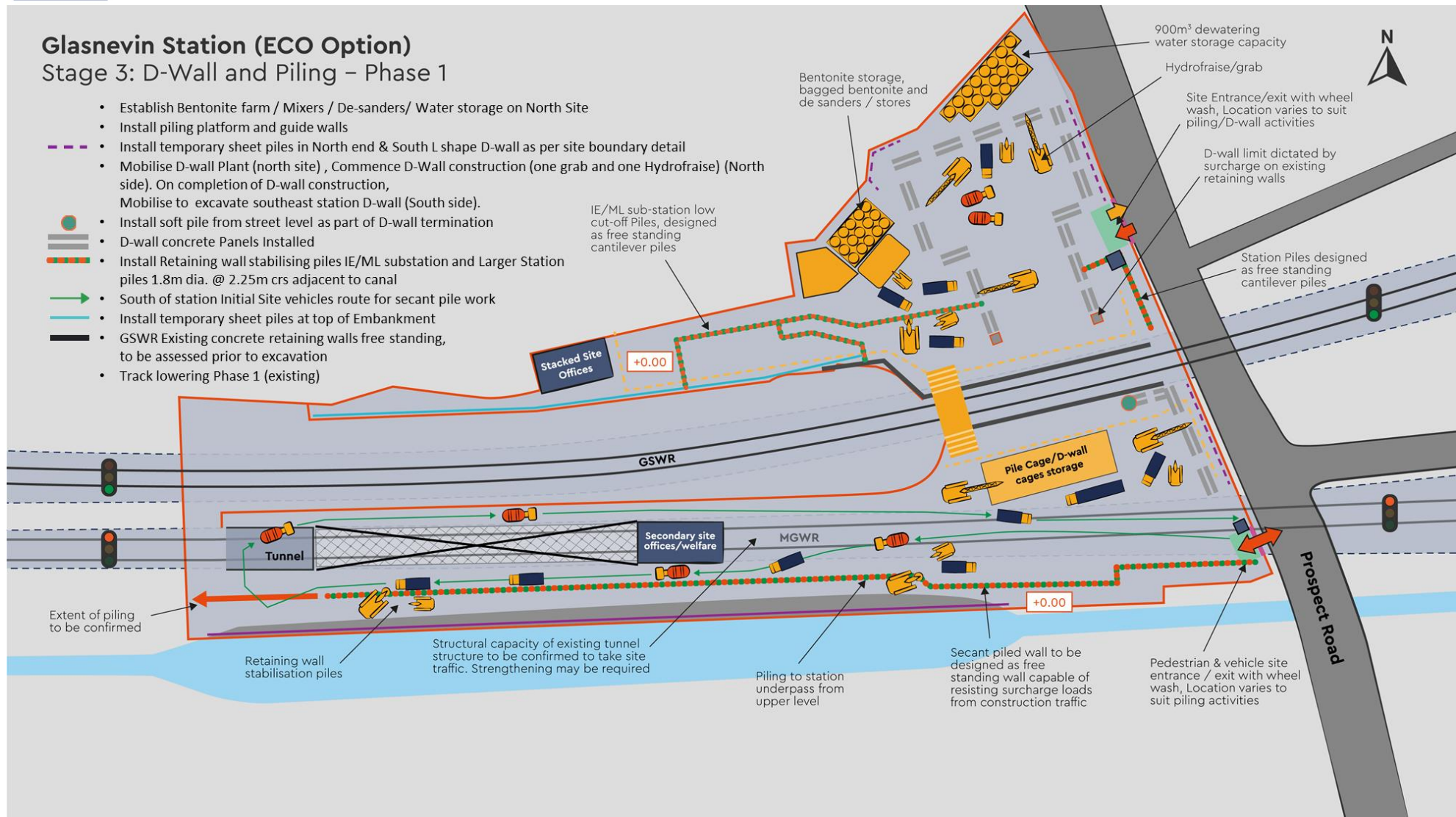


Figure 8-24 Glasnevin Station - Stage 3 D-Wall and Piling Phase 1

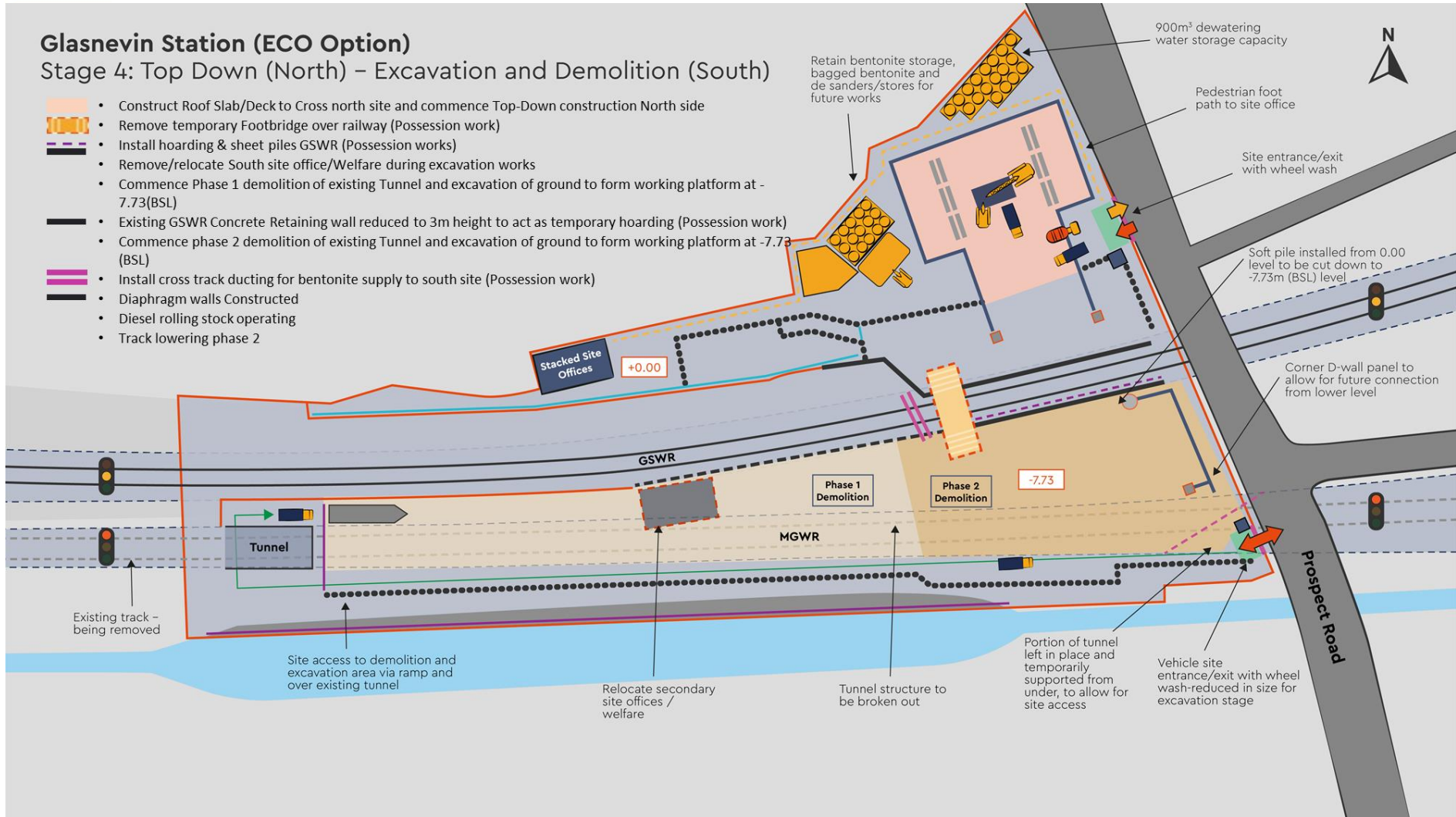


Figure 8-25 Glasnevin Station - Stage 4 Top Down (North) - Excavation and Demolition (South)

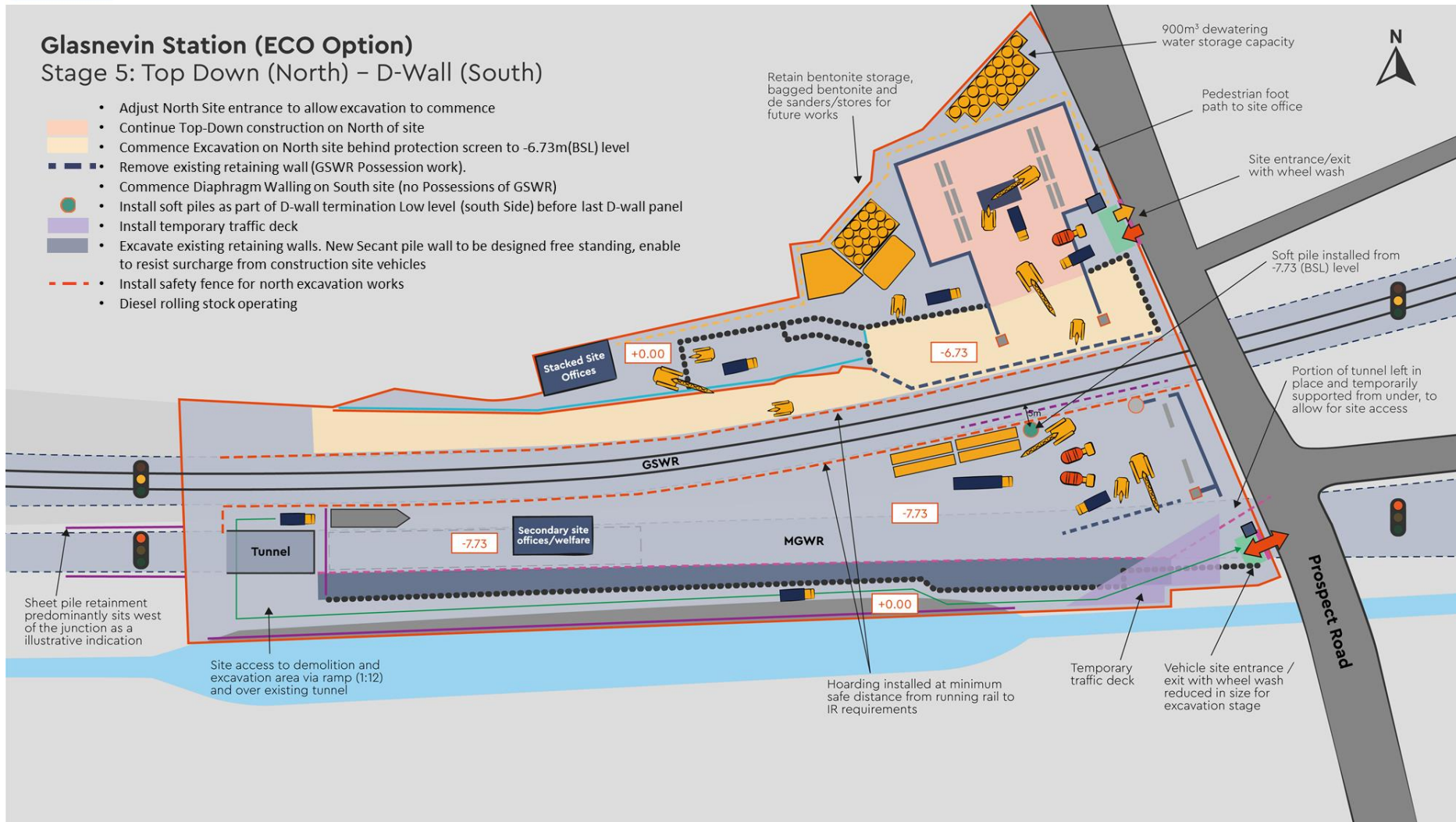


Figure 8-26 Glasnevin Station - Stage 5 Top Down (North) - D-Wall (South)

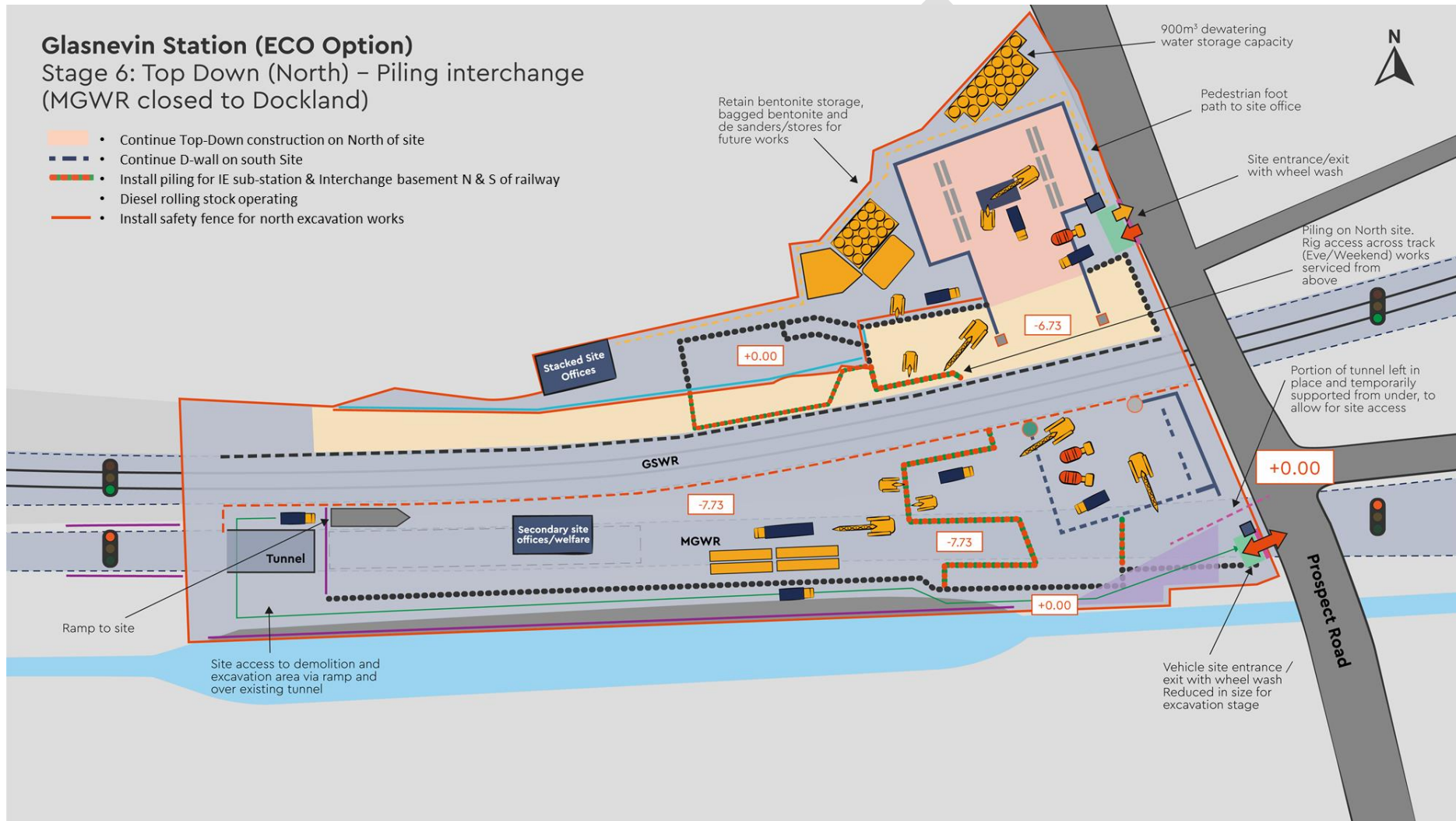


Figure 8-27 S Glasnevin Station - Stage 6 Top Down (North) - Piling Interchange

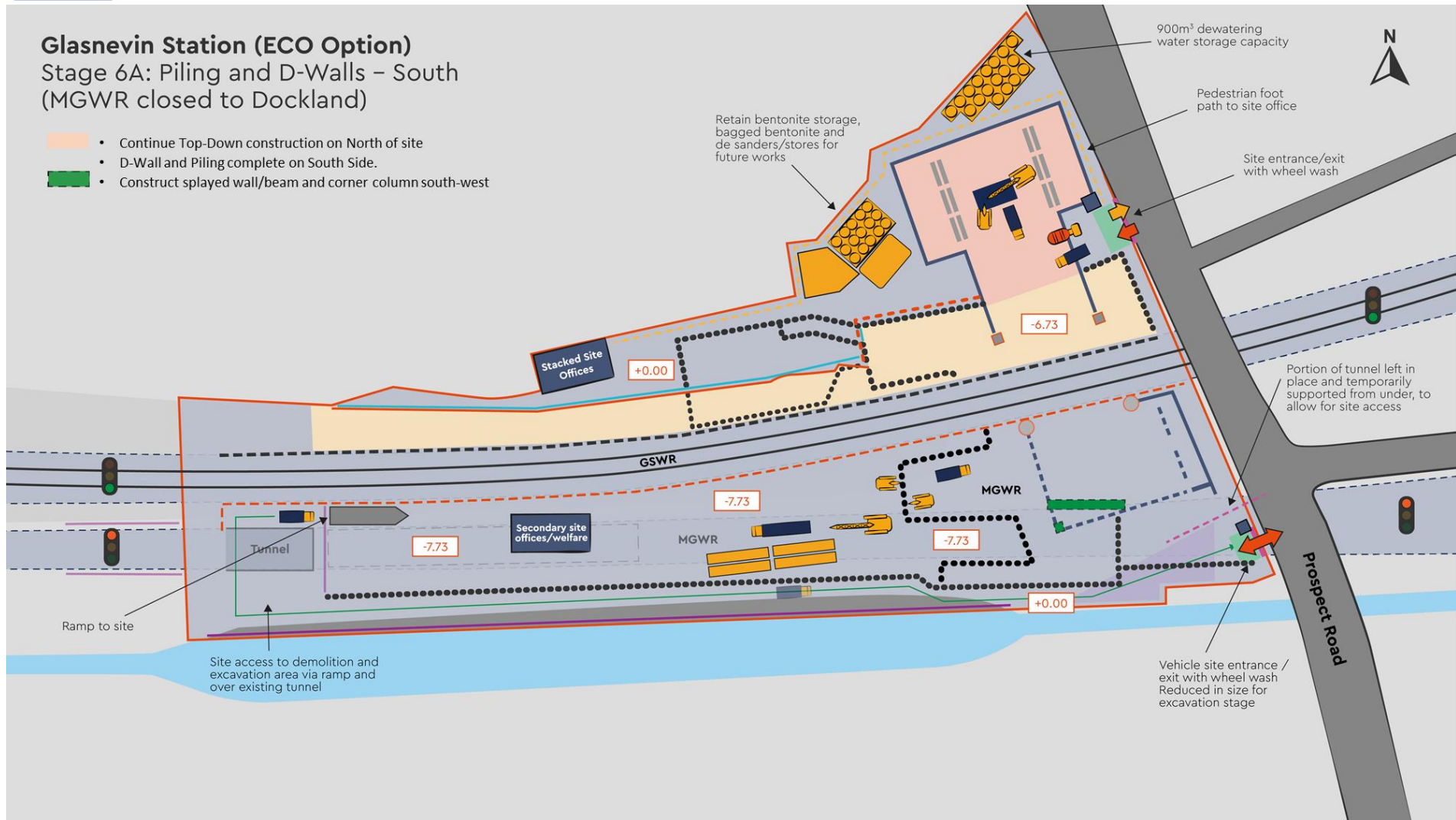


Figure 8-28 Glasnevin Station Stage 6A Piling and D-walls - South

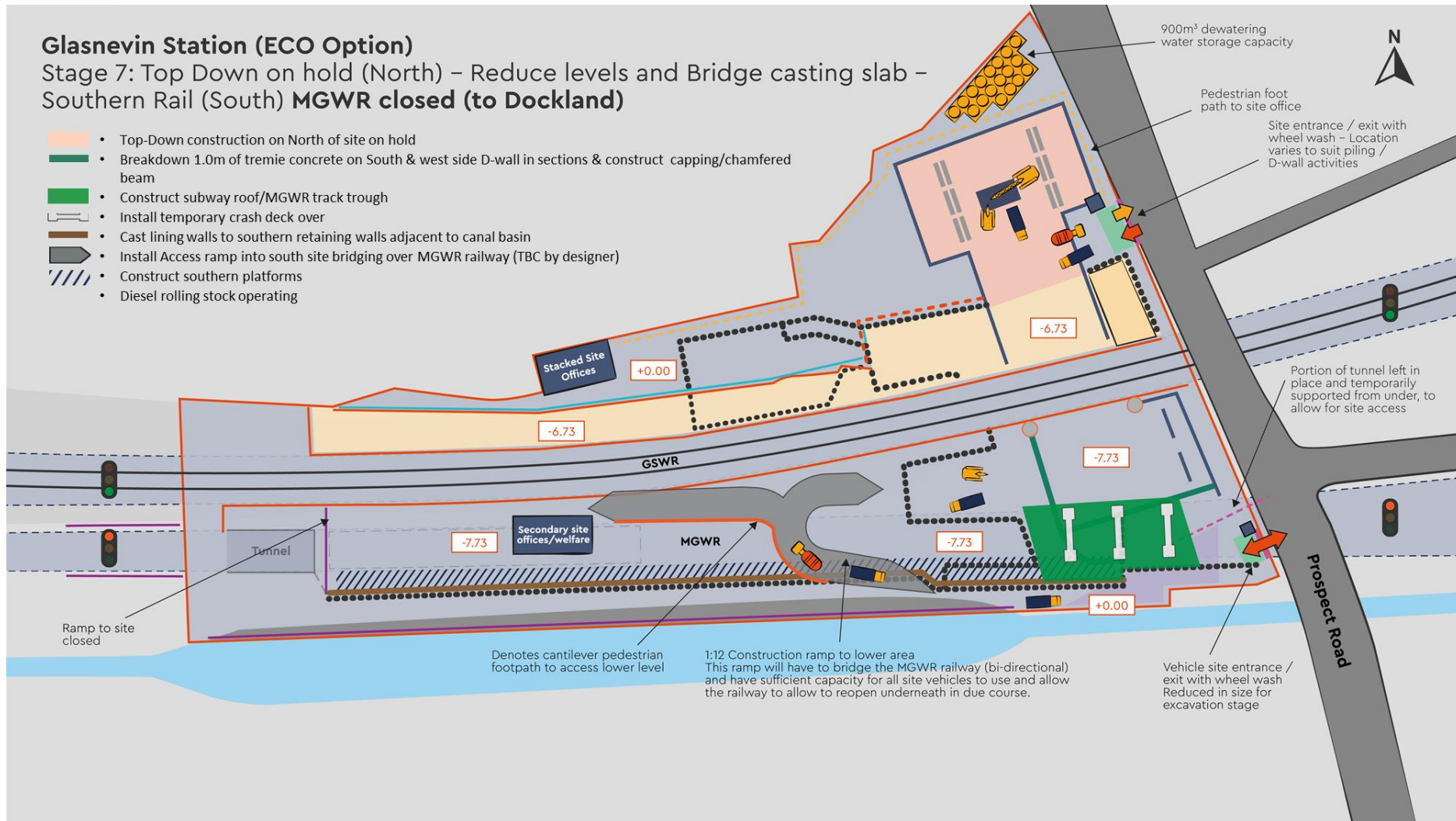


Figure 8-29 Glasnevin Station - Stage 7 Top Down on hold (North) Reduce Levels and Bridge Casting Slab

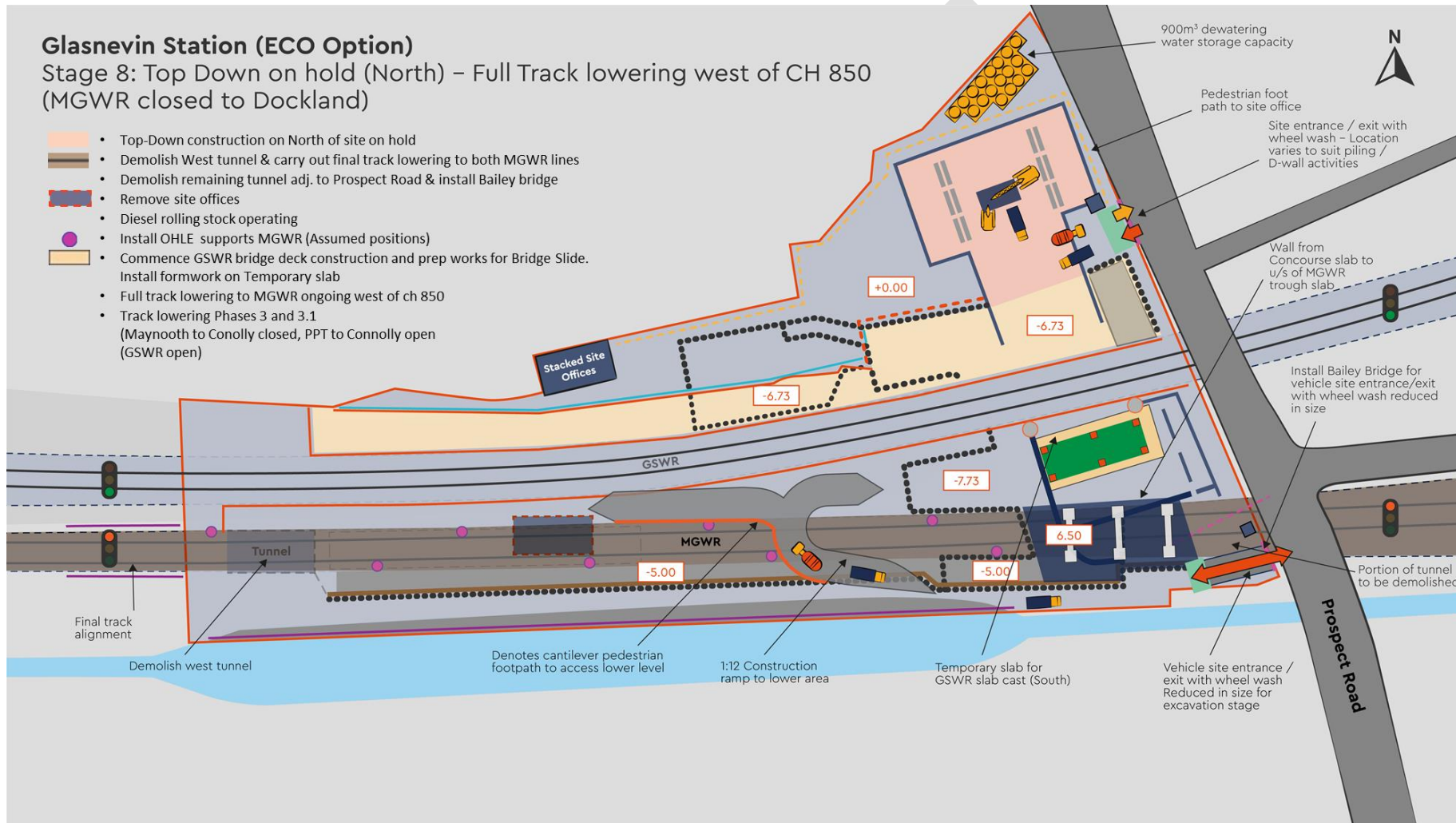


Figure 8-30 Glasnevin Station - Stage 8 Top Down on hold (North) Full Track Lowering West of CH 850

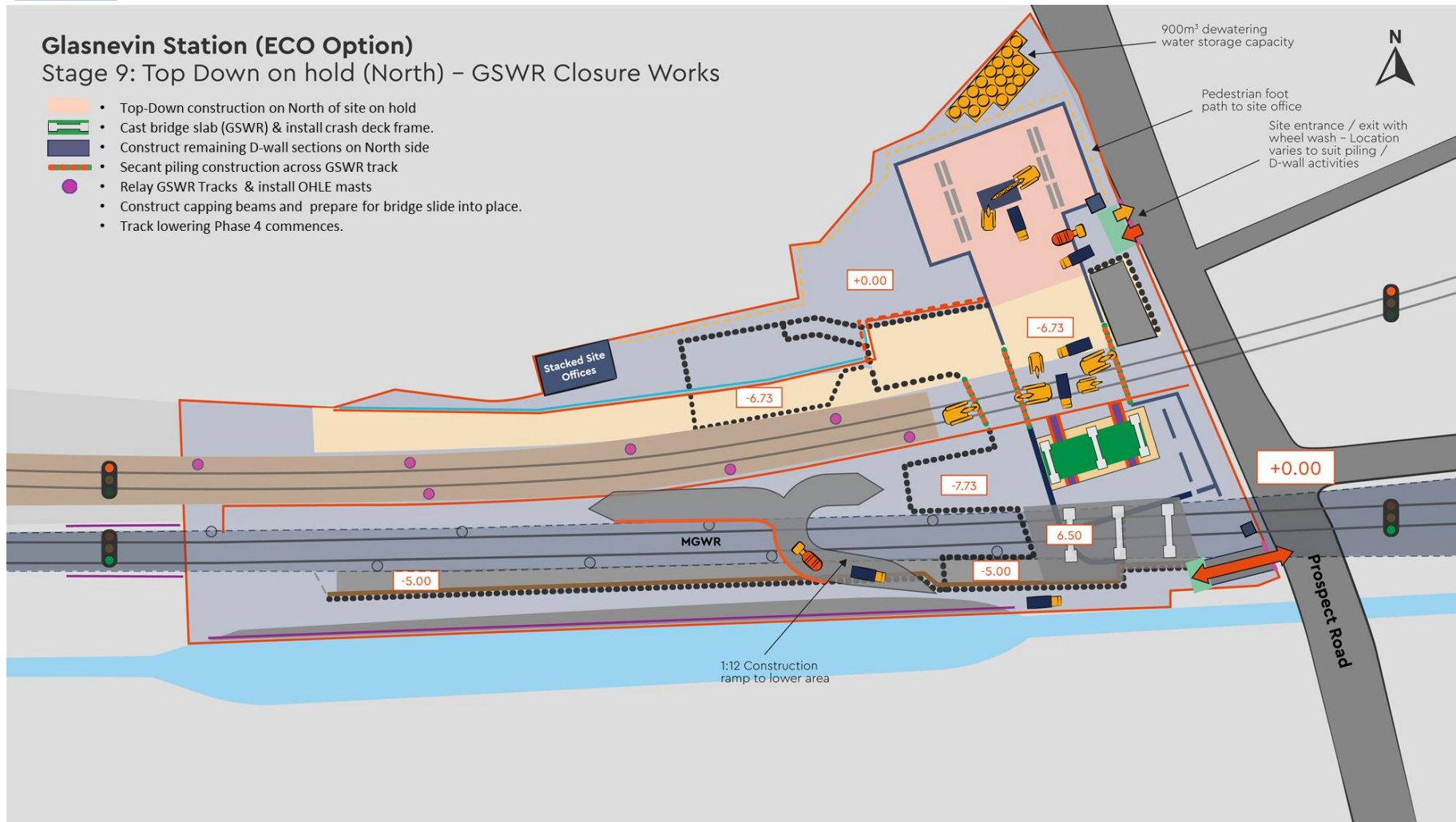


Figure 8-31 Glasnevin Station Stage 9 Top Down on hold (North) - GSWR Closure Works

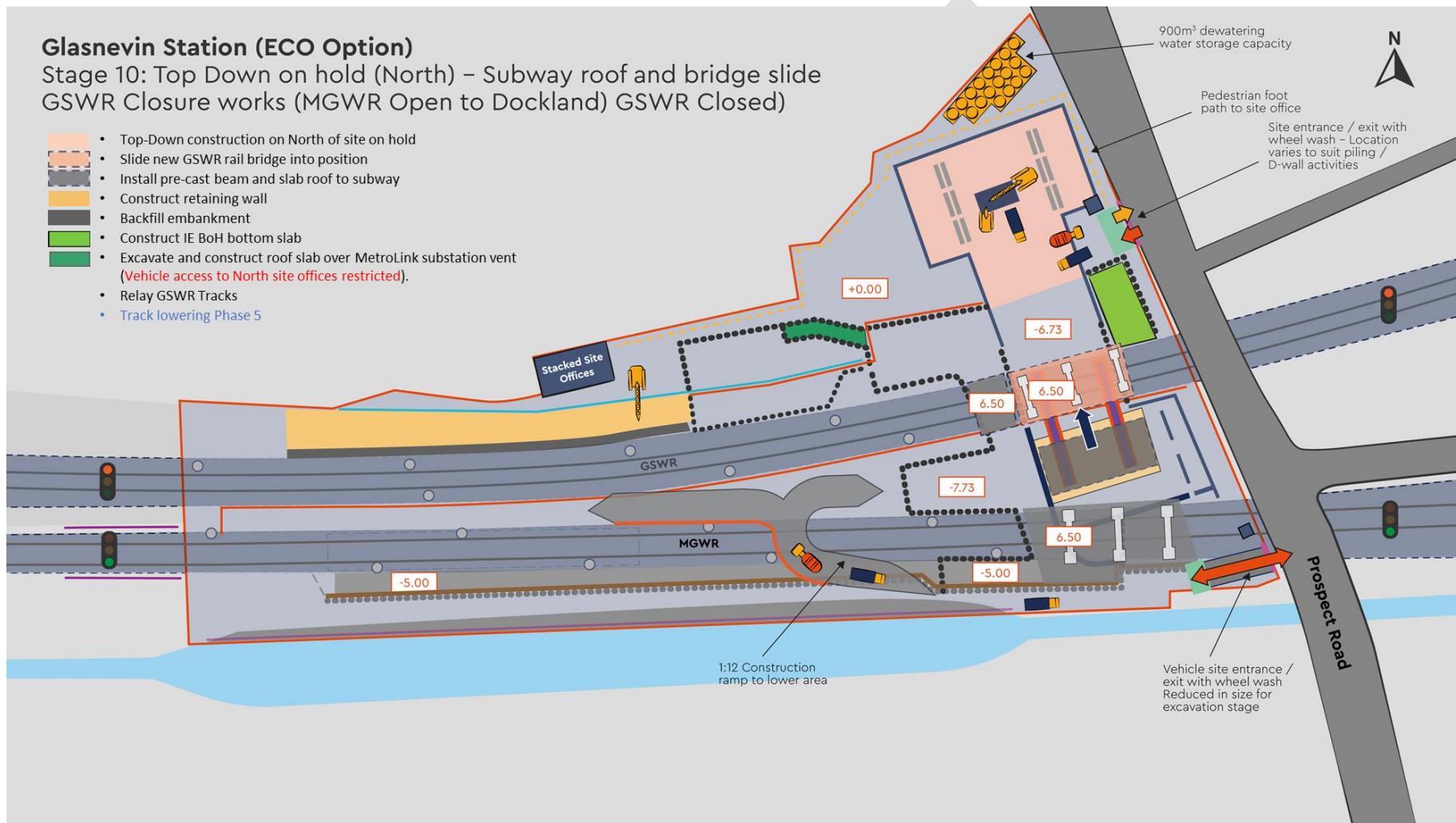


Figure 8-32 Glasnevin Station - Stage 10 Top Down on Hold (North) - Subway Roof and Bridge Slide

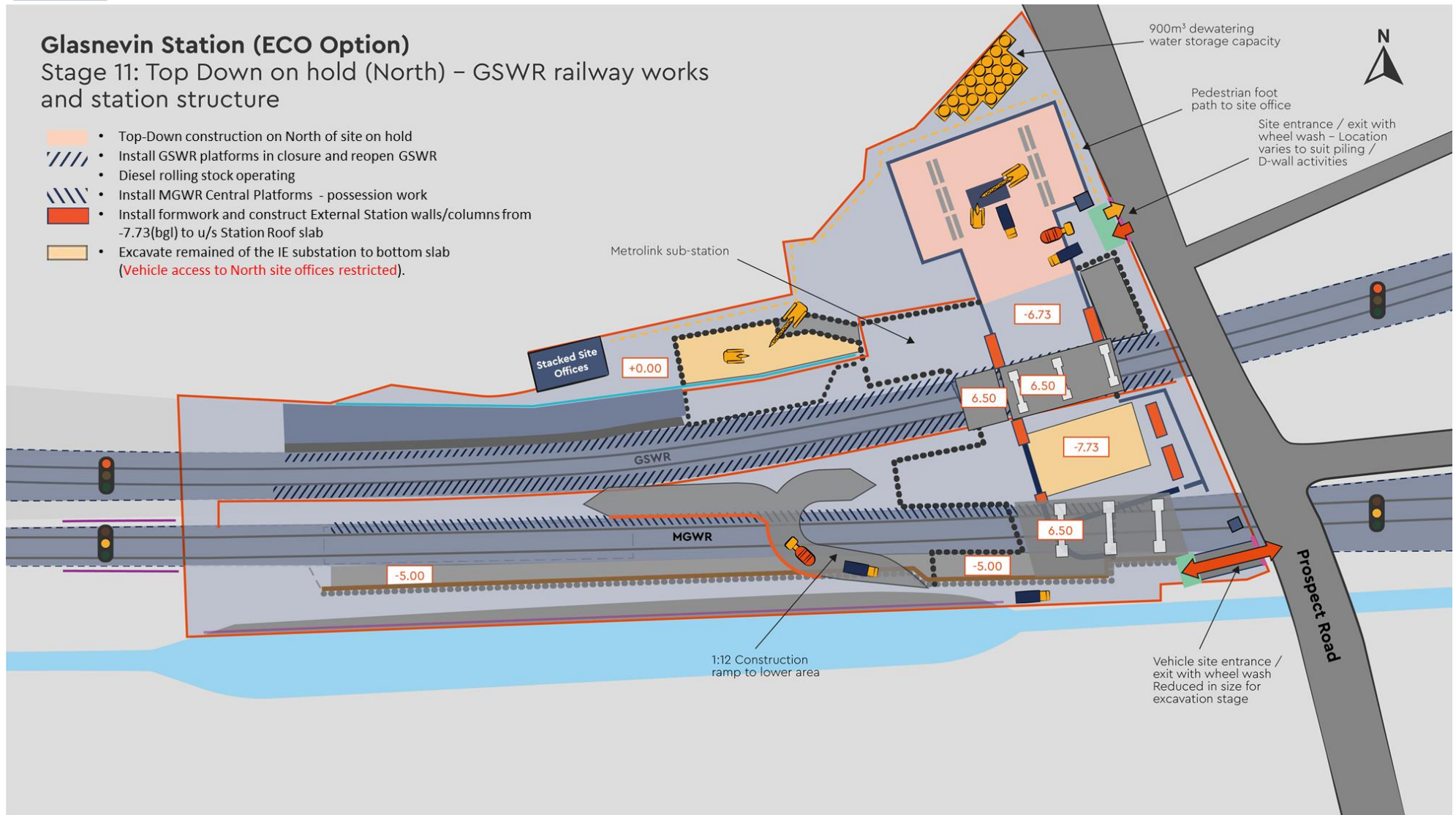


Figure 8-33 Glasnevin Station - Stage 11 Top Down on Hold (North) - GSWR Railway Works

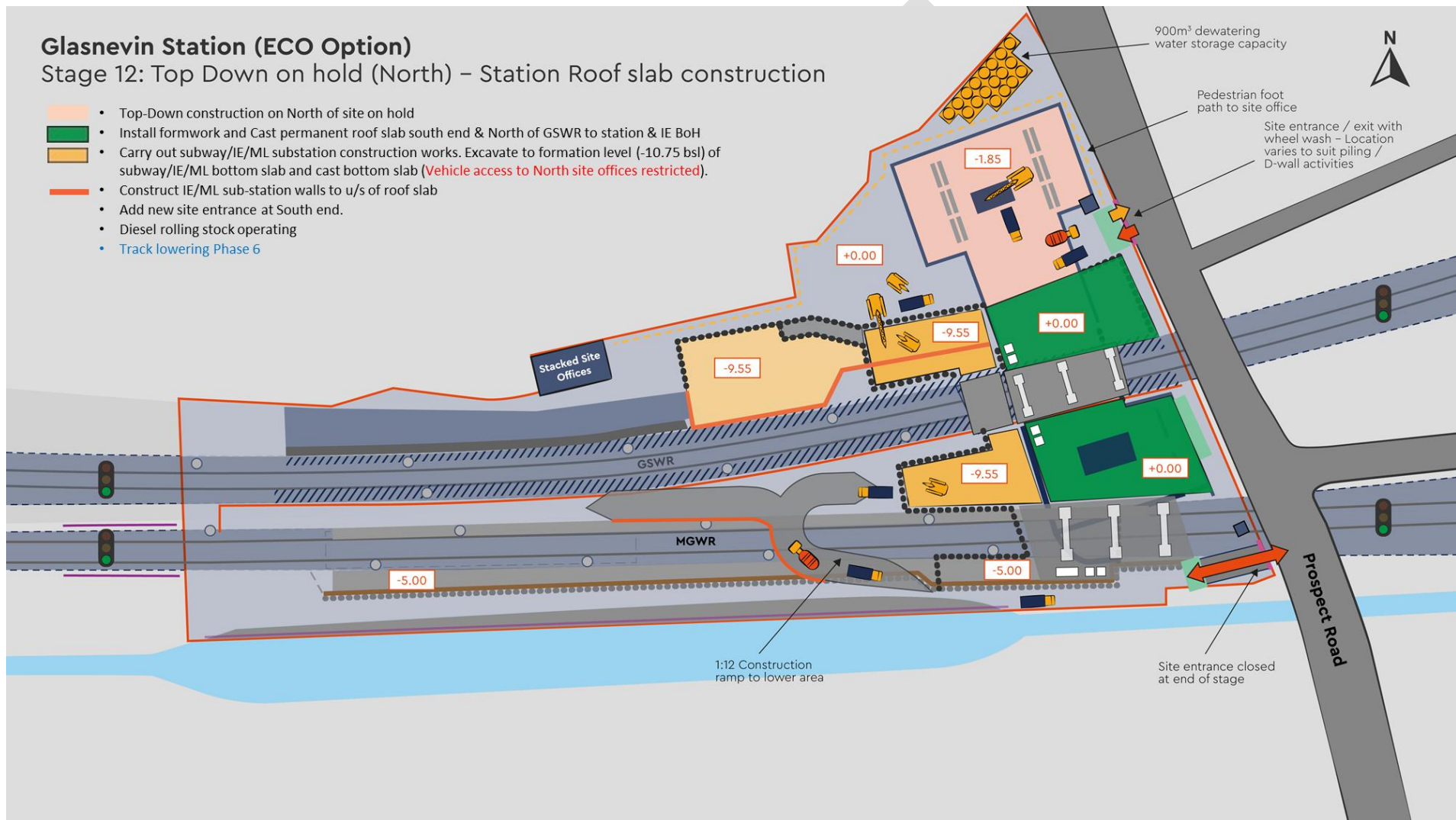


Figure 8-34 Glasnevin Station - Stage 12 Top Down on Hold (North) - Station Roof Slab Construction

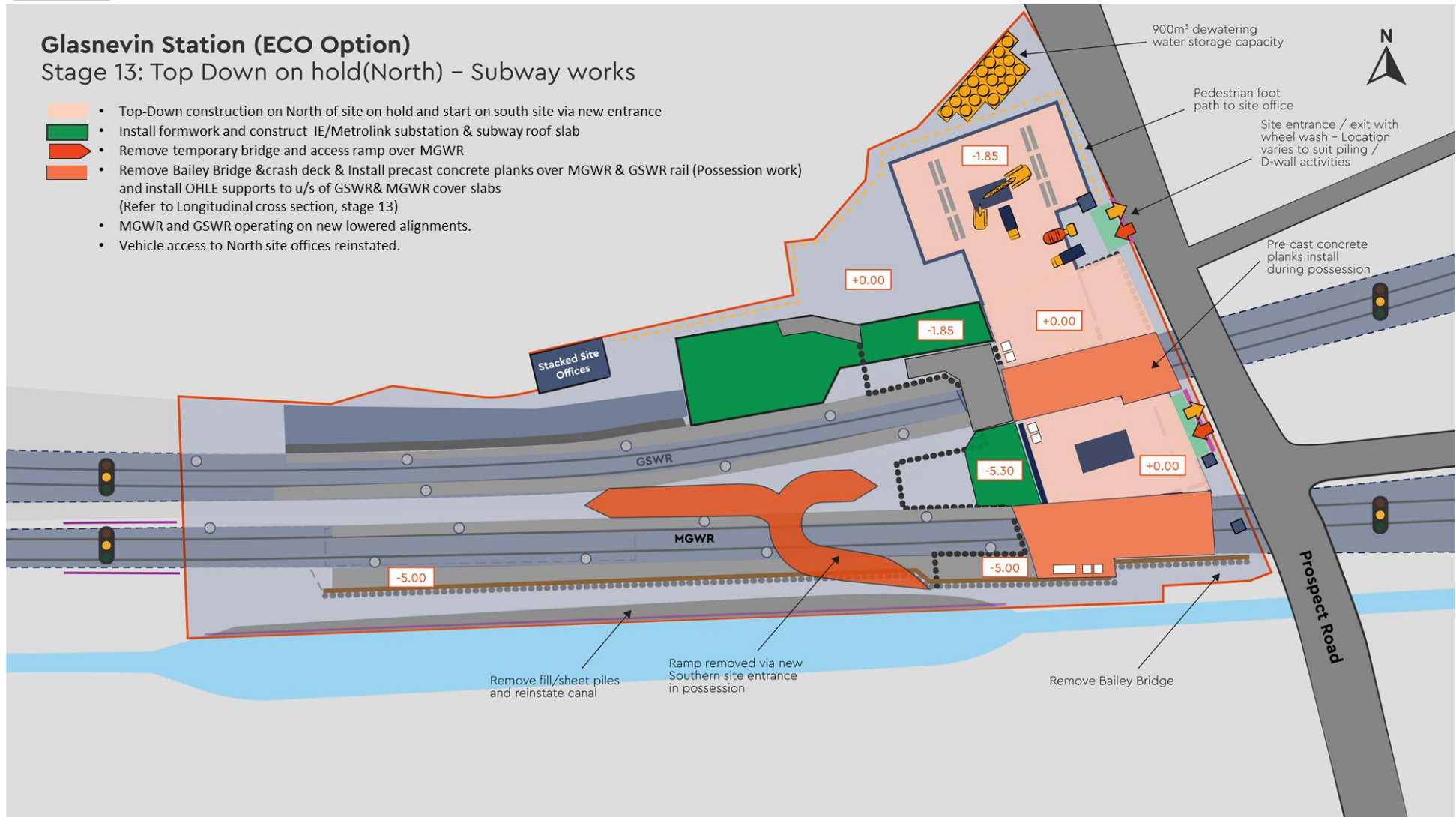


Figure 8-35 Glasnevin Station - Stage 13 Top Down on Hold (North) - Subway Works

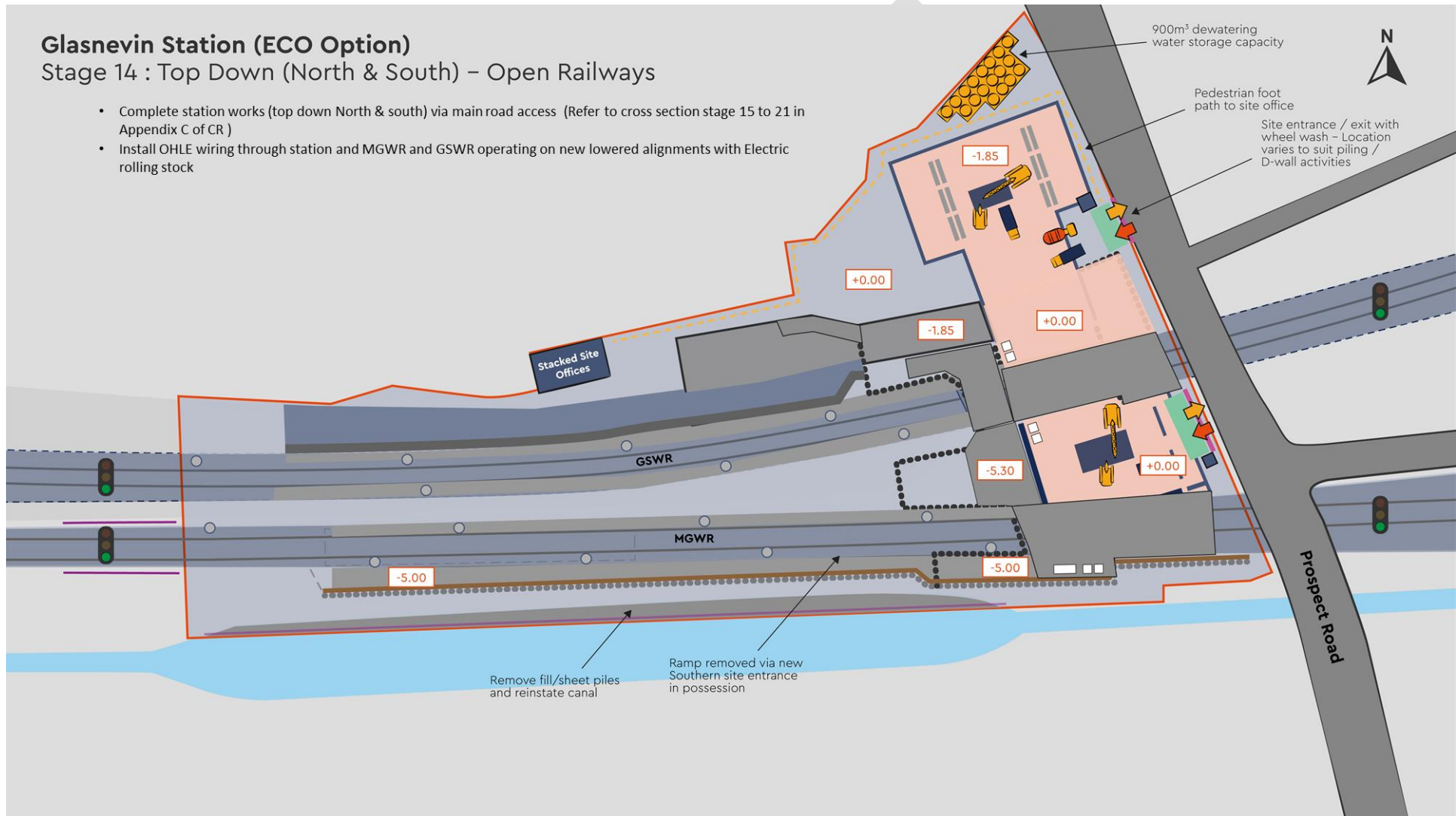


Figure 8-36 Glasnevin Station - Stage 14 Top Down (North & South) - Open Railways

8.8. Glasnevin IR

These works have been carried out by JI and fall outside the scope of this report.

8.9. Mater Station

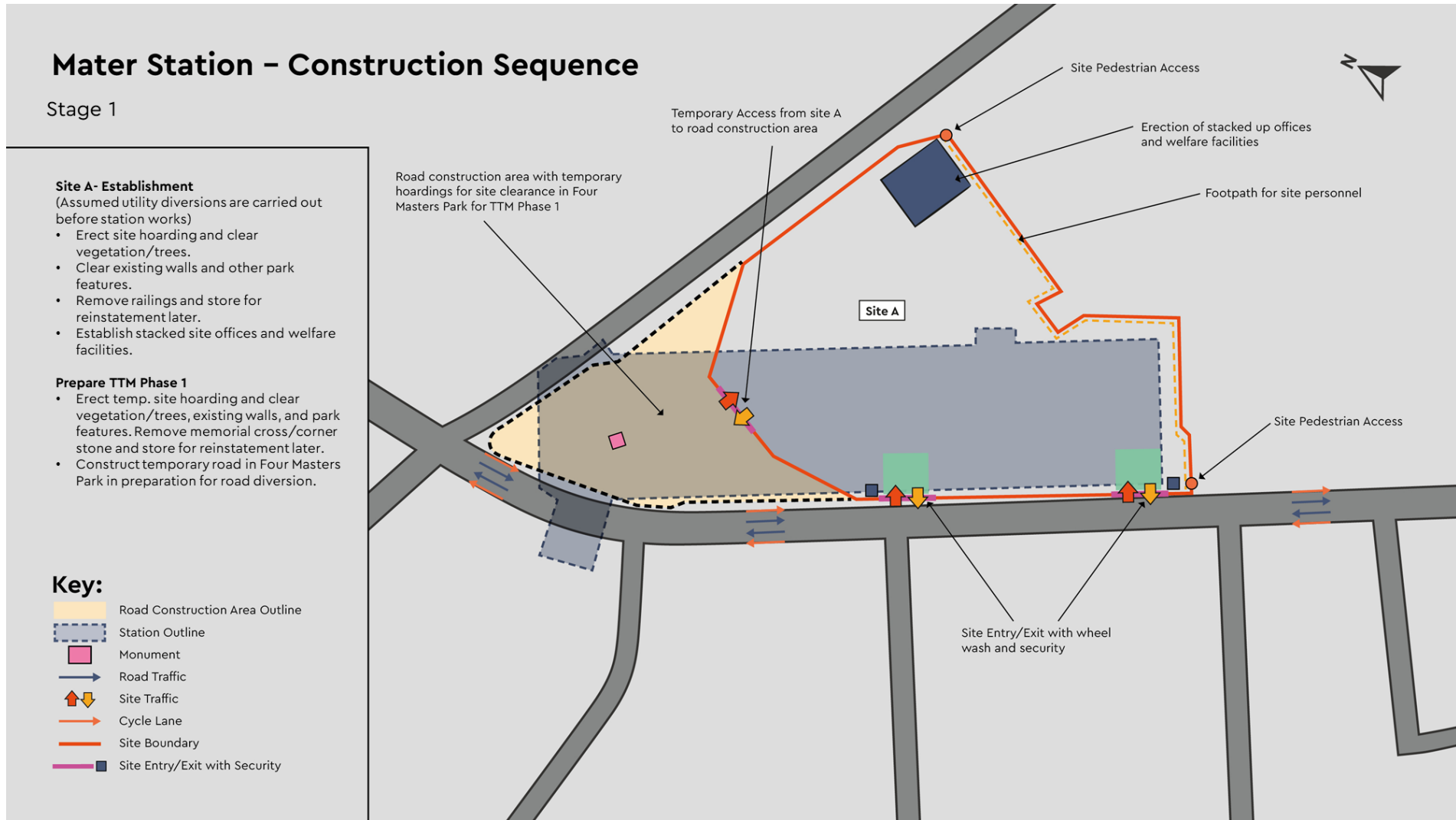


Figure 8-37 Mater Station Stage 1 - Site A Establishment

Mater Station – Construction Sequence

Stage 2

Commission TTM Phase 1

- Divert traffic over unexcavated station box area onto Berkeley Road so that site B can be established to allow construction of vent structure.

Site B Establishment

- Erect site hoarding and clear pavement and road features.

Site A Diaphragm wall & piling works

- Establish Bentonite farm / Mixers / De-sanders and install piling platform as well as guide walls.
- Mobilise secant piling/D-wall plant and commence D-Wall & piling works (one rig, one grab and one hydrofraise) for south & mid eastern section of the station box.
- Install sheet pile adjacent to traffic and cast D-Wall concrete panels and install secant pile wall with soft pile at the D wall/Secant Pile wall joint.

Key:

- Road Traffic
- Site Traffic
- D-Wall panels under construction
- Secant Pile under construction
- Sheet Pile under construction
- Site Boundary
- Site Entry/Exit with Security
- Cycle Lane

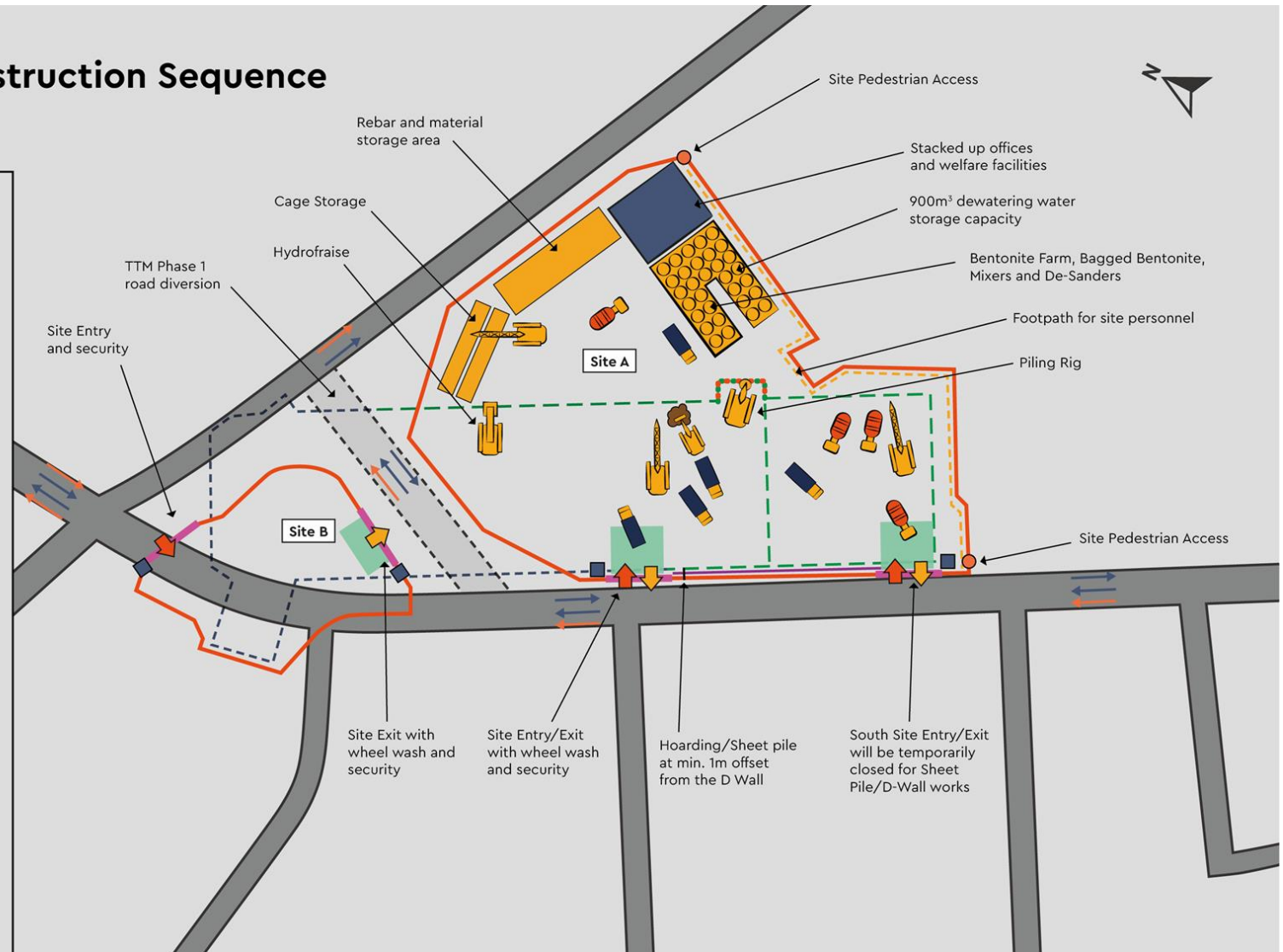


Figure 8-38 Mater Station Stage 2 - Commission TTM Phase 1

Mater Station – Construction Sequence

Stage 3

Site B Piling & roof slab works

- Install piling platform.
- Mobilise secant piling plant by shifting one rig from site A to B and install sheet pile adjacent to traffic to cast secant piled wall with soft pile at the D wall/Secant Pile joint.
- Excavate, break piles and cast vent shaft roof slab.

Prepare TTM Phase 2

- Construct temporary road over vent shaft roof slab in Site B in preparation for road diversion.

Continue Site A Diaphragm Wall works for the south and mid eastern sections

Key:

- D-Wall panels installed
- Road Traffic
- ↑↓ Site Traffic
- D-Wall panels under construction
- Secant Pile under construction
- Sheet Pile under construction
- Site Boundary
- Shaft Void covered with steel plate
- ↑↓ Site Entrance/Exit with Security
- Cycle Lane
- Road Construction Area Outline

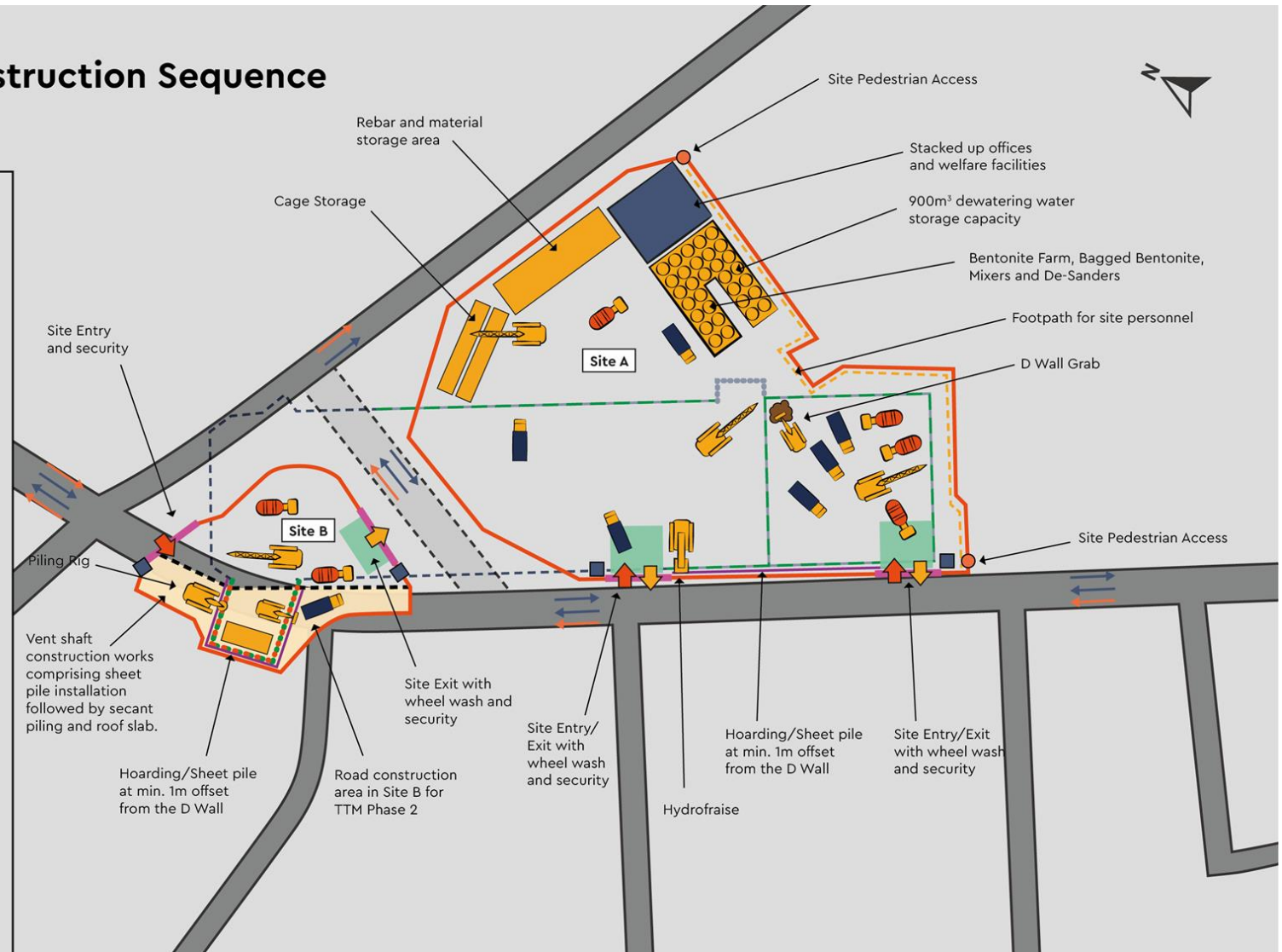


Figure 8-39 Mater Station Stage 3 - TTM Phase 2

Mater Station – Construction Sequence

Stage 4

Commission TTM Phase 2

- Redirect traffic onto Berkeley Road over backfilled vent shaft roof slab and steel deck, covering the shaft void to street level.
- Redirect traffic onto Eccles Street to finish D-Wall and piling works.

Finish Diaphragm wall & piling works

- Construct the remaining piles & D-Wall to the north-east edge, north and north-western section as well as any remaining around the station.

Key:

- Road Traffic
- Site Traffic
- D-Wall panels installed
- D-Wall under construction
- Secant Piles under construction
- Sheet Pile installed
- Site Boundary
- Shaft Void covered with steel plate
- Site Entrance/Exit
- Vent Shaft/Station Roof Slab
- Cycle Lane

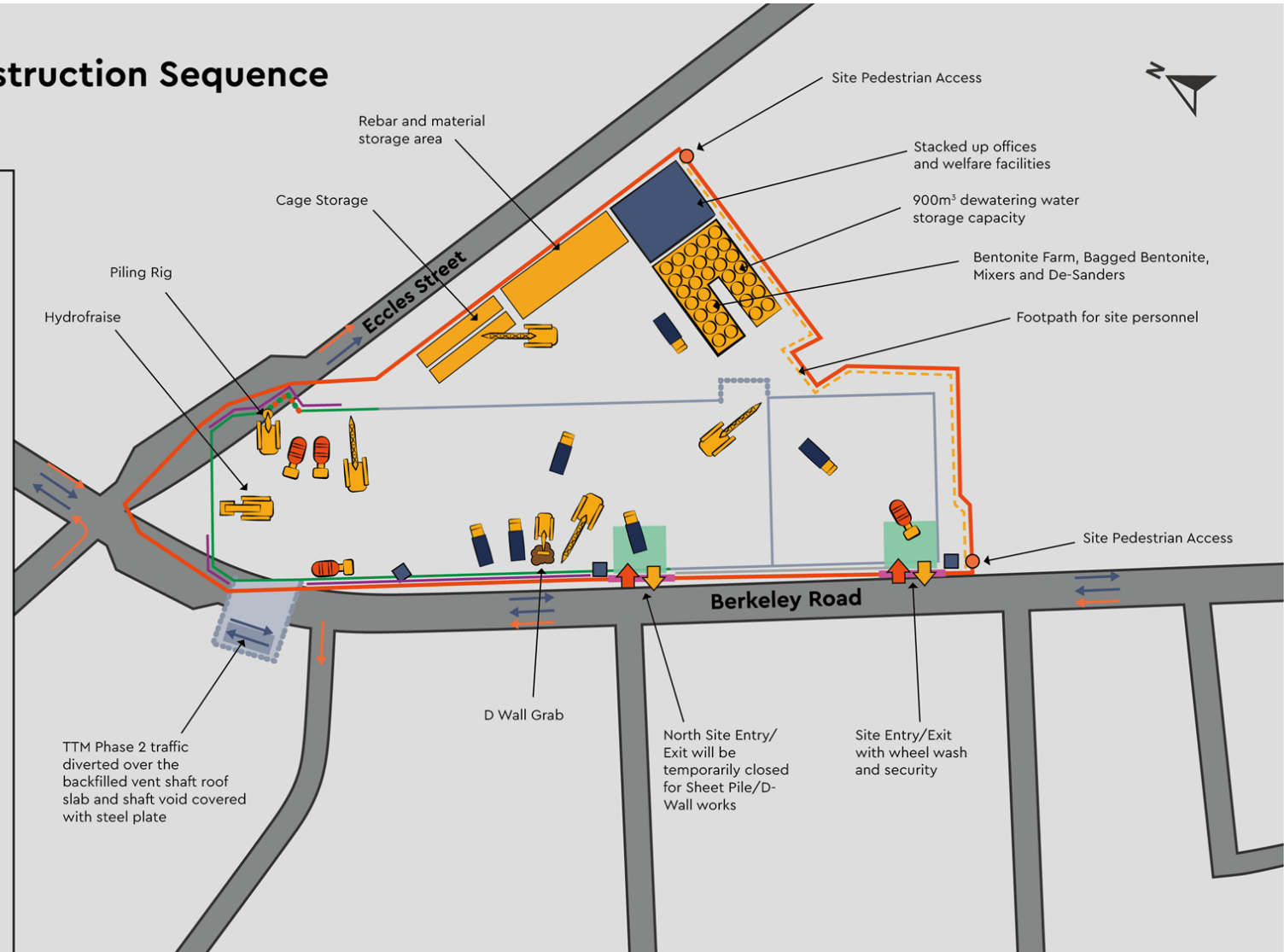


Figure 8-40 Mater Station Stage 4 -Roof Slab Construction












Mater Station – Construction Sequence

Stage 5

Roof slab construction

- Demobilise foundation equipment (D- wall grab/hydrofraise/bentonite farm & piling rig equipment).
- Trim D-Walls and cast capping beams.
- Construct roof slab (with openings for top-down construction) in 10m approximate sections along the length of the station.
- Prepare for top-down excavation and construction.

Key:

-  Sheet Pile installed
-  Voids for top-down works (Indicative)
-  Road Traffic
-  Site Traffic
-  D-Wall installed
-  Secant Pile installed
-  Site Boundary
-  Voids covered with steel plate
-  Site Entrance/Exit
-  Vent Shaft/Station Roof Slab
-  Cycle Lane

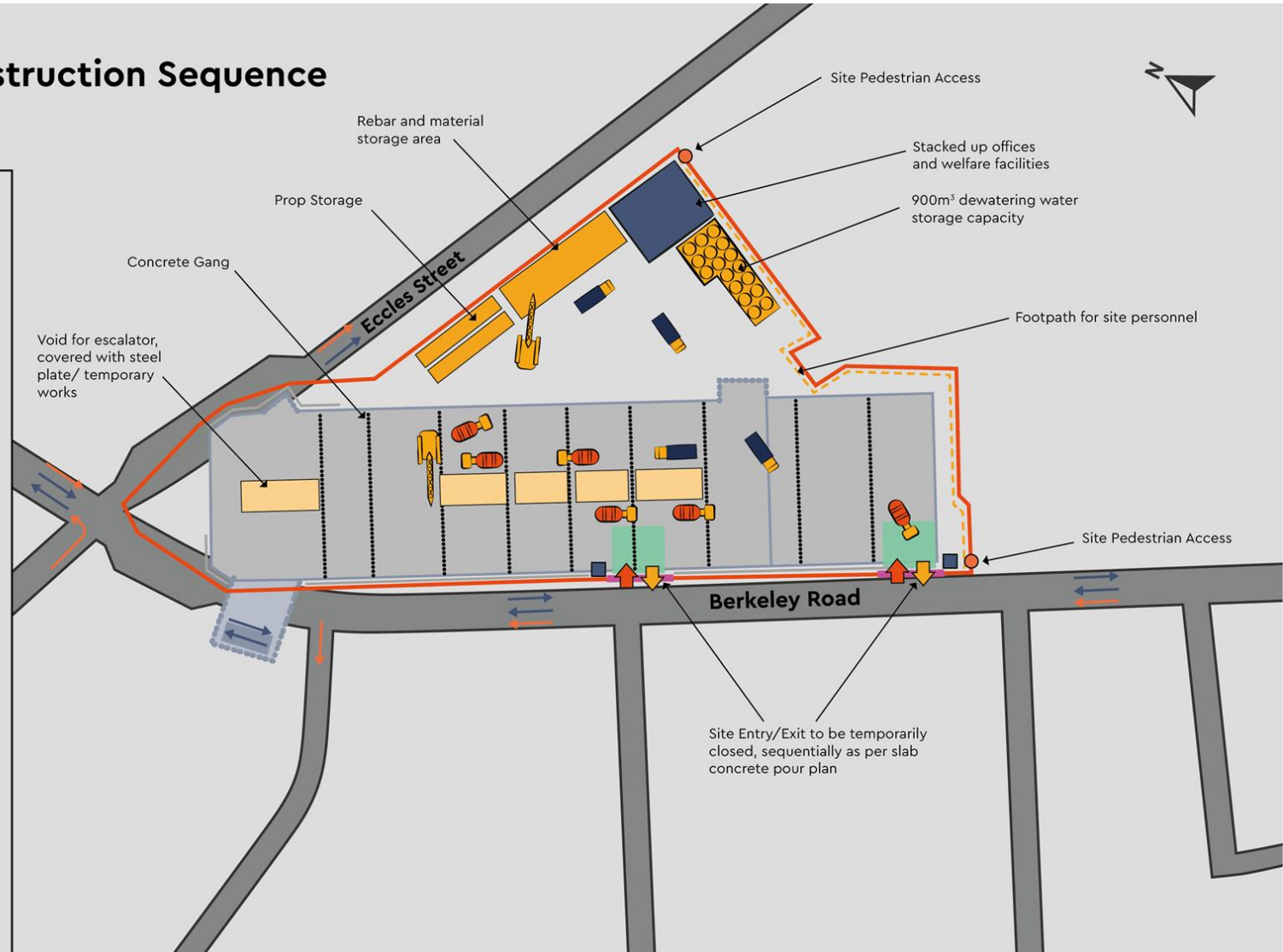


Figure 8-41 Mater Station Stage 5 – Roof slab Construction












Mater Station – Construction Sequence

Stage 6

Top-down Construction works

- Undertake top-down construction of main station box.
- Excavate Berkeley Road vent shaft from the station side.
- Excavate from one side and re-bar, props and concrete deliveries from the other side for top-down excavation phase.

Key:

-  Sheet Pile installed
-  Voids for top-down works (Indicative)
-  Road Traffic
-  Site Traffic
-  D-Wall installed
-  Secant Pile installed
-  Site Boundary
-  Voids covered with steel plate
-  Site Entrance/Exit
-  Vent Shaft/Station Roof Slab
-  Cycle Lane

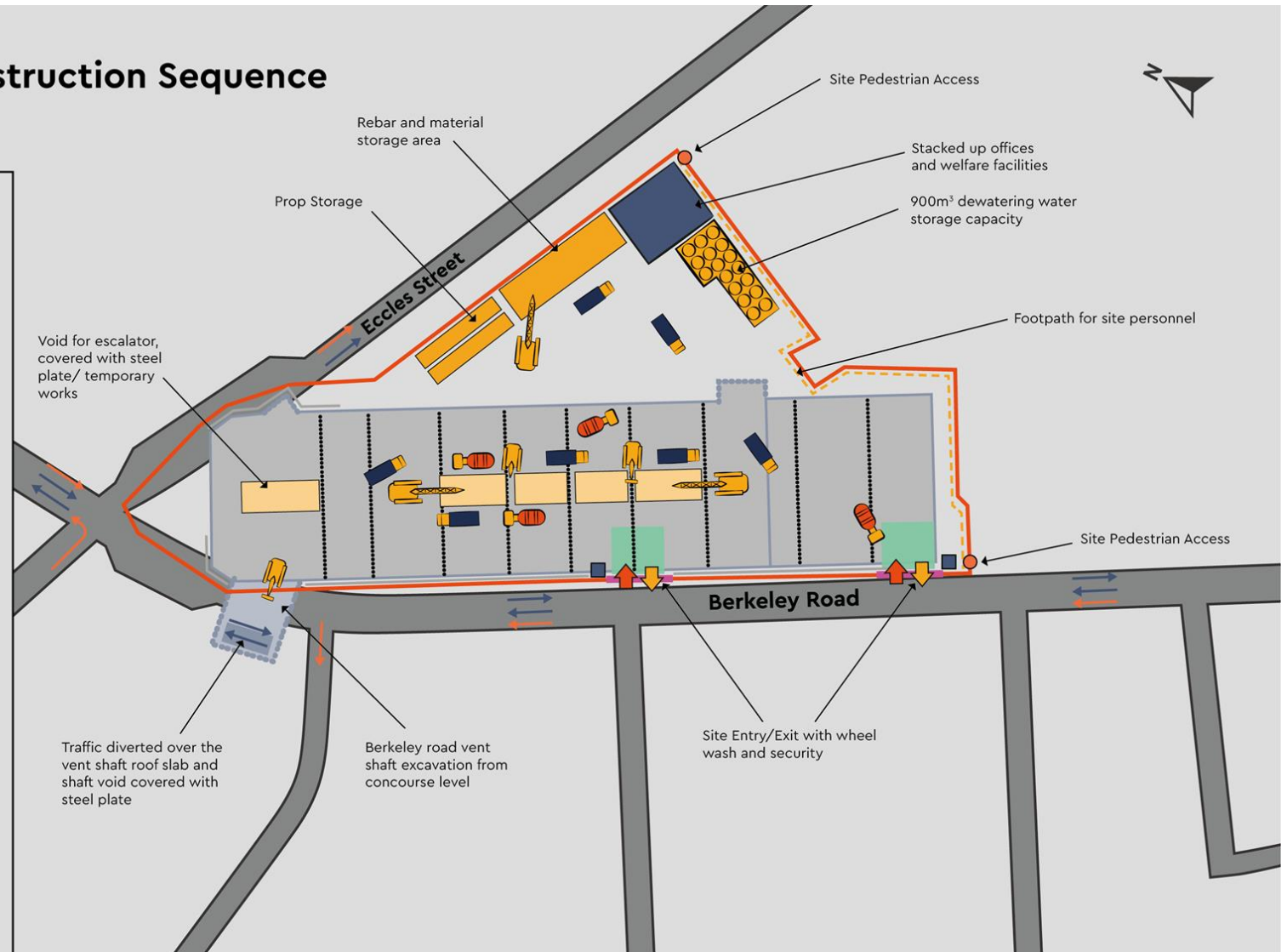


Figure 8-42 Mater Station Stage 6 – Station Void Fit-out

Mater Station – Construction Sequence

Stage 7













Station void fit-out

- Complete surface structure works, and hand over station to MEP fit out contractor after that complete station void fit out works.

Prepare TTM Phase 3

- Construct temporary road over the northern edges (both on Berkeley Road and Eccles Street) of the station in preparation for road diversion.

Key:

-  Sheet Pile installed
-  Road Construction Area Outline
-  Void fit-out
-  Road Traffic
-  Site Traffic
-  D-Wall installed
-  Secant Pile installed
-  Site Boundary
-  Voids covered with steel plate
-  Site Entrance/Exit
-  Vent Shaft/Station Roof Slab
-  Cycle Lane

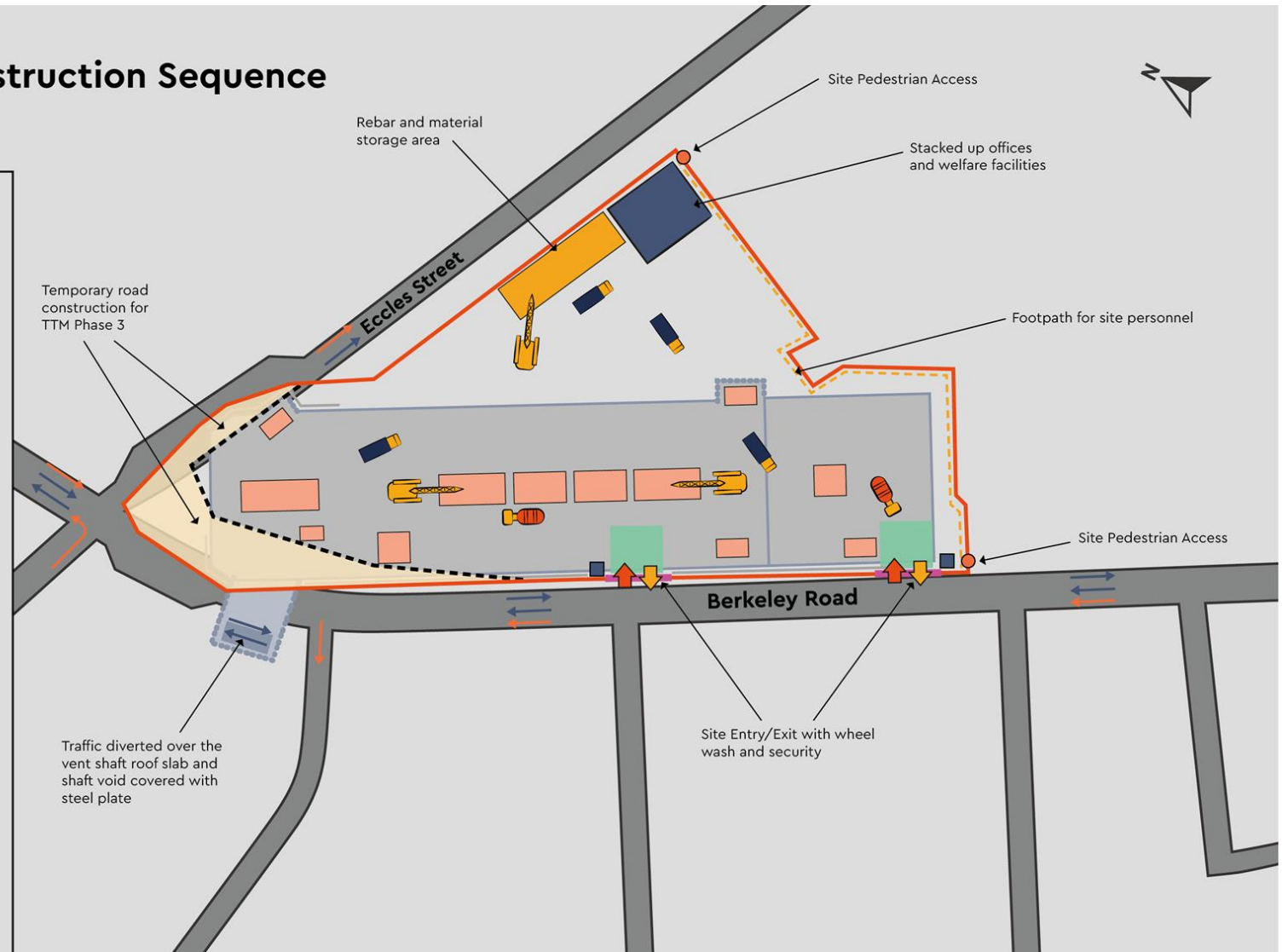


Figure 8-43 Mater Station Stage 7 - Commission TTM Phase 3

Mater Station – Construction Sequence

Stage 8

Commission TTM Phase 3

- Re-divert traffic over northern edges of station box, onto Berkeley Road and Eccles Street, over the backfilled station box for final vent shaft fit-out.

Site D shaft void fit-out & reinstatement

- Re-visit vent shaft location for final fit-out by taking over Site D and supplying small materials through the vent adit from the station box.
- Complete surface structure works, and hand over vent shaft to MEP fit out contractor, after that complete shaft void fit out works and reinstate site D as per the final design layout.

Site C Reinstatement works

- Reinstall the Memorial Cross and Corner stone, railings, trees and features of the landscape to the final design layout in Four Masters Park.

Key:

- Road Traffic
- Site Traffic
- D-Wall installed
- Secant Pile installed
- Site Boundary
- Fitted voids
- Site Entrance/Exit
- Vent Shaft/Station Roof Slab
- Cycle Lane
- Skylights
- Monument

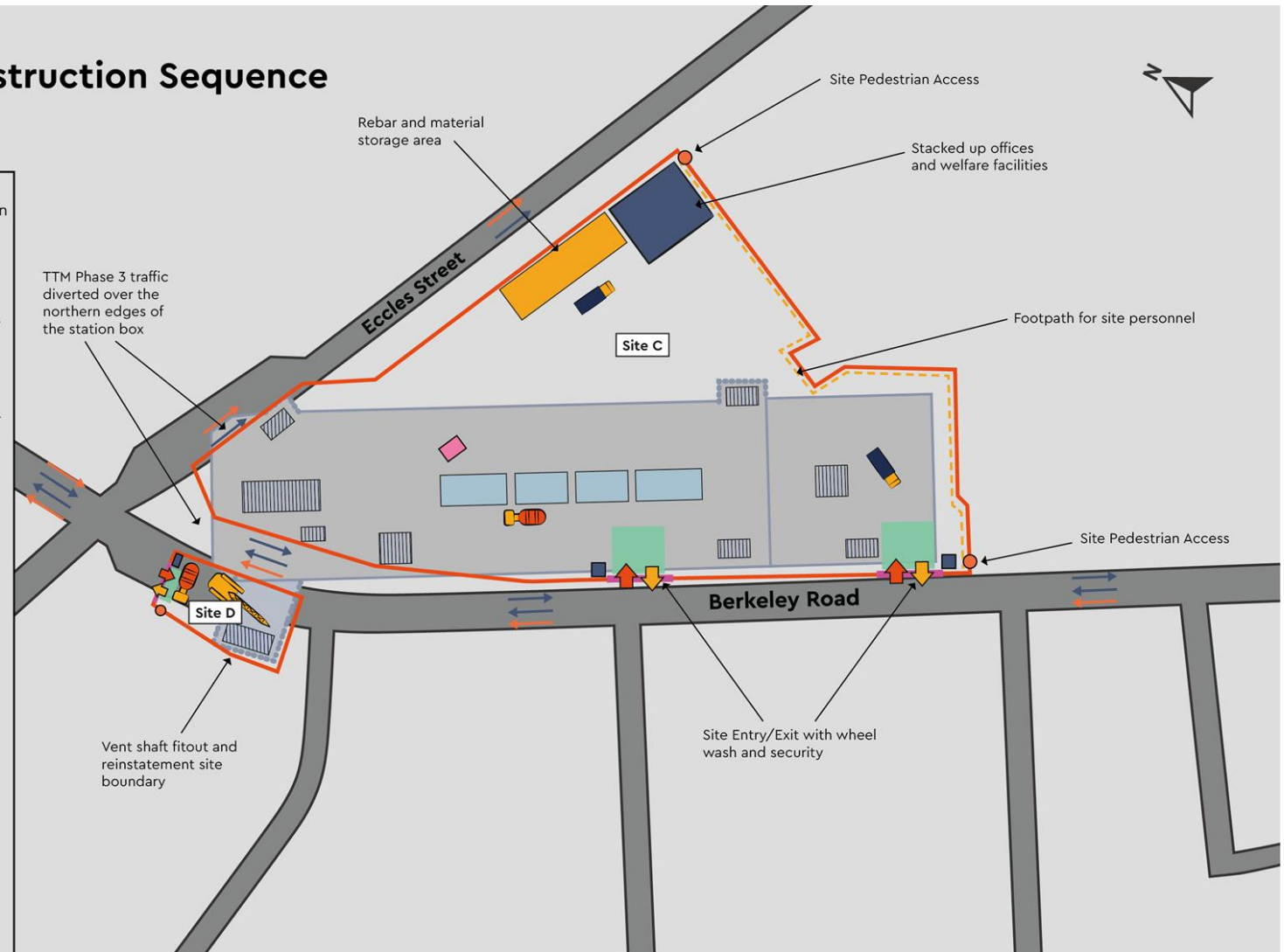


Figure 8-44 Mater Station Stage 8 – Prepare and Commission TTM

Mater Station - Construction Sequence

Stage 9

Prepare & Commission TTM as per final design layout

- Reinstall pavement and other road features and other features on Berkeley Road and Eccles Street as per the final design layout.
- Re-divert the traffic flow to the final design layout on Berkeley Road and Eccles Street.

Complete Site Reinstatement works

- Extend site boundary in the north western edge of Four Masters Park to reinstate the remaining park railings and the surrounding pavement.
- Finish all site reinstatement works as per the final design layout and de-mobilise.

Key:

- Road Traffic
- Site Traffic
- D-Wall installed
- Secant Pile installed
- Site Boundary
- Fitted voids
- Site Entrance/Exit
- Vent Shaft/Station Roof Slab
- Cycle Lane
- Skylights
- Memorial Cross

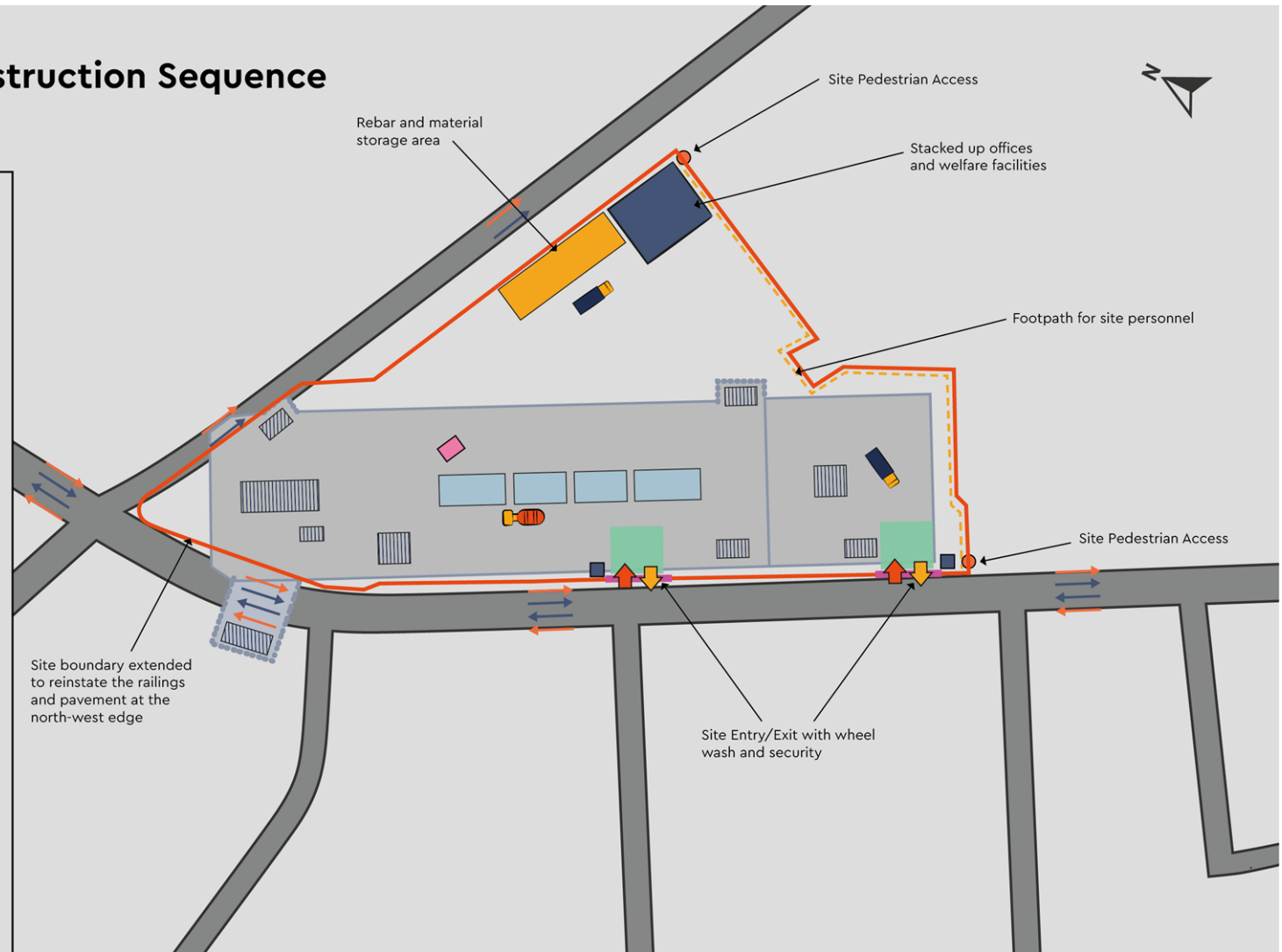


Figure 8-45 Mater Station - Stage 9

8.10. O'Connell Station – Development Progressed after Station Completion

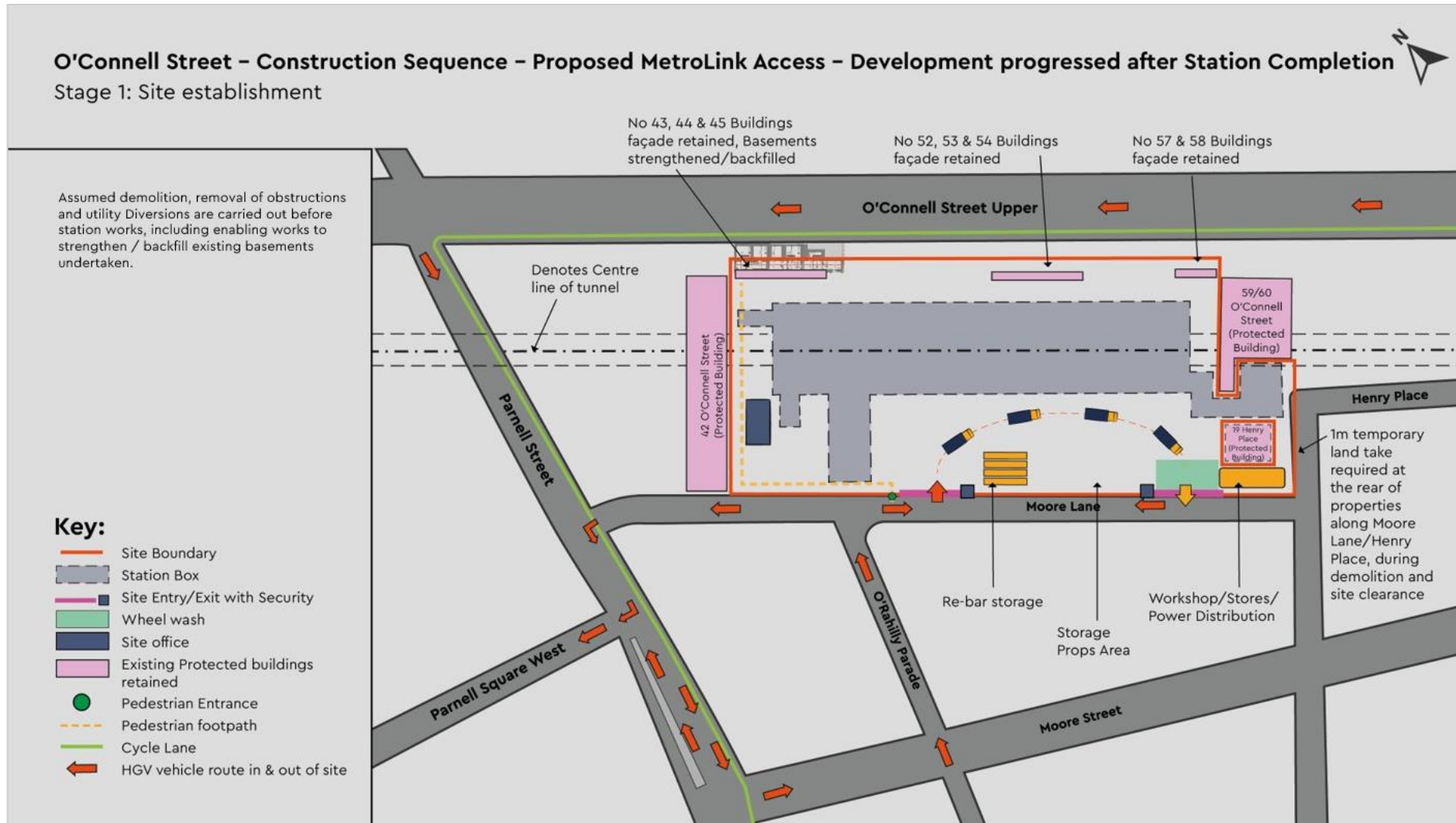


Figure 8-46 O'Connell Street Stage 1 – Site Establishment

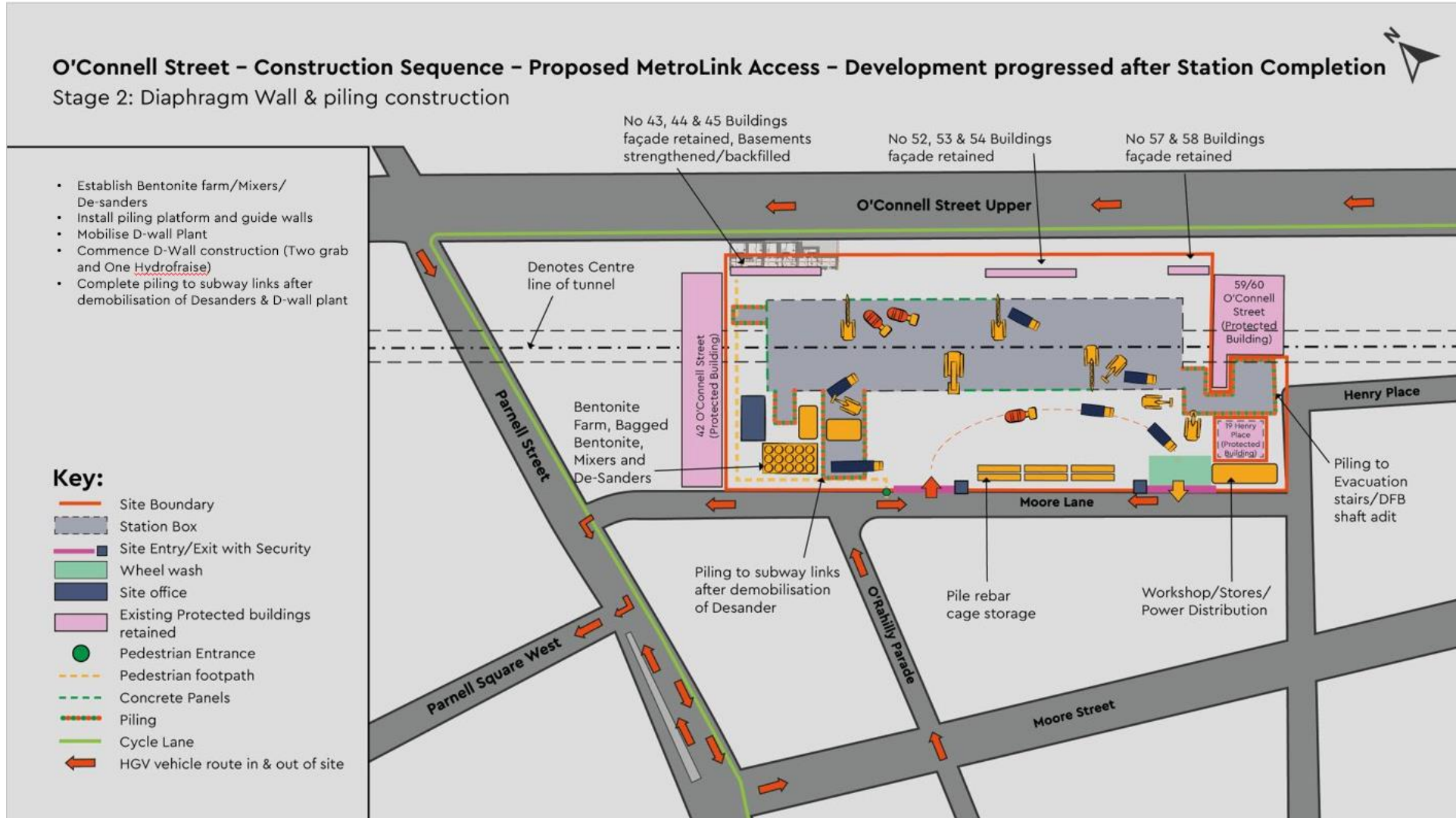


Figure 8-47 O'Connell Street Stage 2 – Diaphragm wall & piling construction

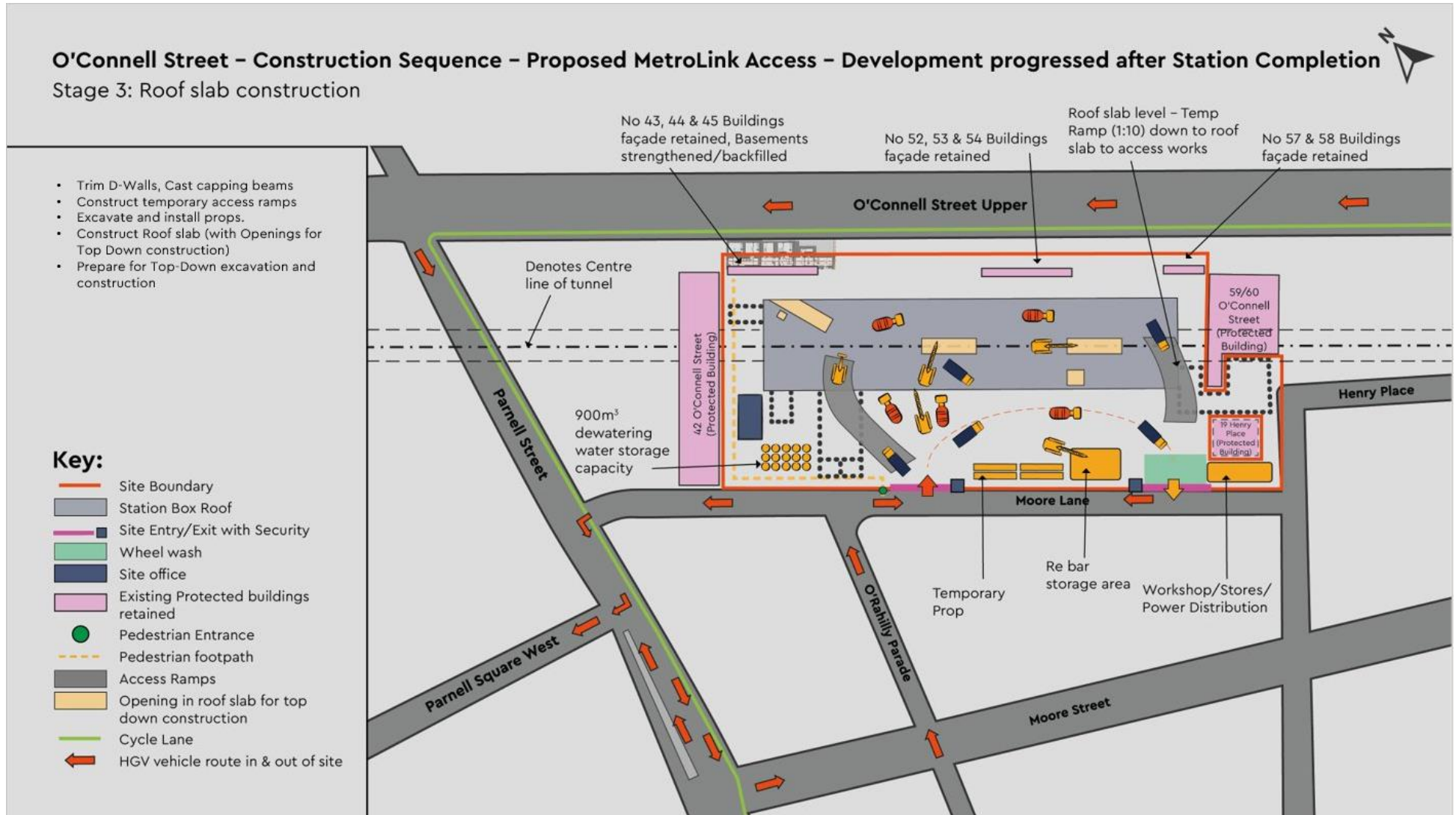


Figure 8-48 O'Connell Street Stage 3 – Roof slab construction

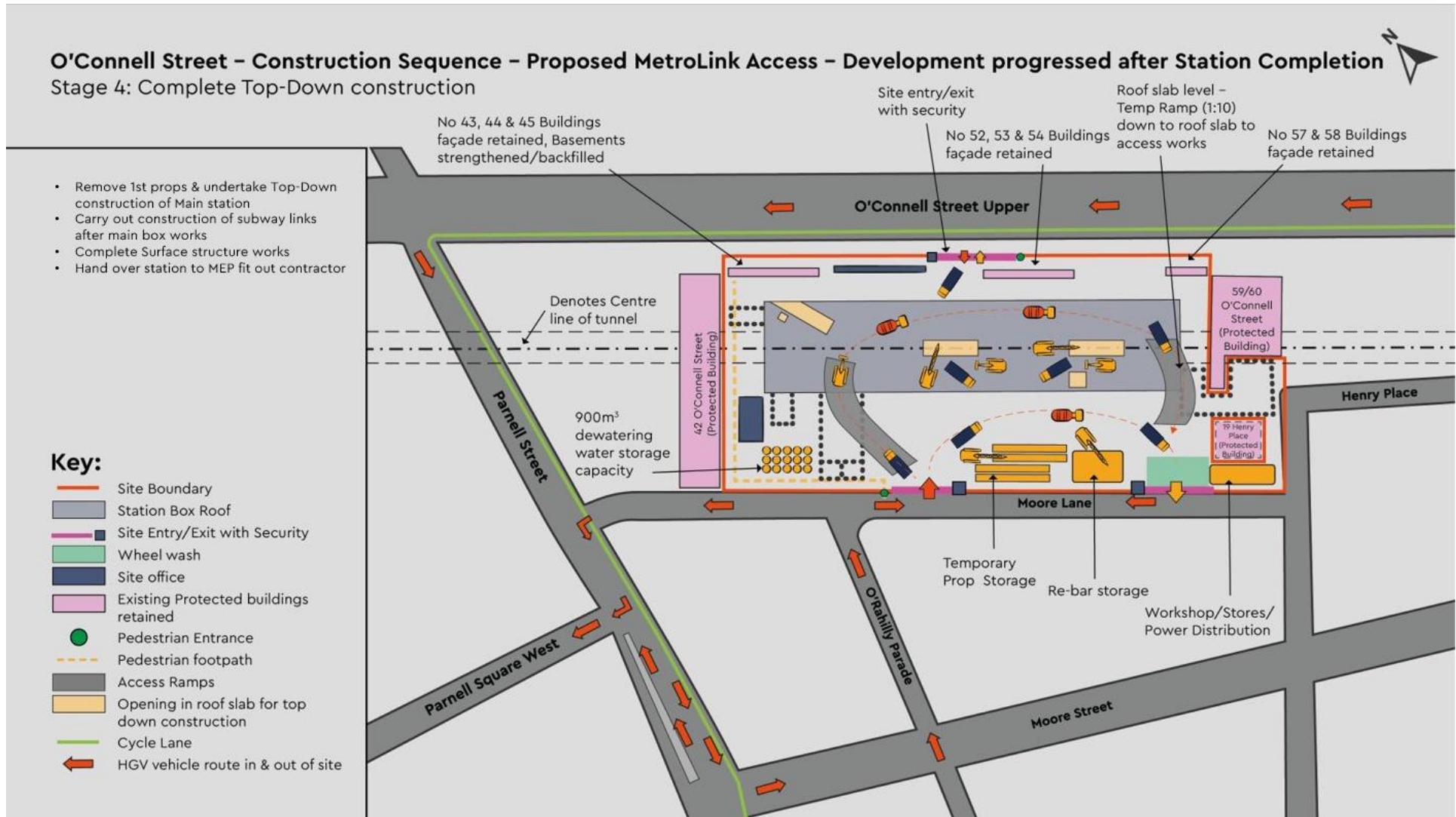


Figure 8-49 O'Connell Street Stage 4 – Complete Top-down construction

O'Connell Street – Construction Sequence – Proposed MetroLink Access – Development progressed after Station Completion

Stage 5: Construction Sequence/Subway link

The subway, vent shafts, lift shafts and evacuation staircase, escalator barrel project outside the station diaphragm wall box on the west side.

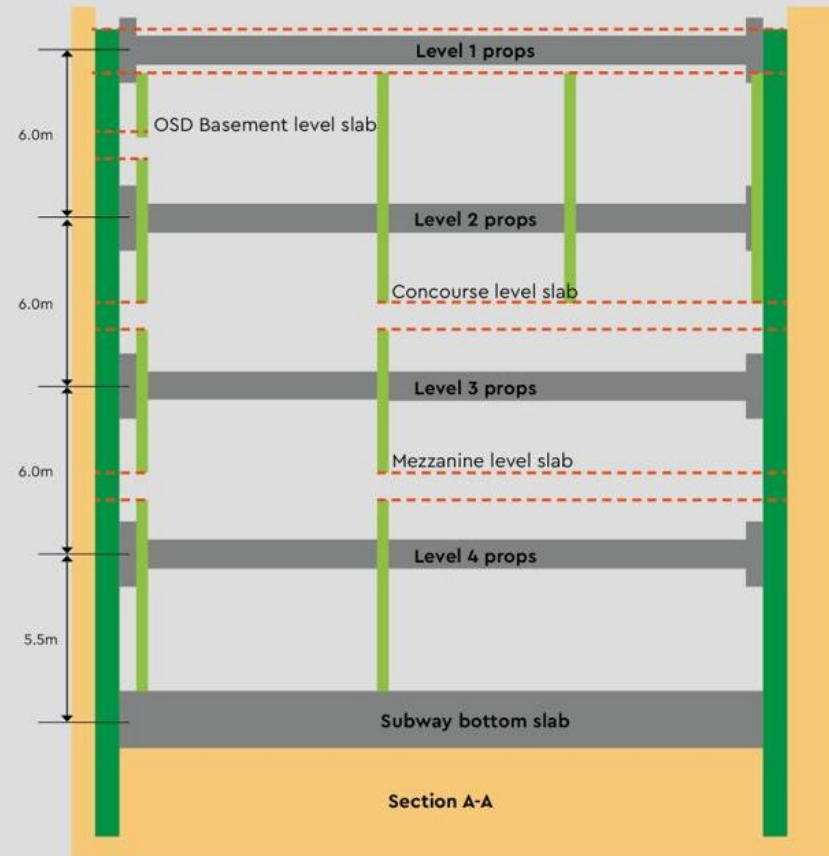
- These will be constructed within a secant piled box (Bottom up) as shown on the diagrams. These will be piled, excavated, propped, followed by bottom slab cast, install formwork and construct slabs at Mezzanine, Concourse, OSD basement and street level. On removal of temporary props and formwork, internal passages and lining walls alongside the secant piled wall, lift shafts/service shafts and staircase are constructed. The void below the Concourse slab between the escalator barrel separating wall and south secant piled wall can be backfilled if required.
- On completion of the subway works, it is assumed a temporary steelwork canopy is installed at street level over the subway link by the MWC until the permanent access structure is constructed by the OSD developer



Section B-B, Subway/link & Station



Plan, Subway/link at Platform Level



Section A-A

Figure 8-50 O'Connell Street Stage 5 – Construction sequence/subway link

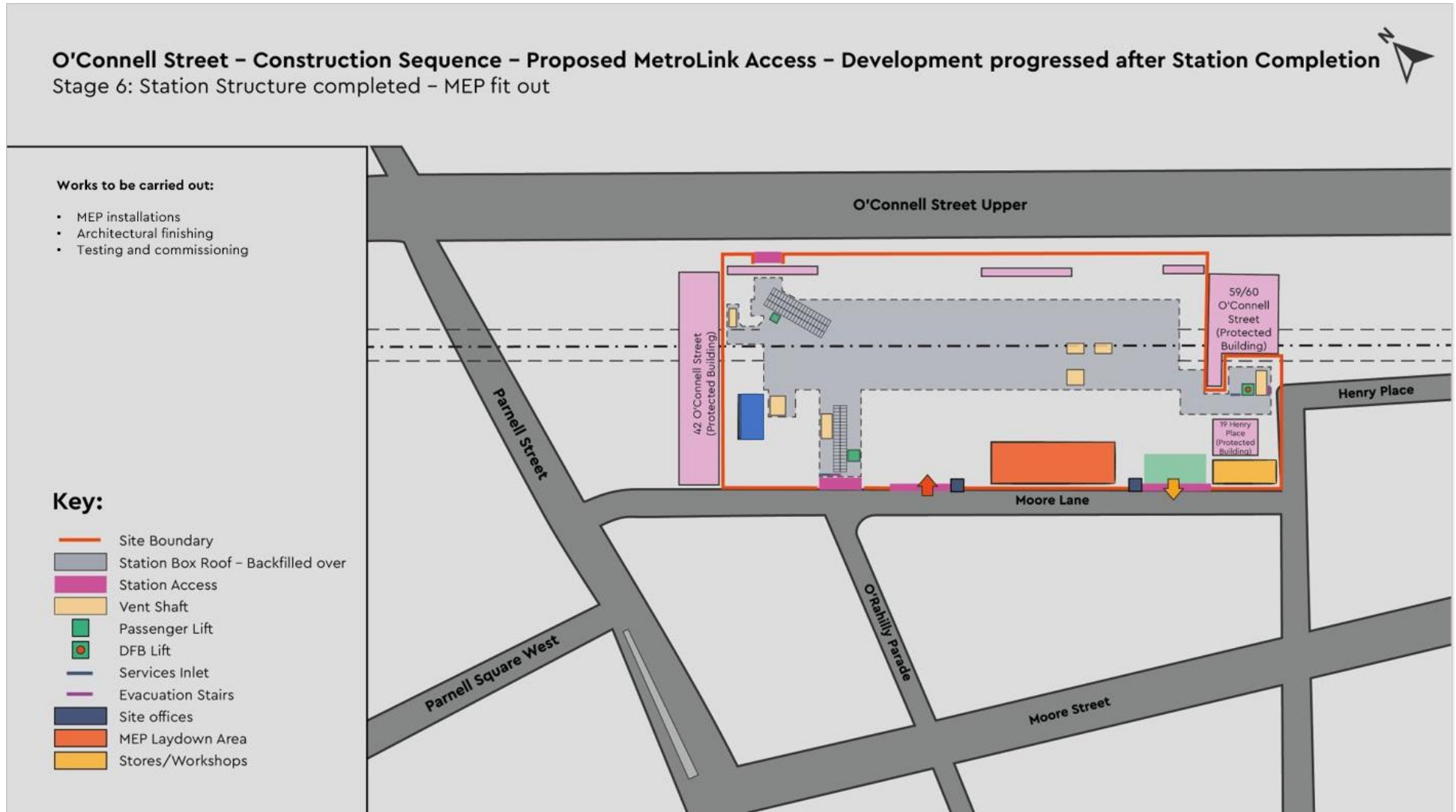


Figure 8-51 O'Connell Street Stage 6 - Station structure completed - MEP fit out

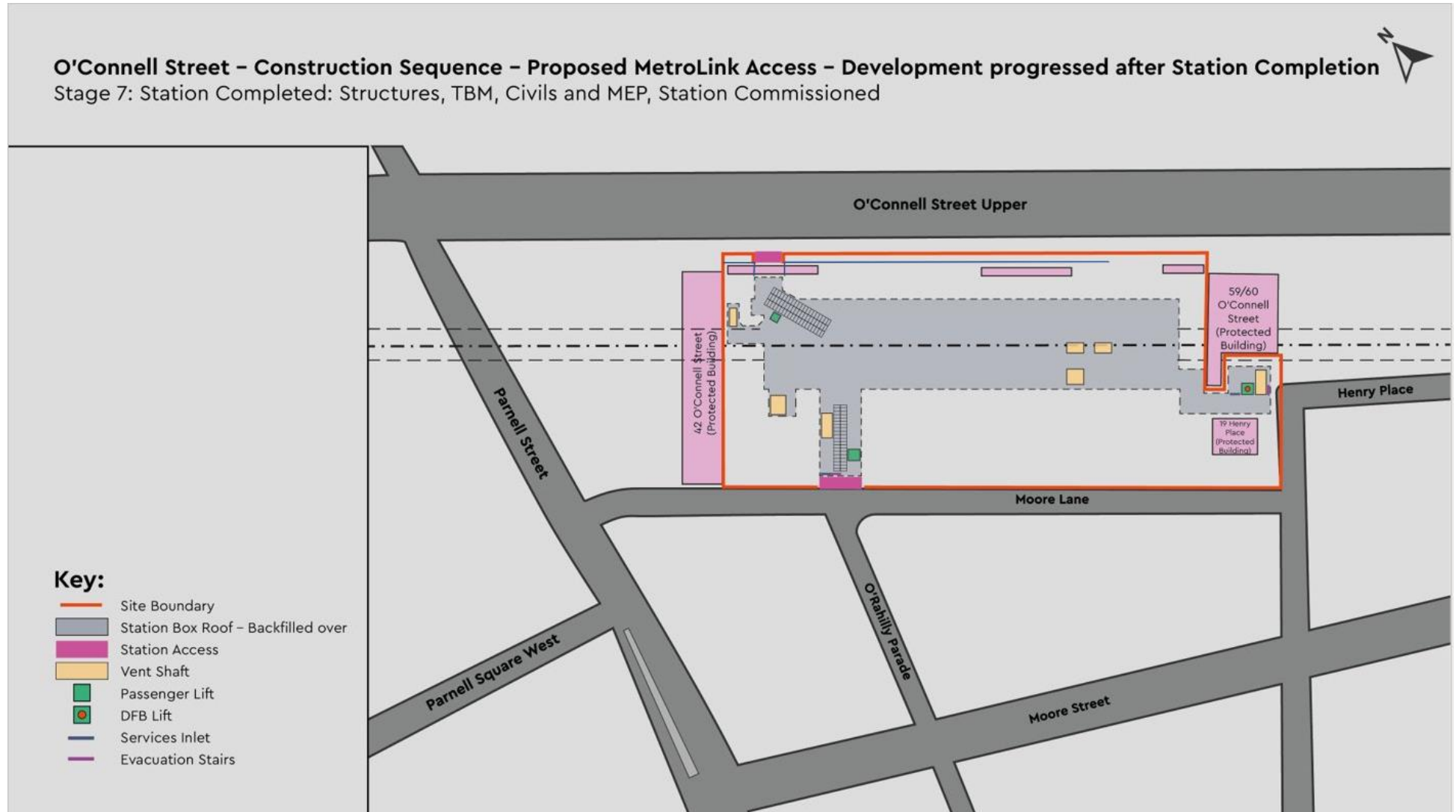


Figure 8-52 O'Connell Street Stage 7 - Station completed: Structures, TBM, Civils and MEP, Station commissioned

8.11. O'Connell Street – Post Developer Completed Station

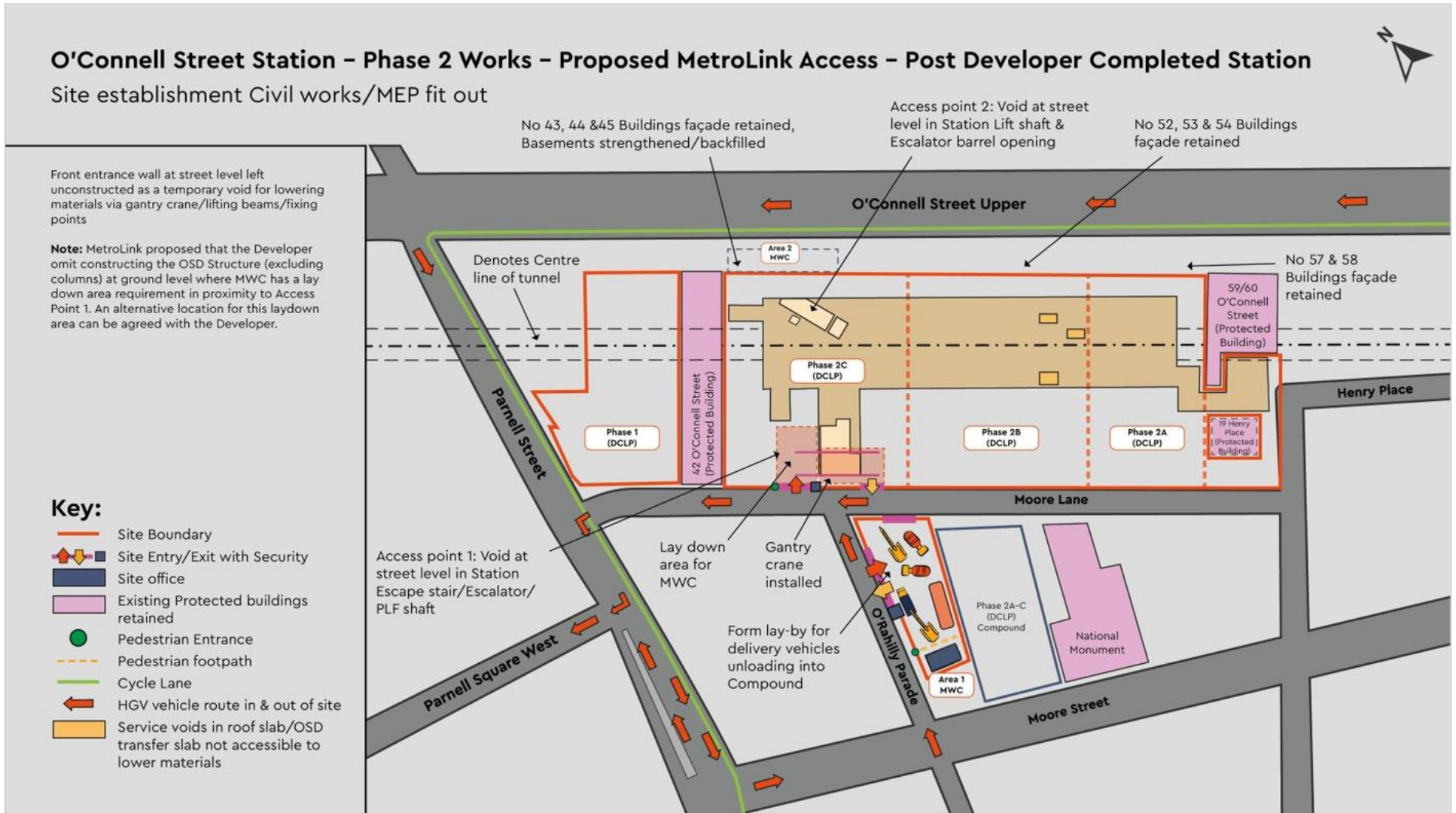


Figure 8-53 O'Connell Street – Site establishment Civil works/MEP fit out

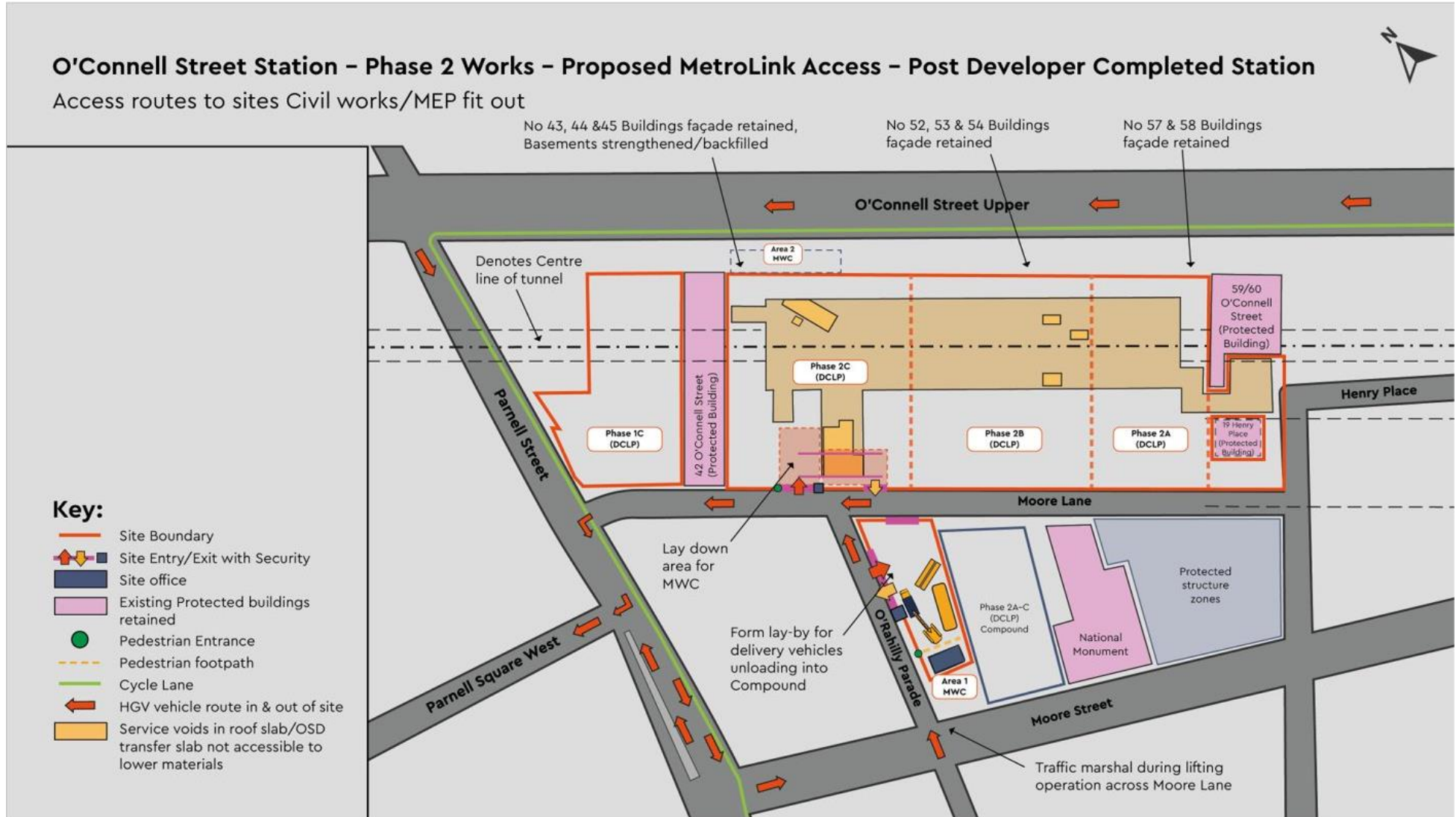


Figure 8-54 O'Connell Street – Access routes to sites Civil works/MEP fit out

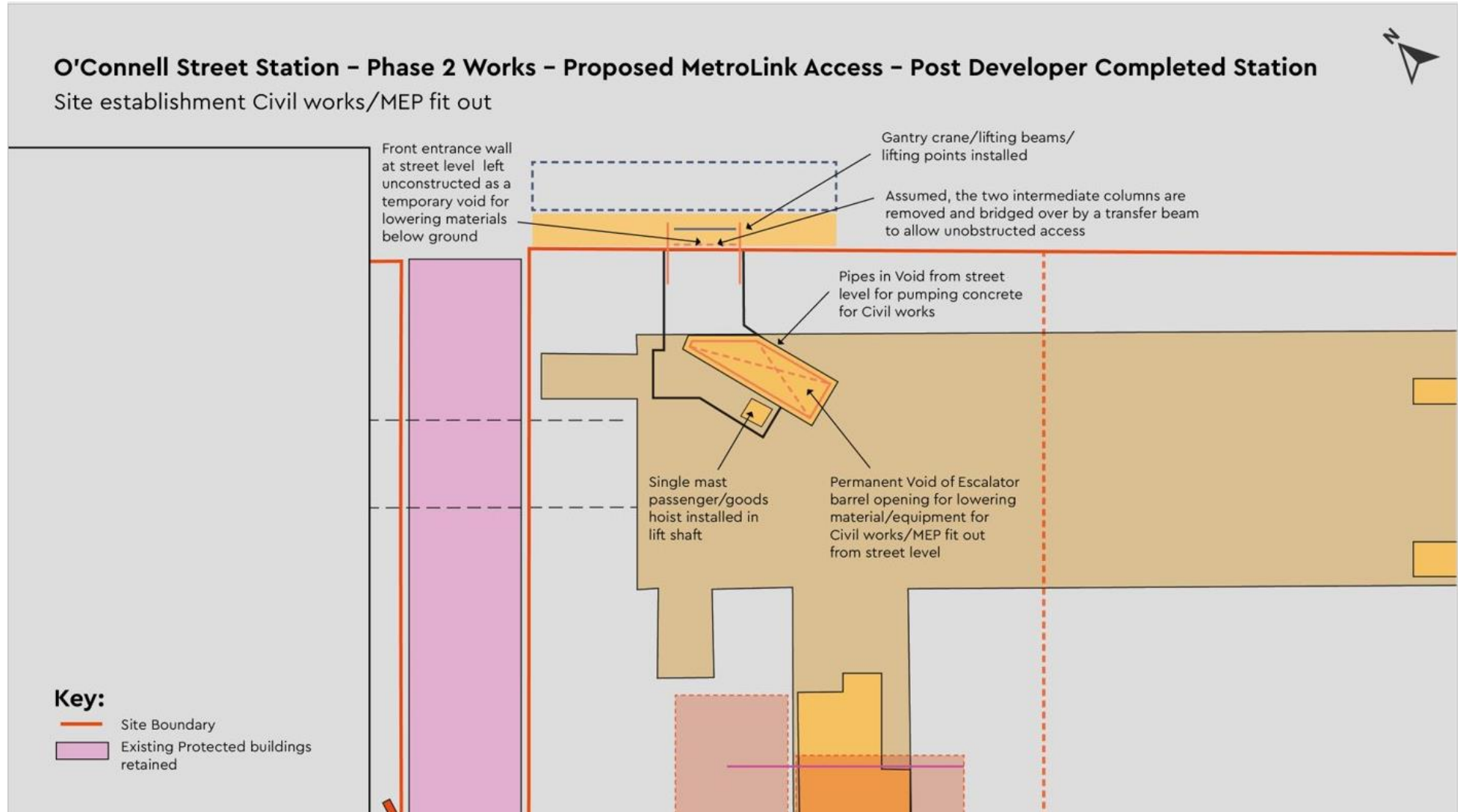


Figure 8-55 O'Connell Street – Site establishment Civil works/ MEP fit out

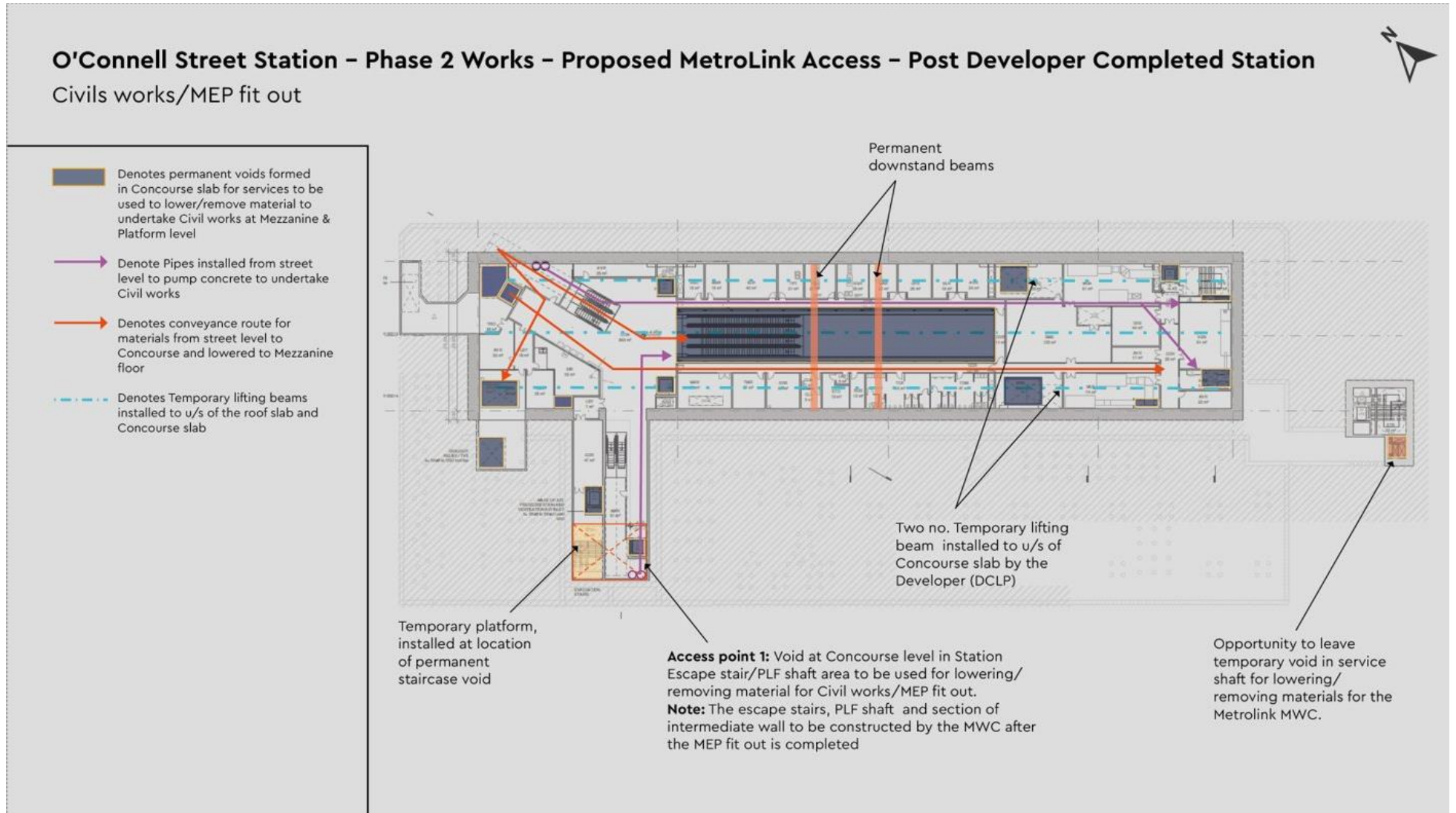


Figure 8-56 O'Connell Street – Civil works/ MEP fit out

O'Connell Street Station – Phase 2 Works – Proposed MetroLink Access – Post Developer Completed Station

Civil works/MEP fit out







-  Denotes permanent voids formed in Mezzanine slab for services, to be used to lower/remove material to undertake Civil works at Mezzanine & Platform level
-  Denote Pipes installed from street level to pump concrete to undertake Civil works
-  Denotes conveyance route for materials from street level to Concourse and lowered to Mezzanine floor
-  Denote glazed flooring



Figure 8-57 O'Connell Street – Civil works/ MEP fit out



O'Connell Street Station – Phase 2 Works – Proposed MetroLink Access – Post Developer Completed Station

Civil works/MEP fit out. Construct Mezzanine slab

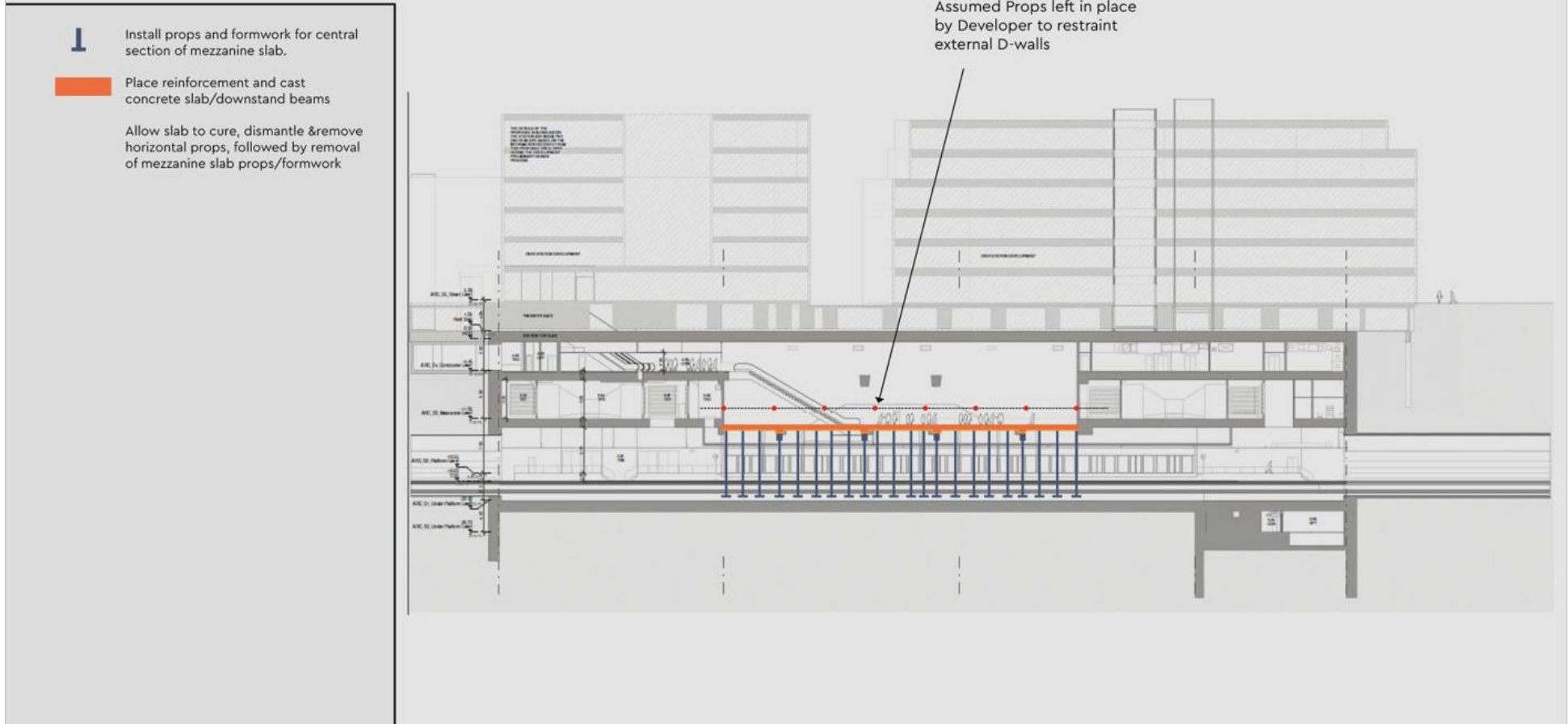


Figure 8-58 O'Connell Street – Civil works/ MEP fit out Construct mezzanine slab

8.12. Tara Station

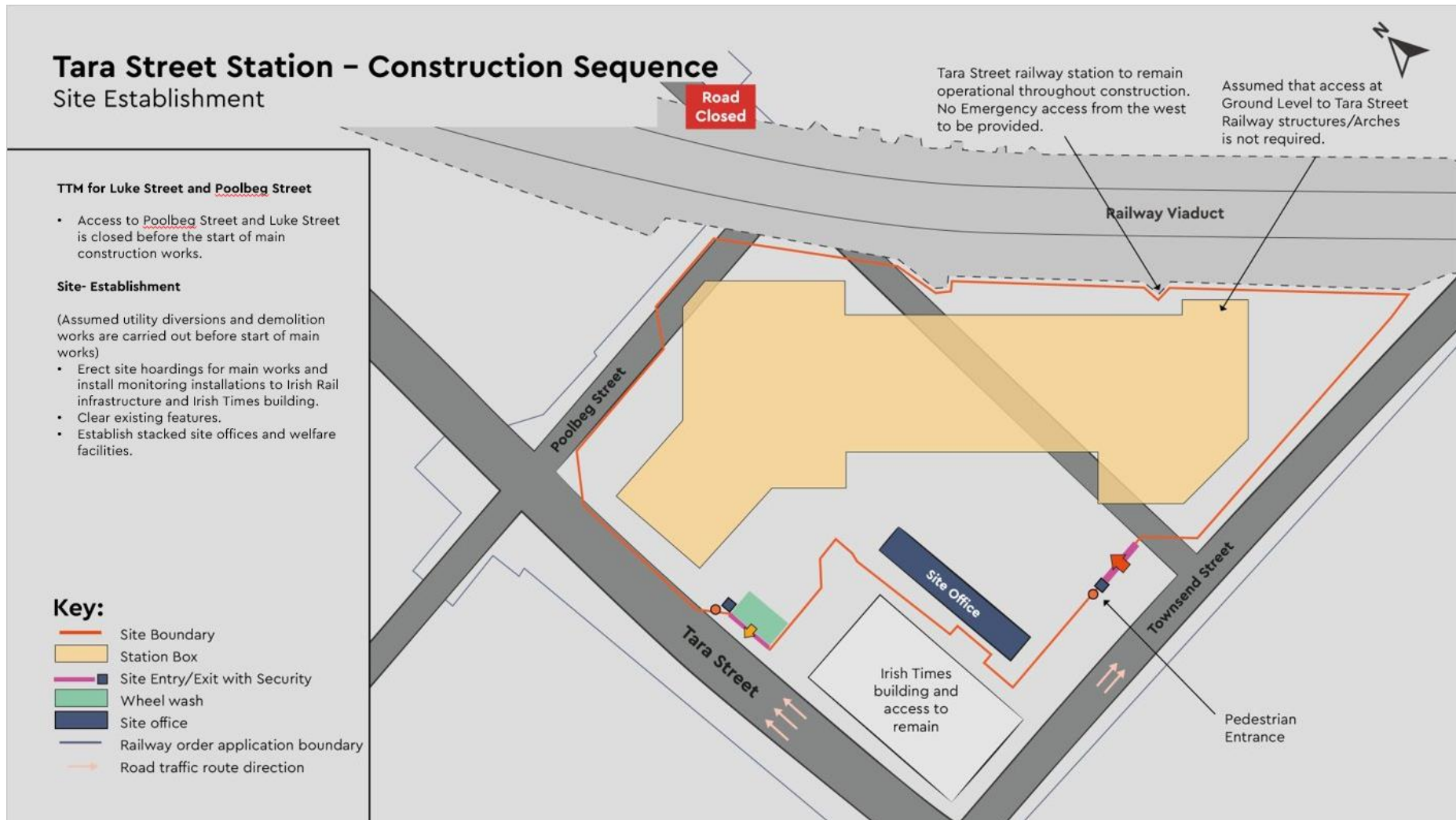


Figure 8-59 Tara Station Stage 1 - TTM Works

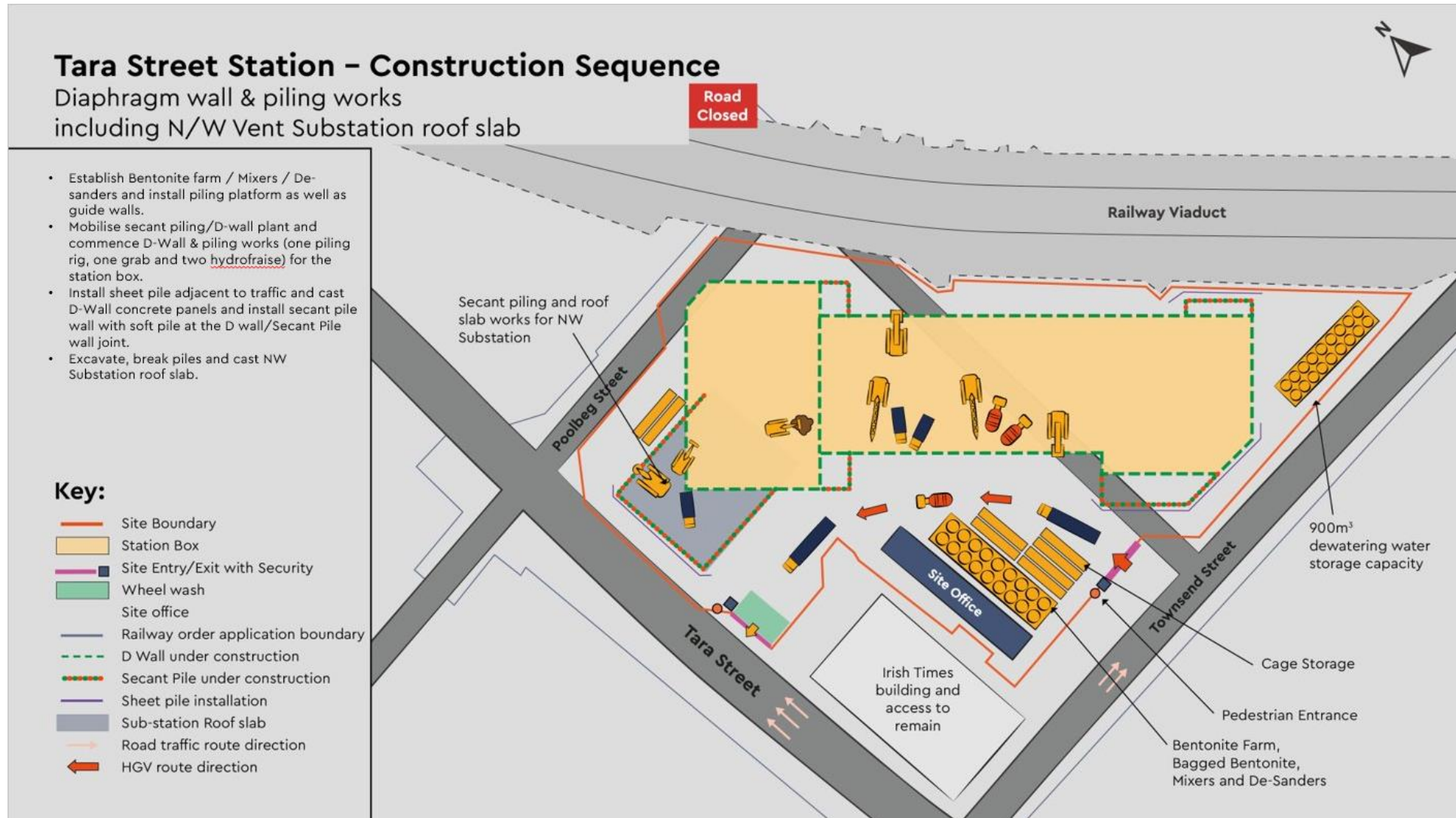


Figure 8-60 Tara Station Stage 2 Diaphragm Wall and Piling Works

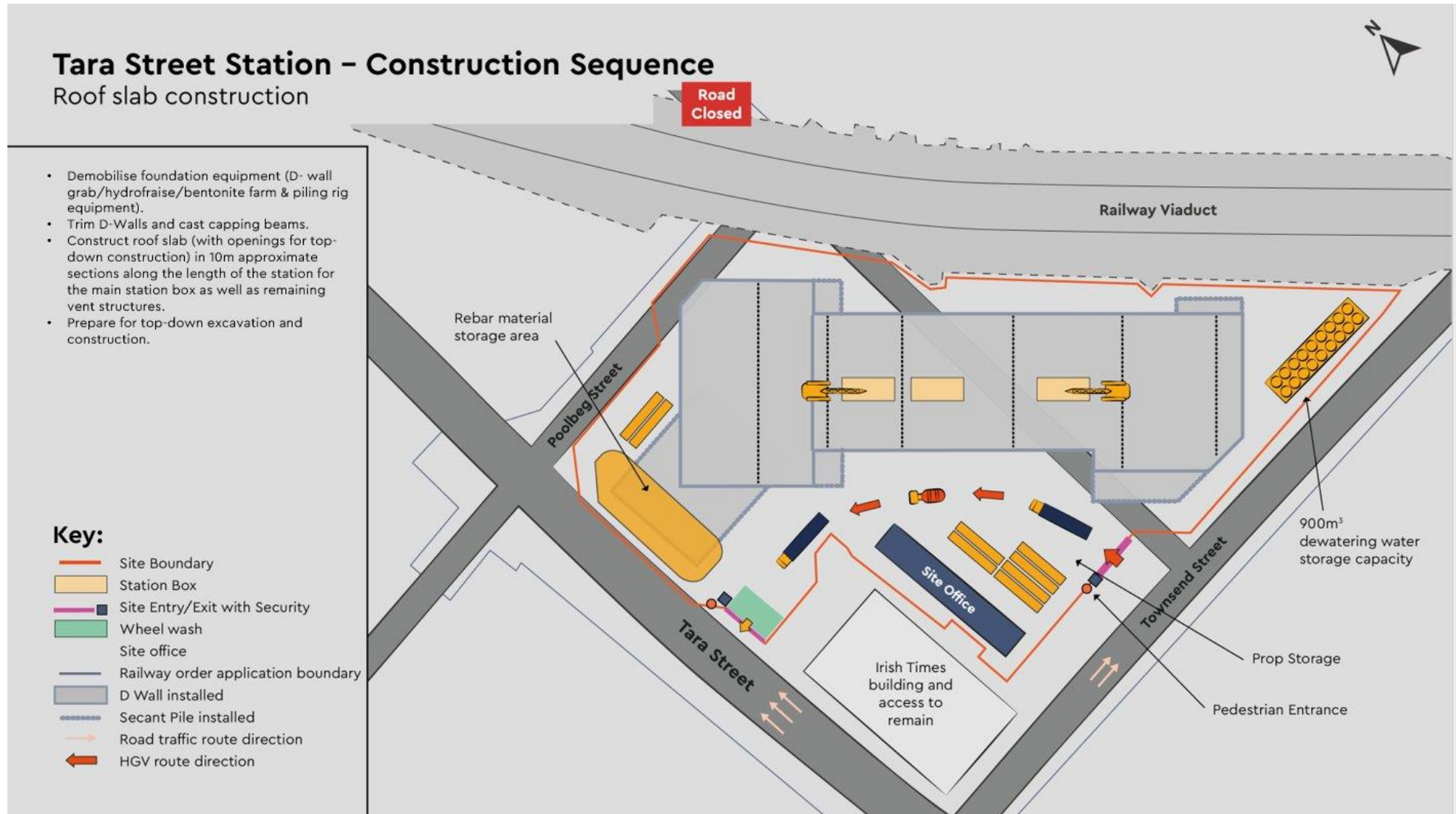


Figure 8-61 Tara Station Stage 3 - Roof Slab Construction

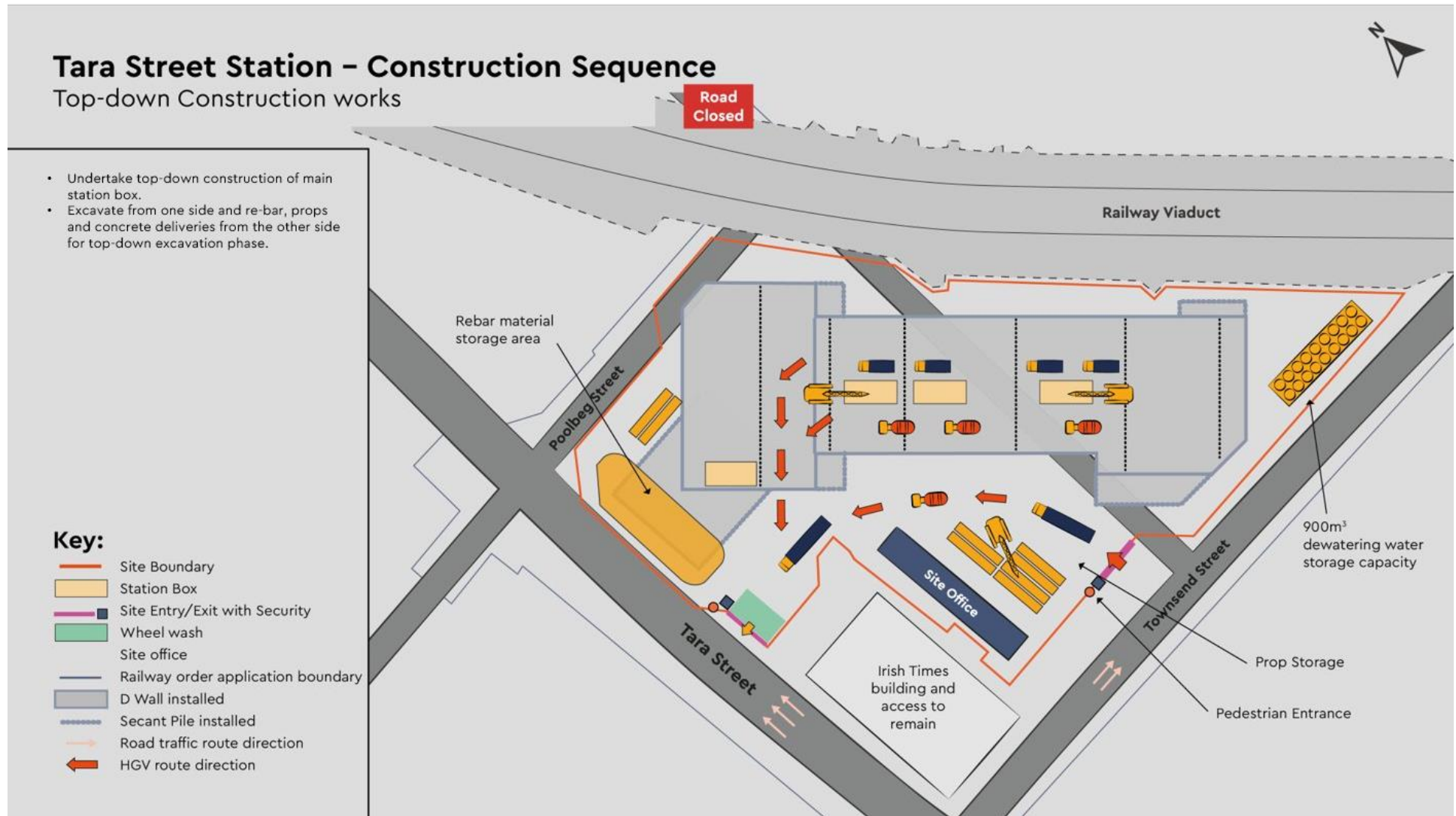


Figure 8-62 Tara Station Stage 4 - Top-down Construction Works

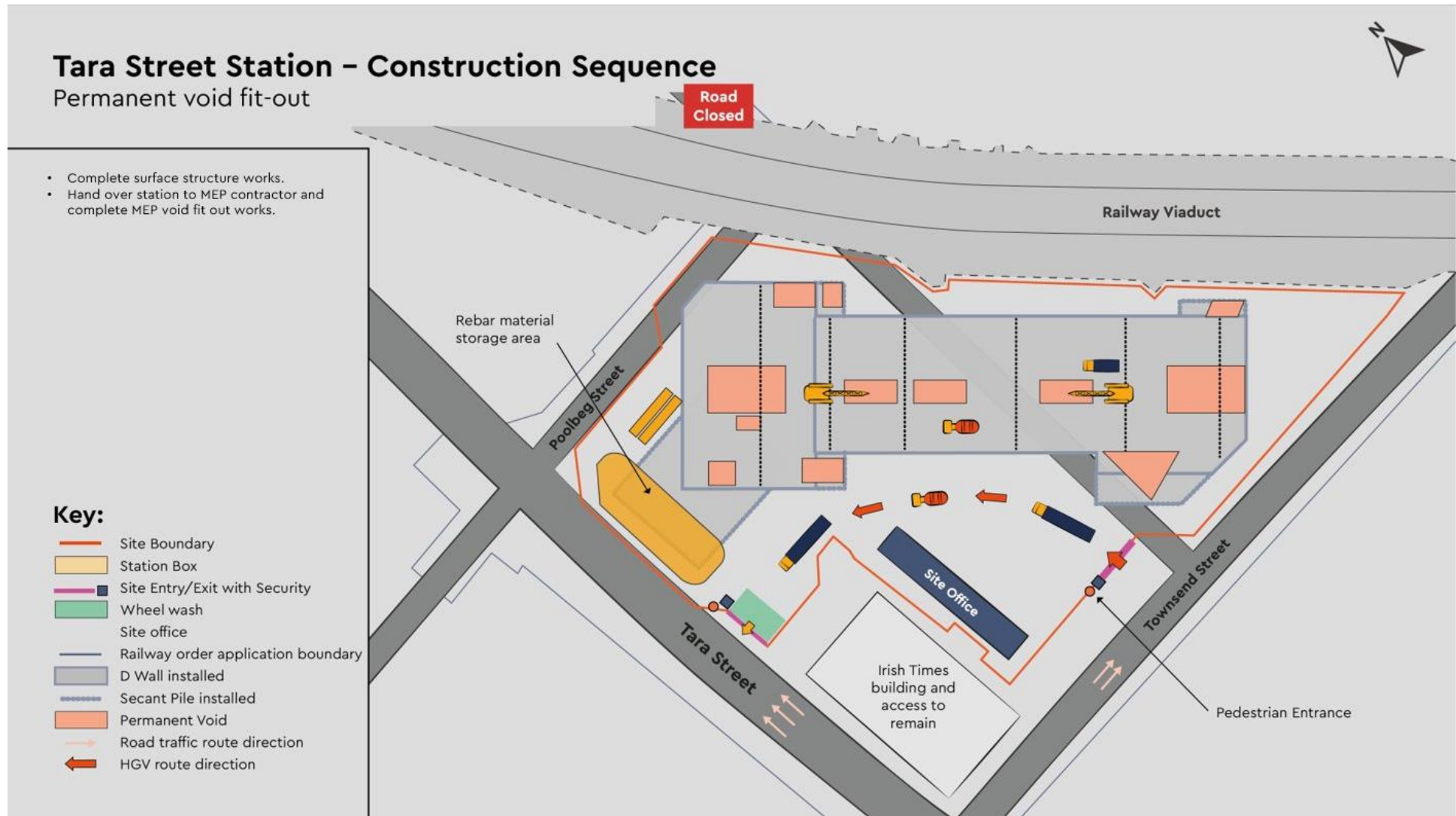


Figure 8-63 Tara Station Stage 5 Permanent Void Fit out

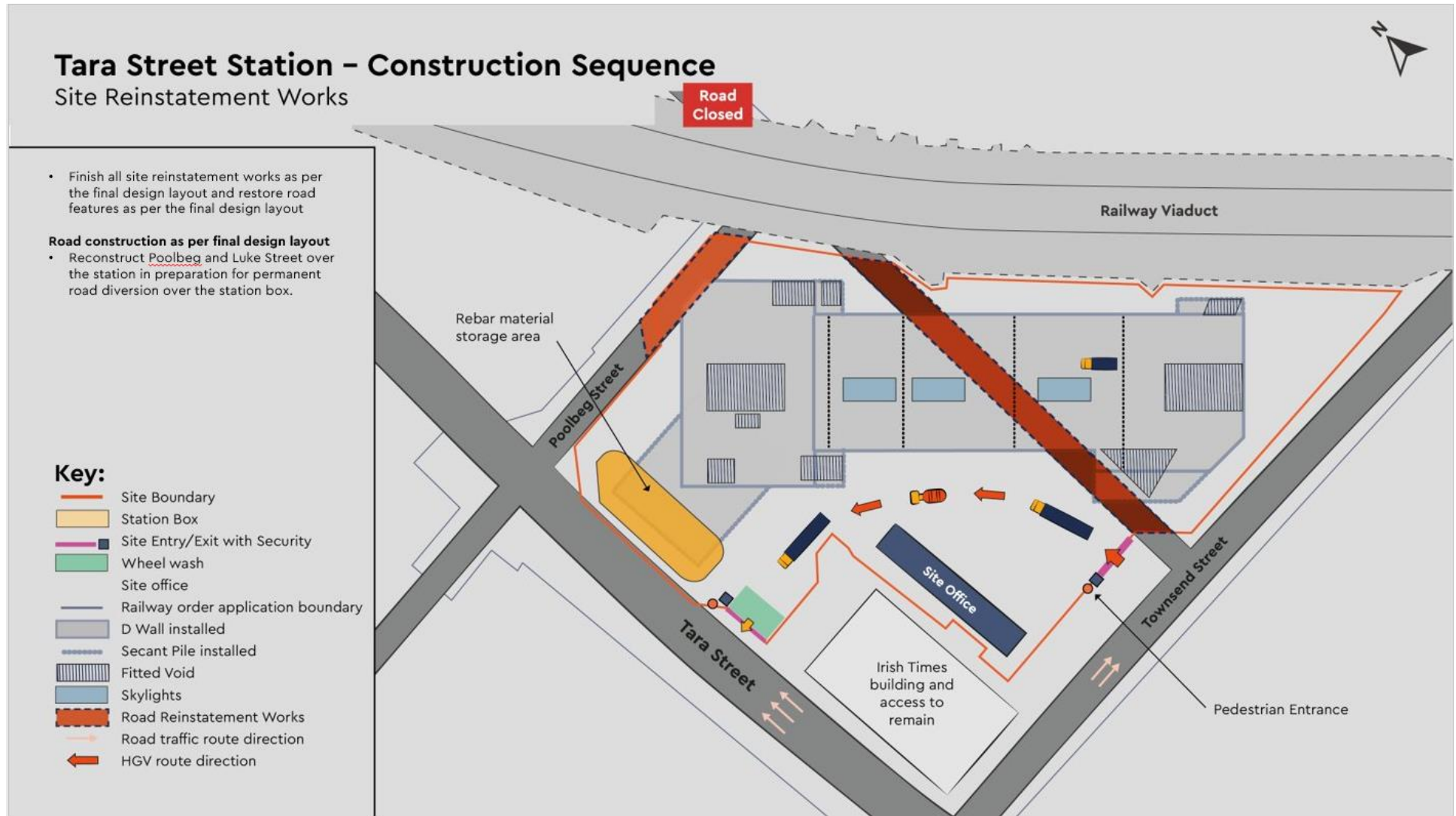


Figure 8-64 Tara Station Stage 6 - Site Reinstatement Works

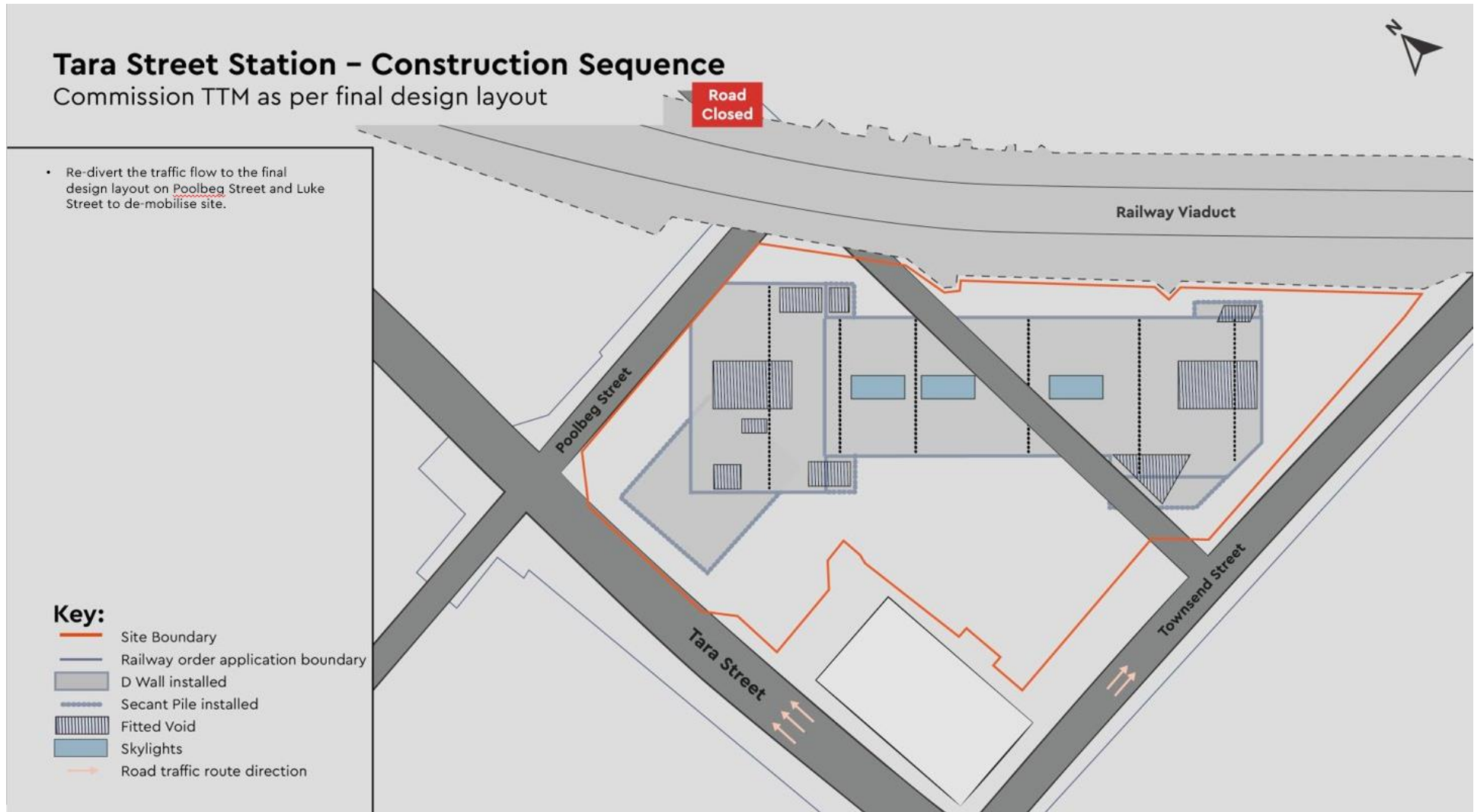


Figure 8-65 Tara Station Stage 7 - Commission TTM

8.13. St Stephen's Green Station

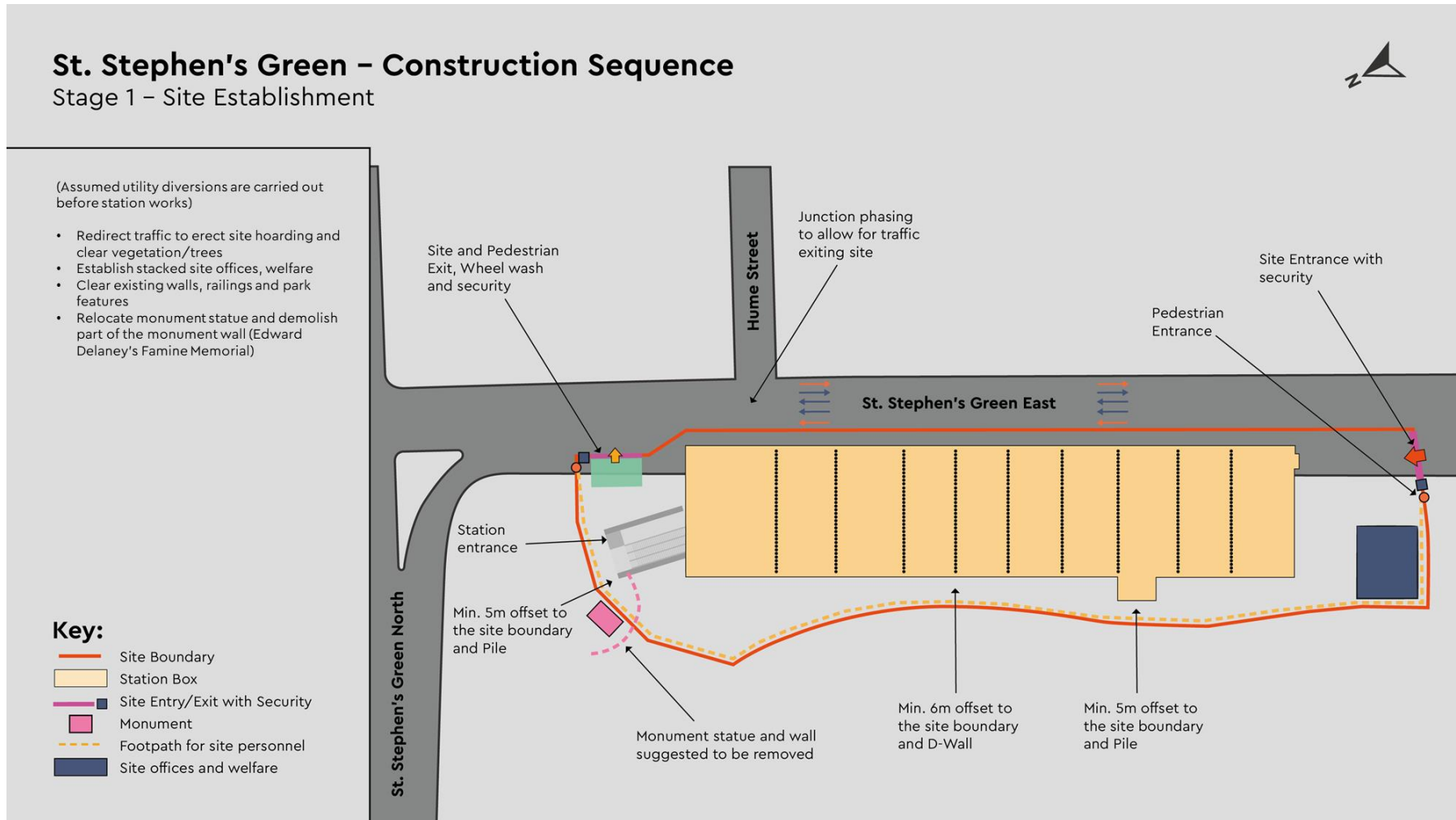


Figure 8-66 St Stephen's Green Stage 1 - Site Establishment

St. Stephen's Green – Construction Sequence

Stage 2 – Diaphragm wall & piling works

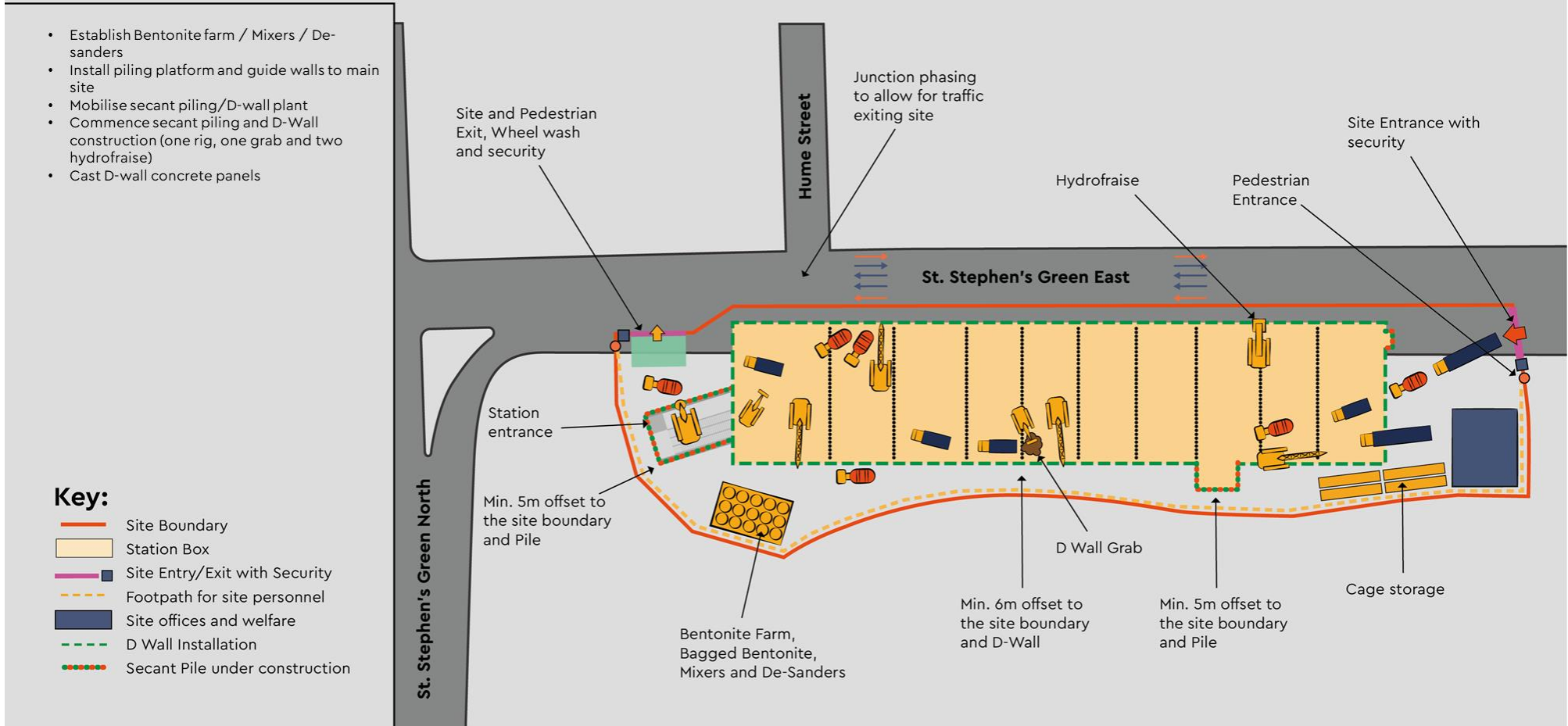


Figure 8-67 St Stephen's Green Stage 2 – Diaphragm wall & piling works

St. Stephen's Green – Construction Sequence

Stage 3 – Roof slab construction



- Demobilise foundation equipment (D- wall grab/hydrofraise/bentonite farm & piling rig equipment)
- Trim D-Walls and cast capping beams
- Construct roof slab (with openings for top-down construction)
- Prepare for top-down excavation and construction

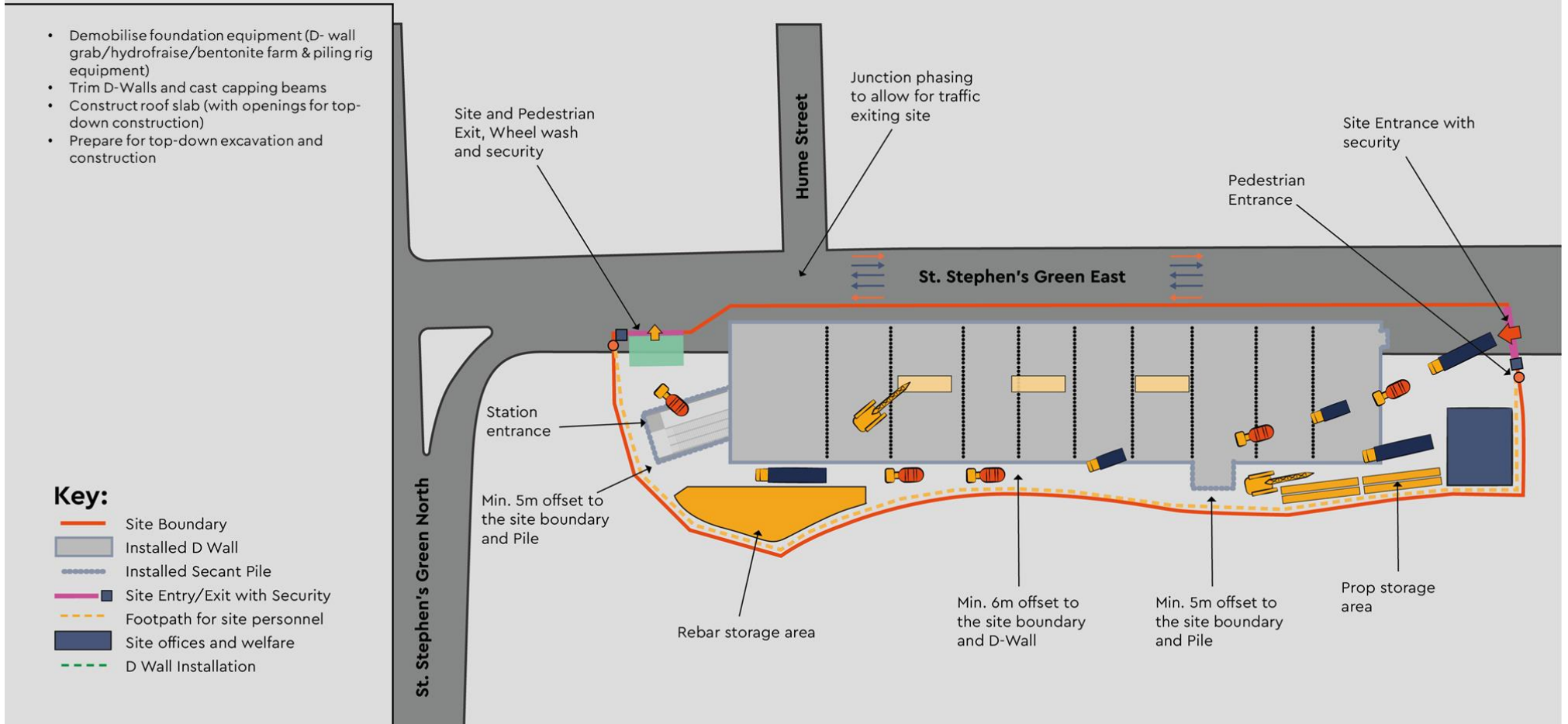


Figure 8-68 St Stephen's Green Stage 3 – Roof slab construction

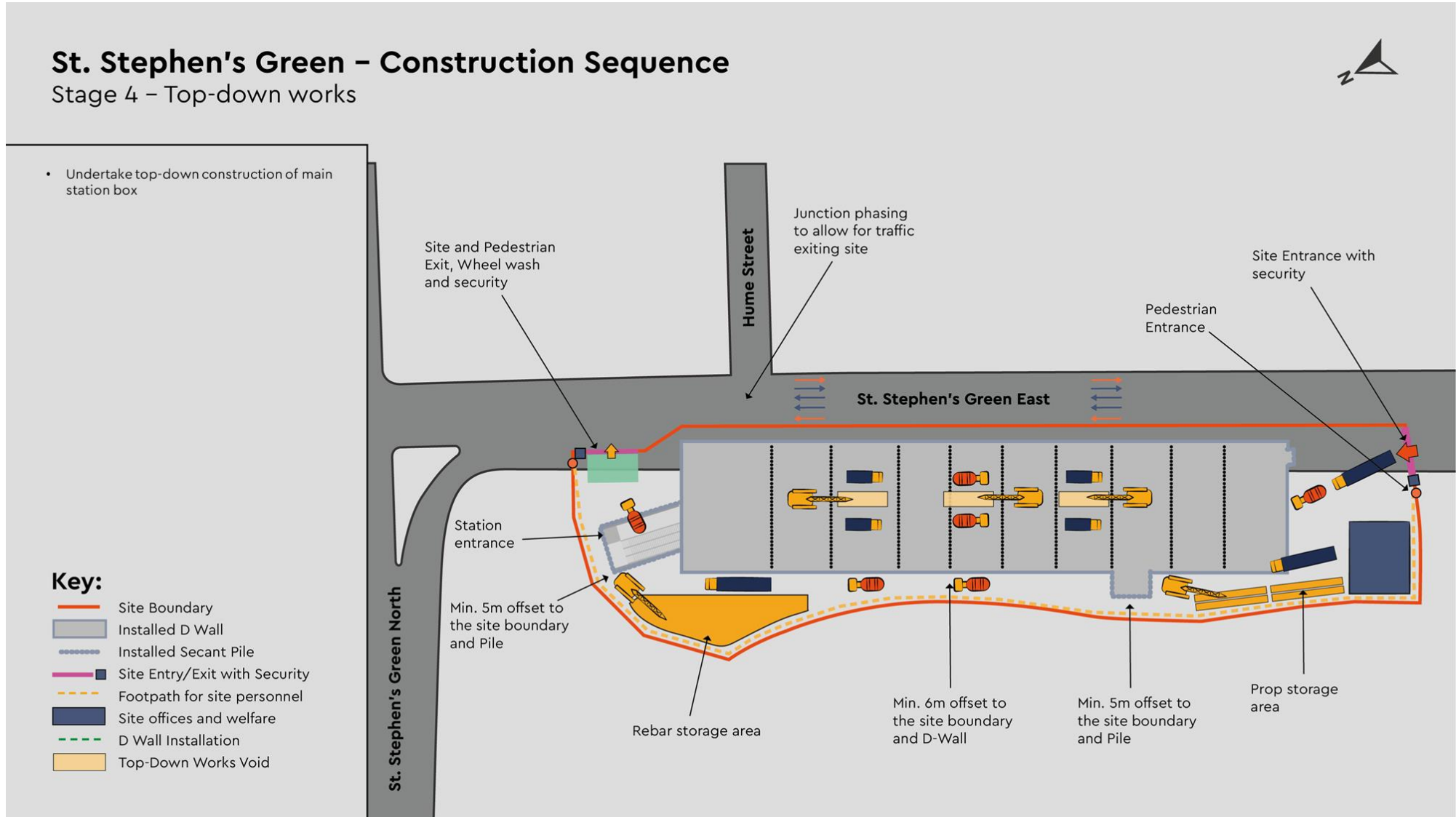


Figure 8-69 St Stephen's Green Stage 4 – Top-down works

St. Stephen's Green – Construction Sequence

Stage 5 – Station void fit-out



- Divert site traffic over the roof slab
- Complete surface structure works, and station box vent shaft and entrance void fit out
- Complete hand over station to MEP fit out contractor

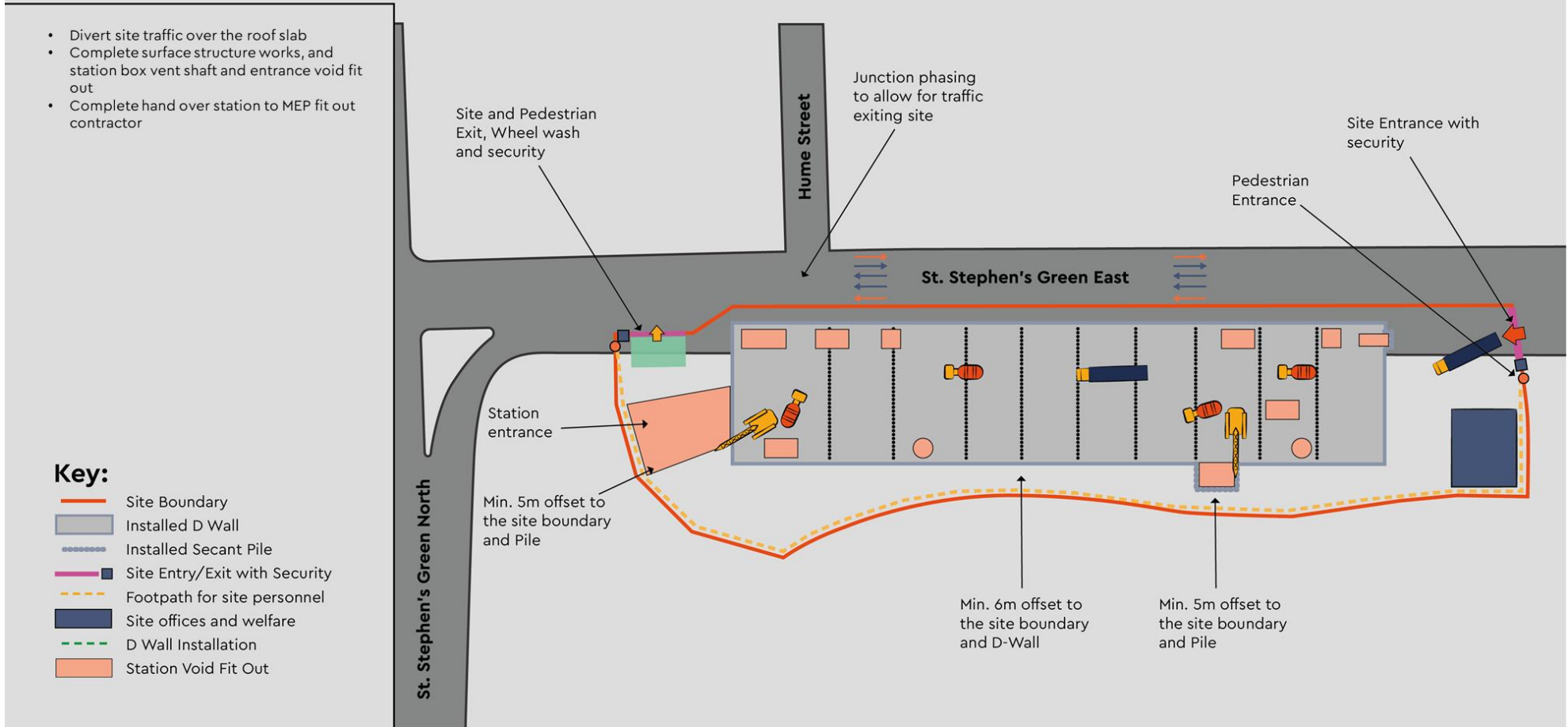


Figure 8-70 St Stephen's Green Stage 5 – Station fit-out

St. Stephen's Green – Construction Sequence

Stage 6 – Site Reinstatement works



- Retract site boundary (redline) to black line after reinstating the traffic lanes and car parking on R138 to original state.
- Extend site boundary (redline) to black line to reinstate the Edward Delaney's Famine Memorial monument.
- Reinstall railings, tress and other features/vegetation of the landscape to the original state as well as the footpath through St. Stephen's Green Park before the final de-mobilisation.

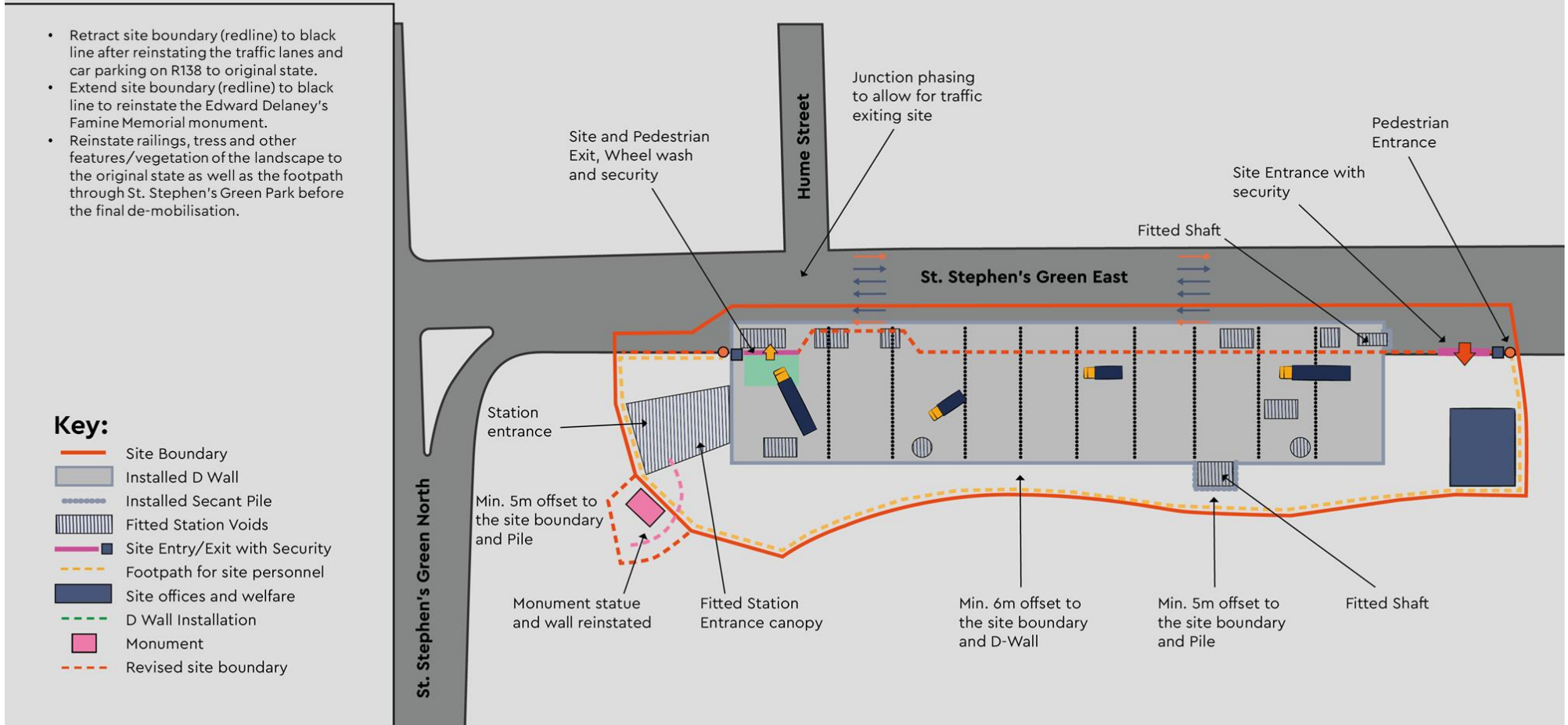


Figure 8-71 St Stephen's Green Stage 6 - Station void fit-out

8.14. Charlemont Station

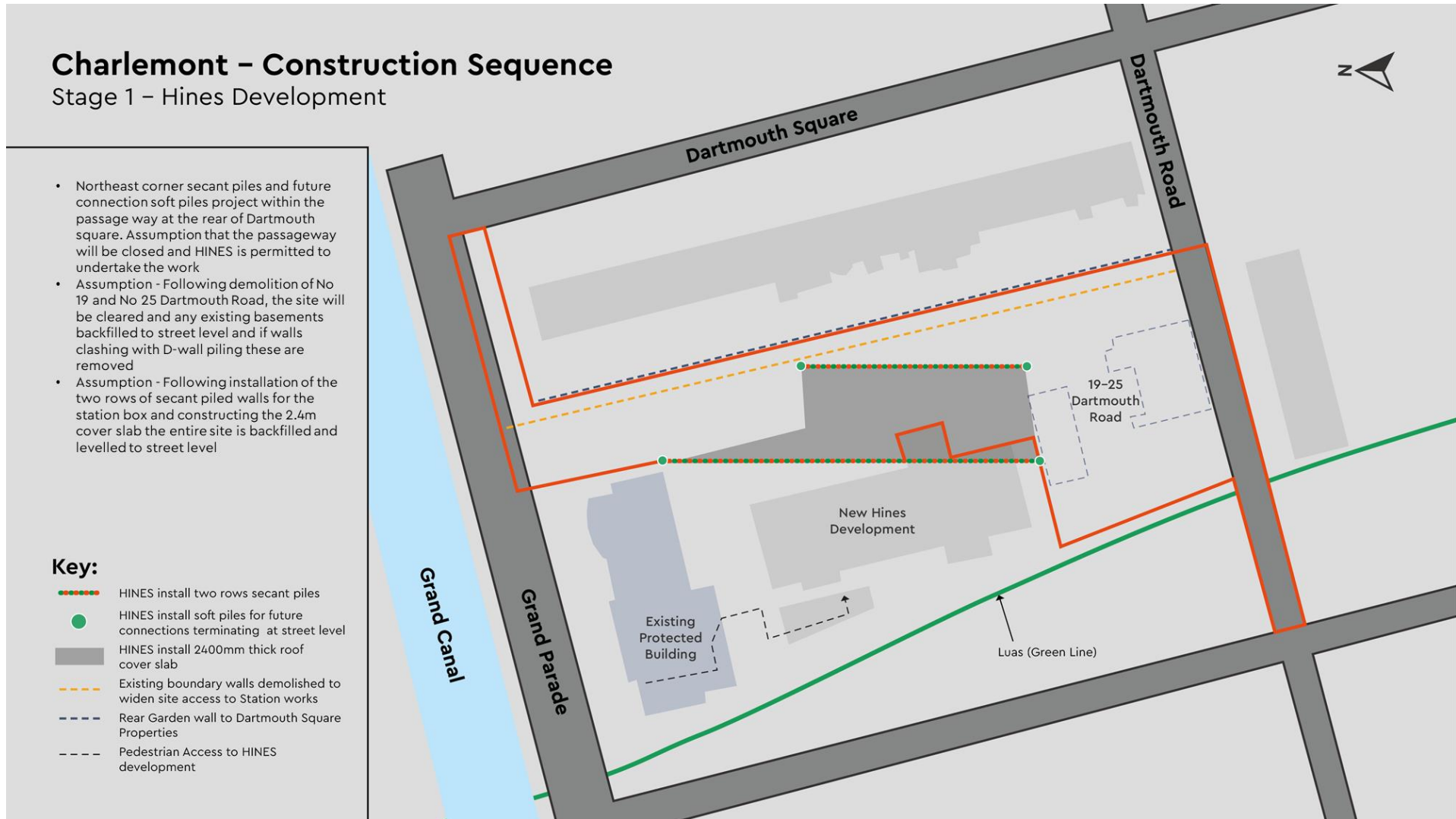


Figure 8-72 Charlemont Station - Stage 1 Hines Development

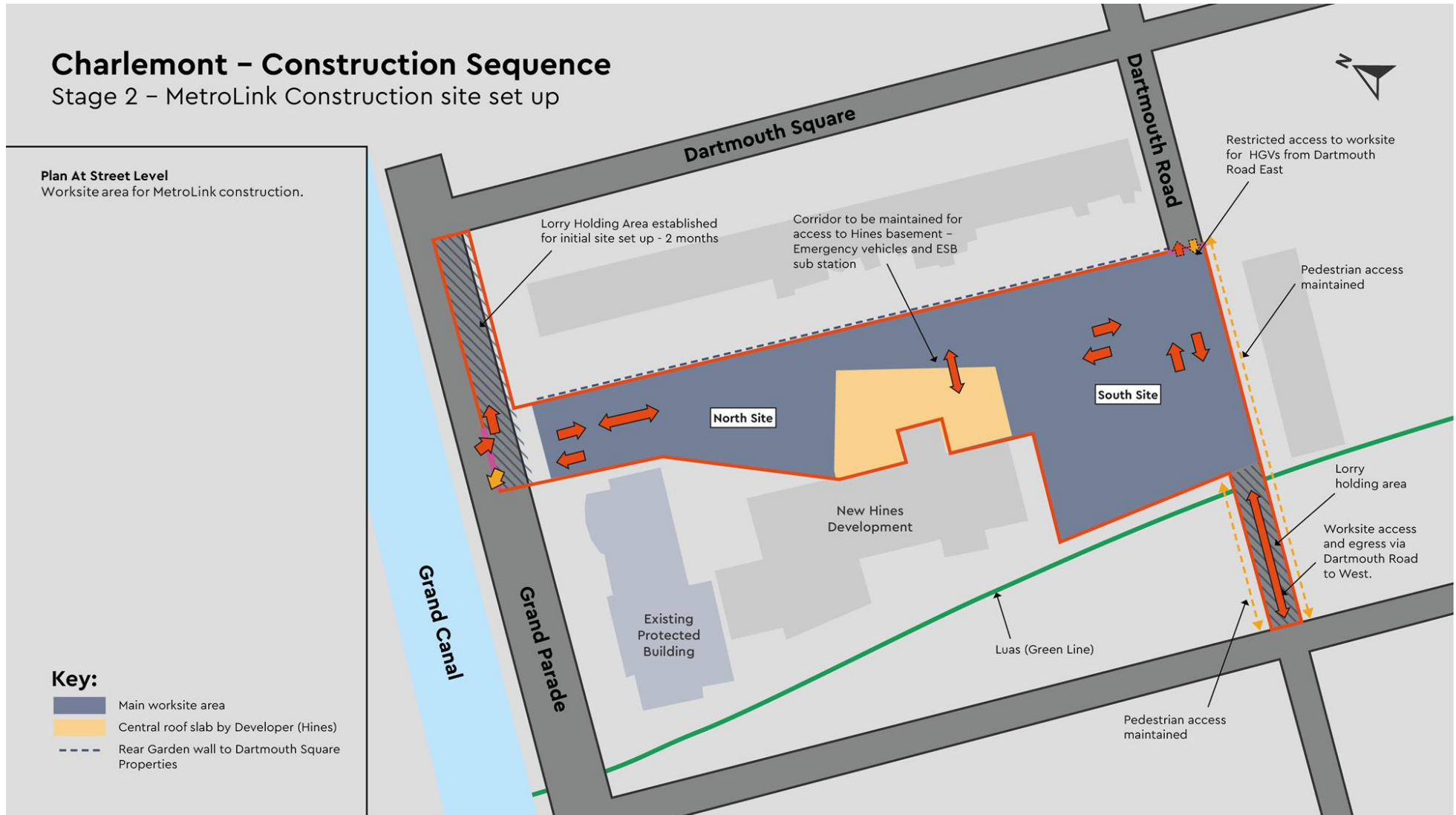


Figure 8-73 Charlemont Station - Stage 2 Metrolink Construction Site Set Up

Charlemont - Construction Sequence

Stage 3 - MetroLink Construction stage 1



Figure 8-74 Charlemont Station - Stage 3 Metrolink Construction Stage 1

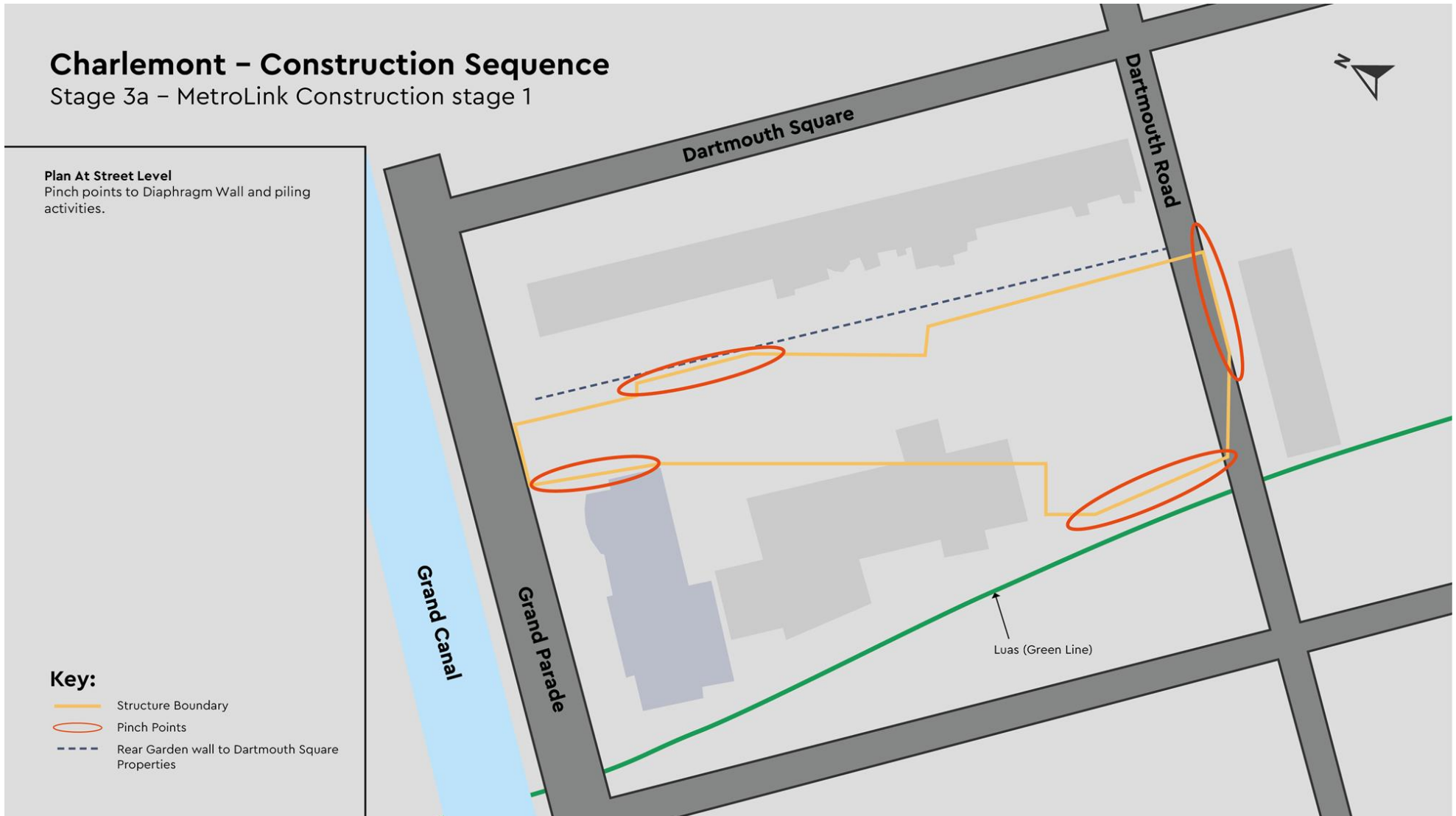


Figure 8-75 Charlemont Station - Stage 3a Metrolink Construction Stage 1

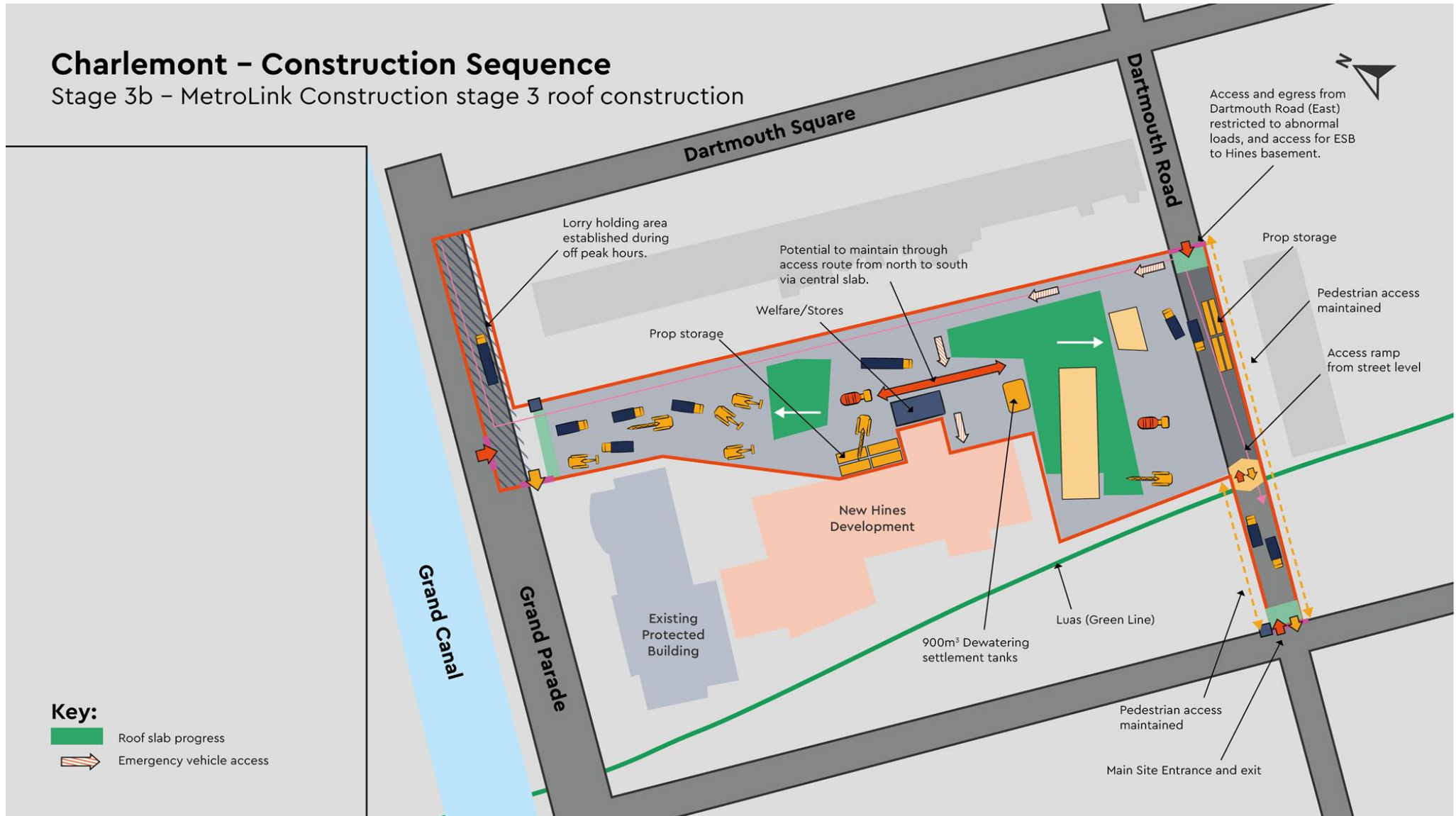


Figure 8-76 Charlemont Station - Stage 3b Metrolink Construction Stage 3 Roof Construction

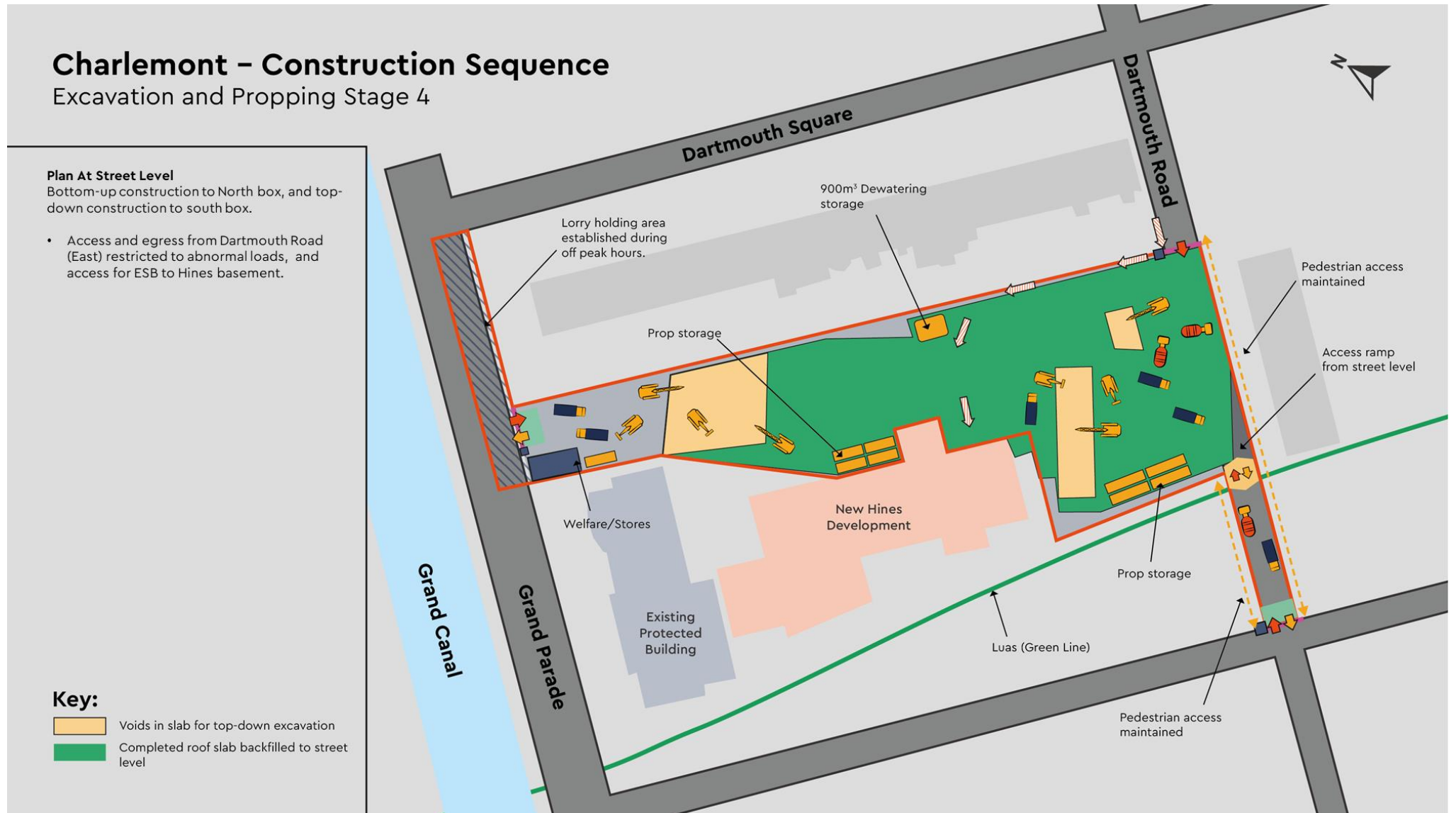


Figure 8-77 Charlemont Station - Stage 4 Excavation and Propping

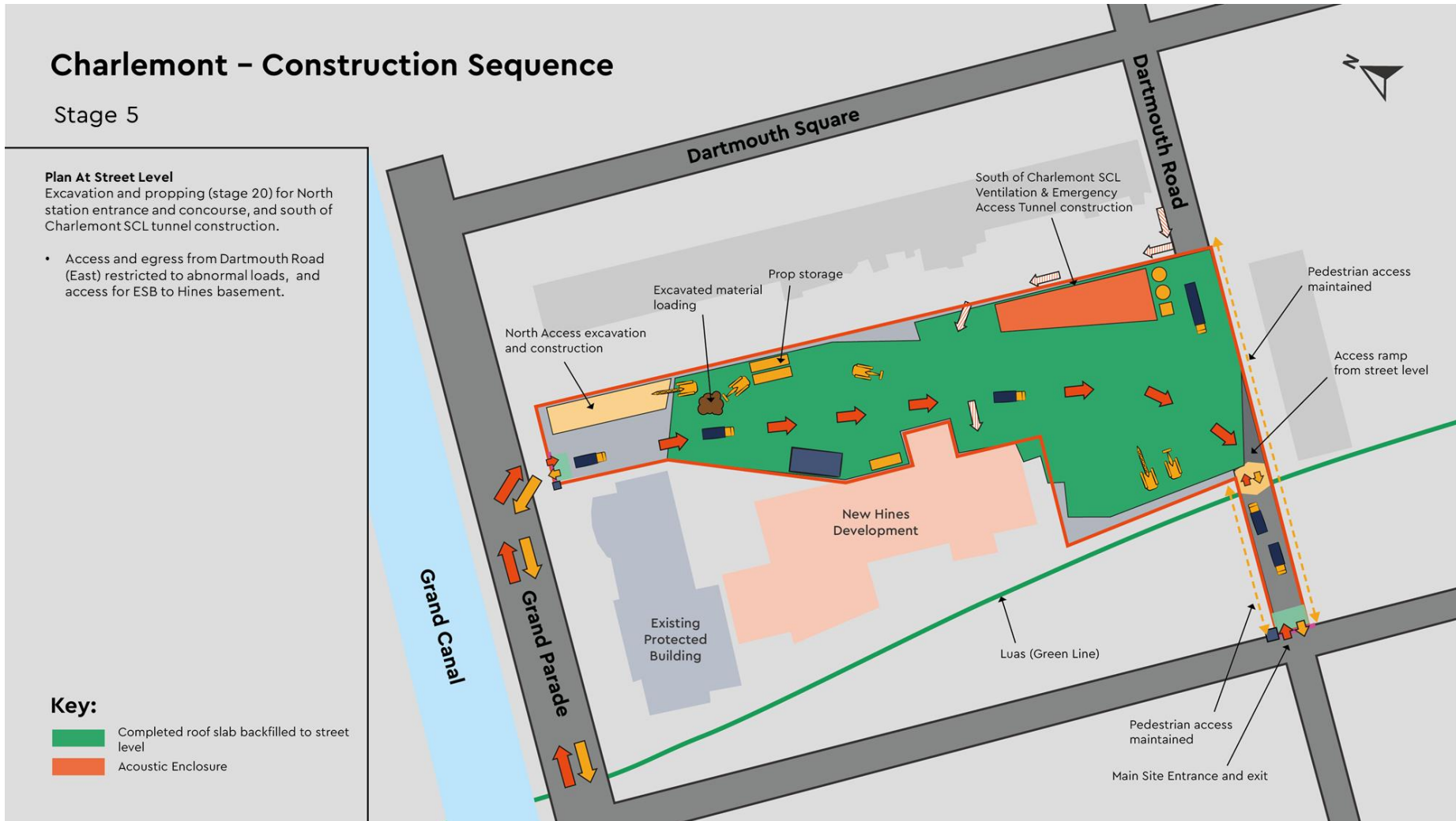


Figure 8-78 Charlemont Station Stage 5

8.15. Charlemont Station – Developer Alternative

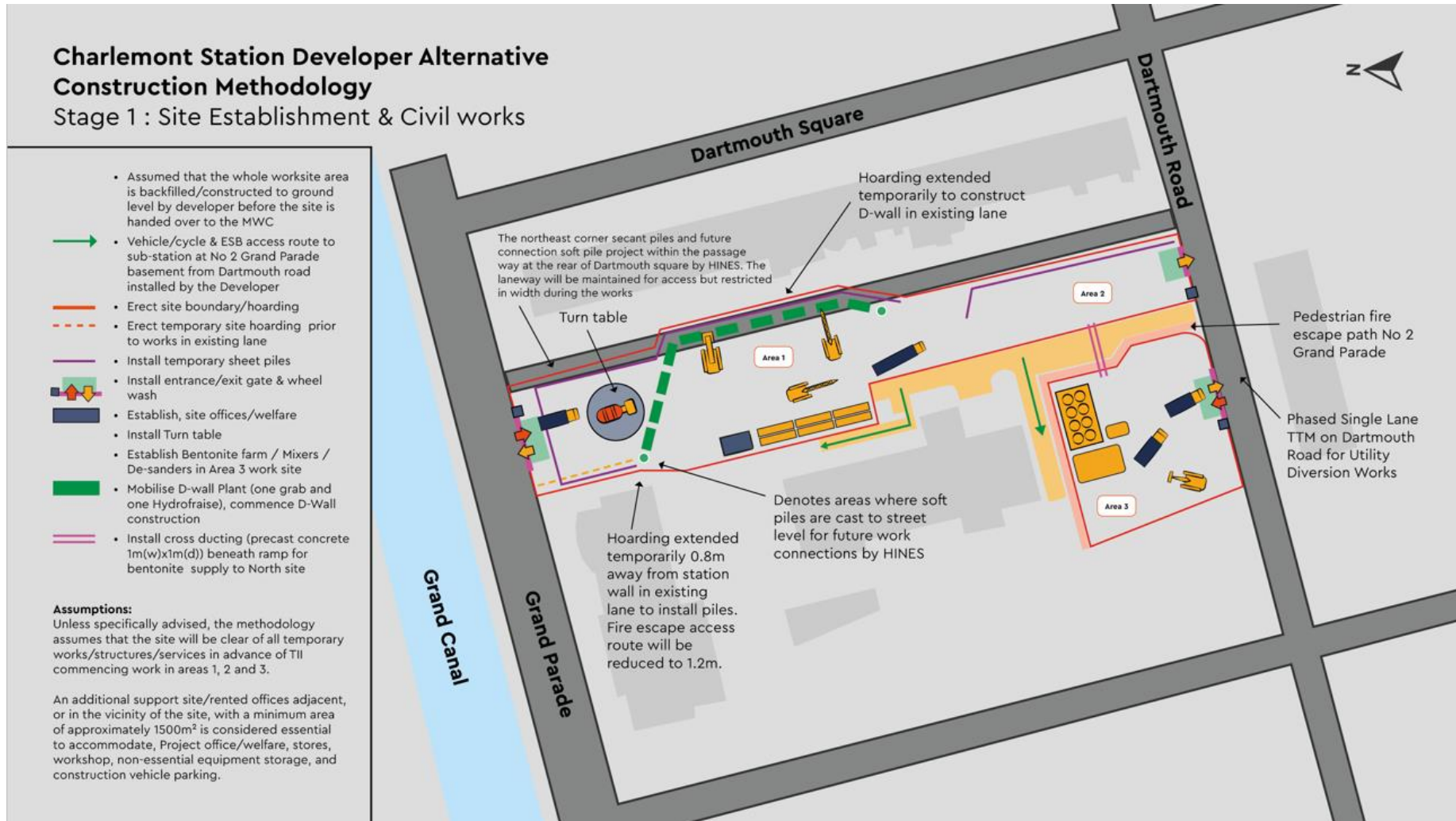


Figure 8-79 Charlemont Station Stage 1 – Site establishment & Civil Works

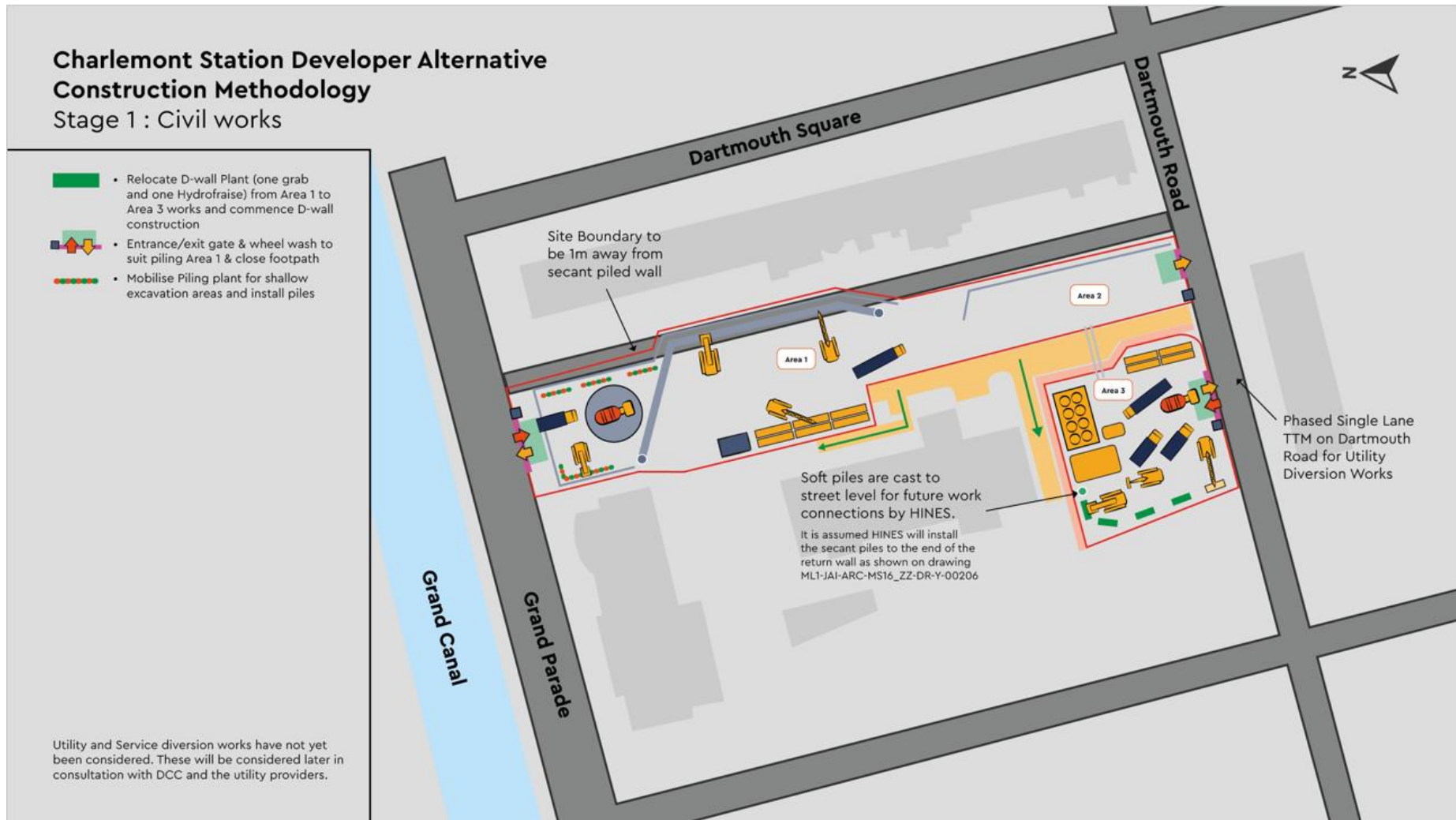


Figure 8-80 Charlemont Station Stage 1 – Civil works

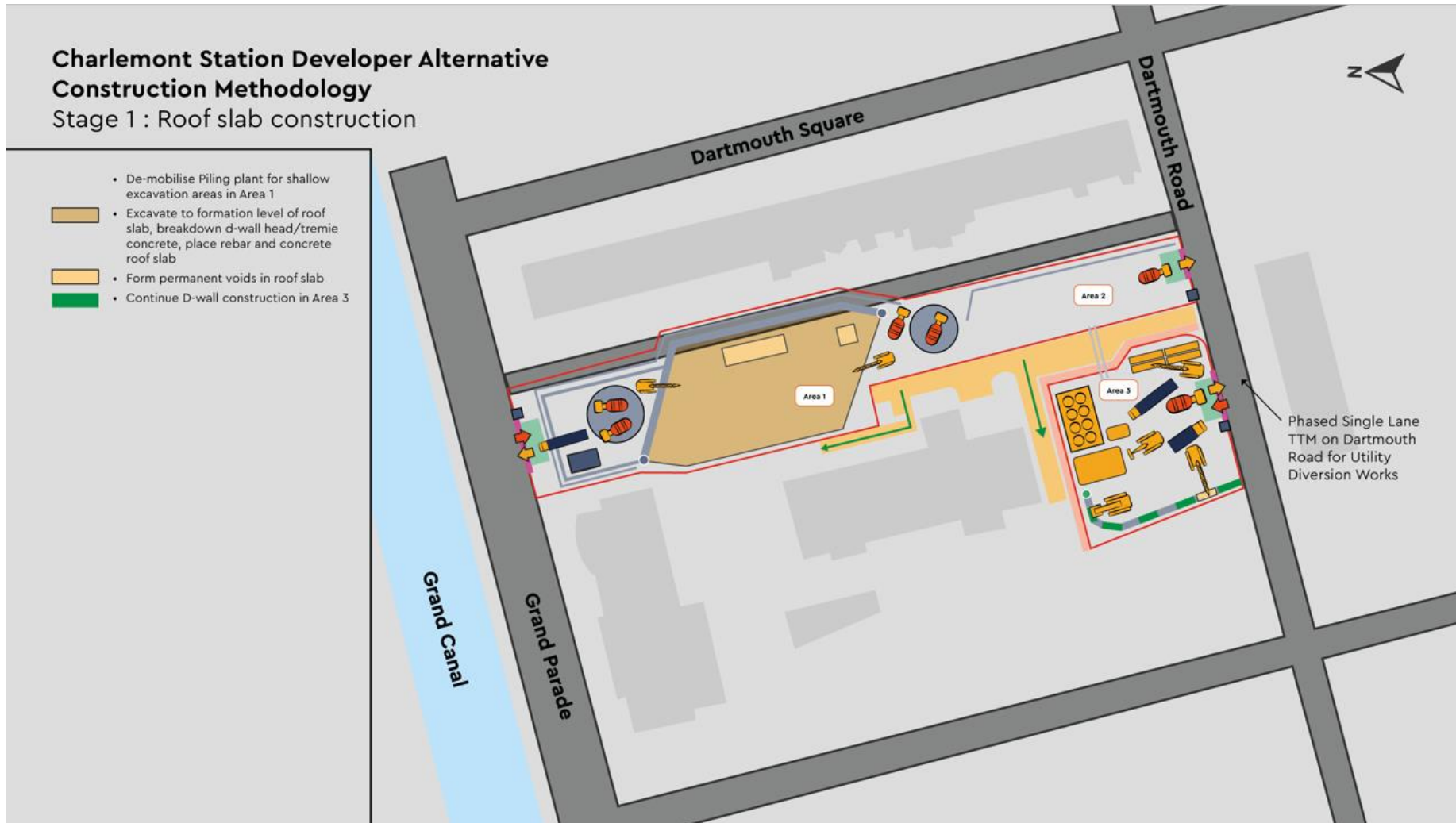


Figure 8-81 Charlemont Station Stage 1 – Roof slab construction

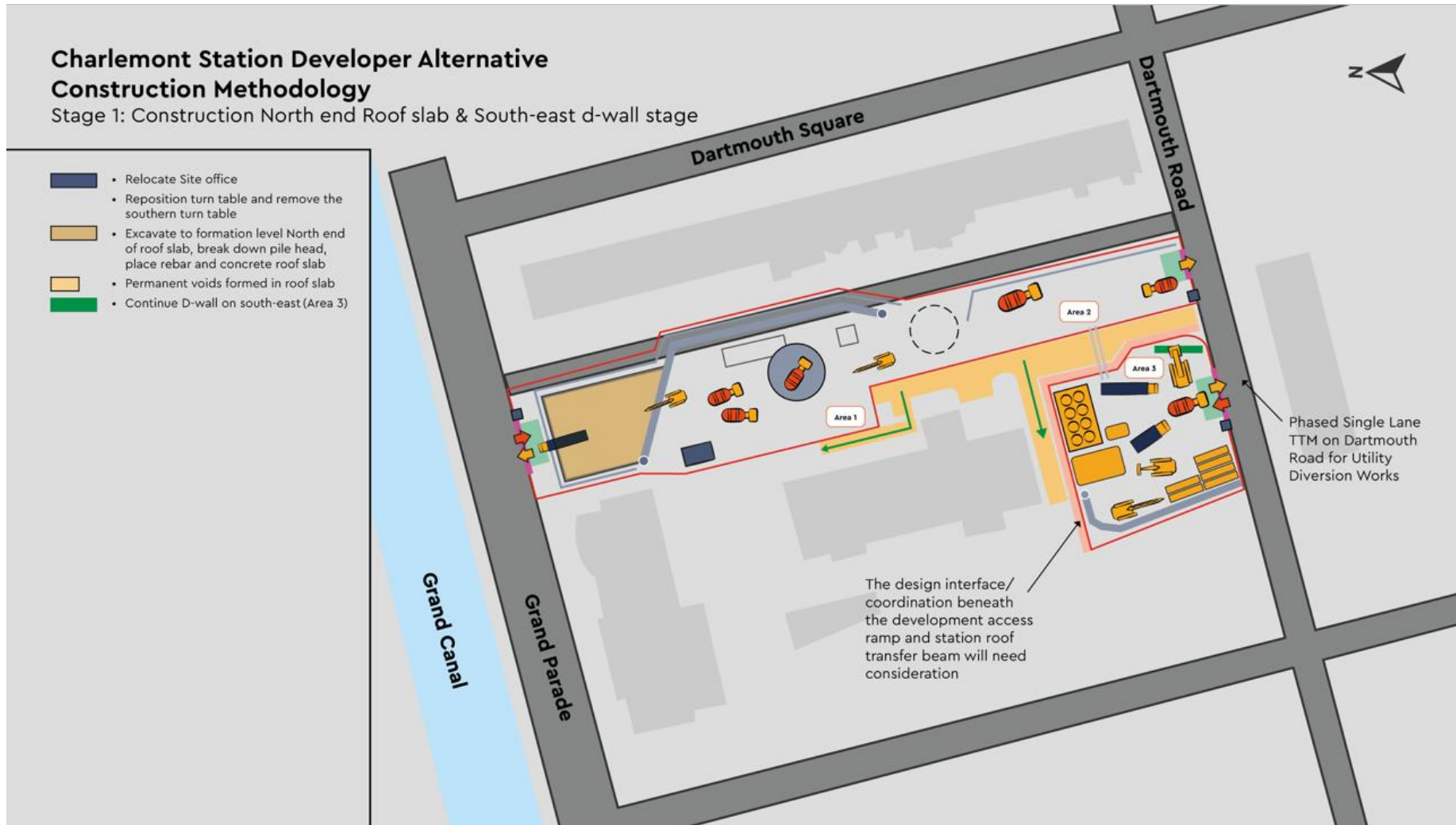


Figure 8-82 Charlemont Station Stage 1 – Construction North end roof slab & South-east d-wall stage

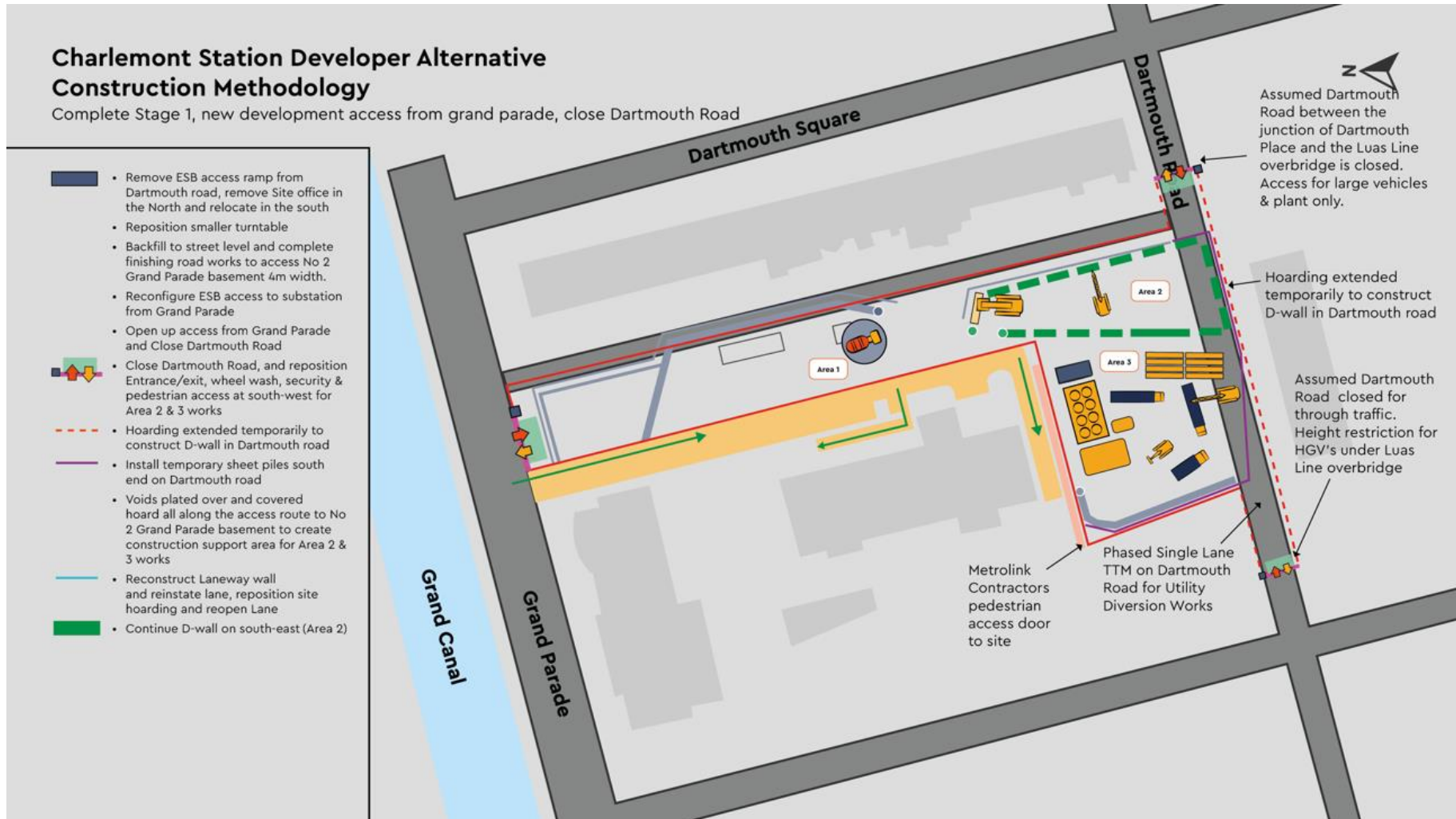


Figure 8-83 Charlemont Station – Complete Stage 1

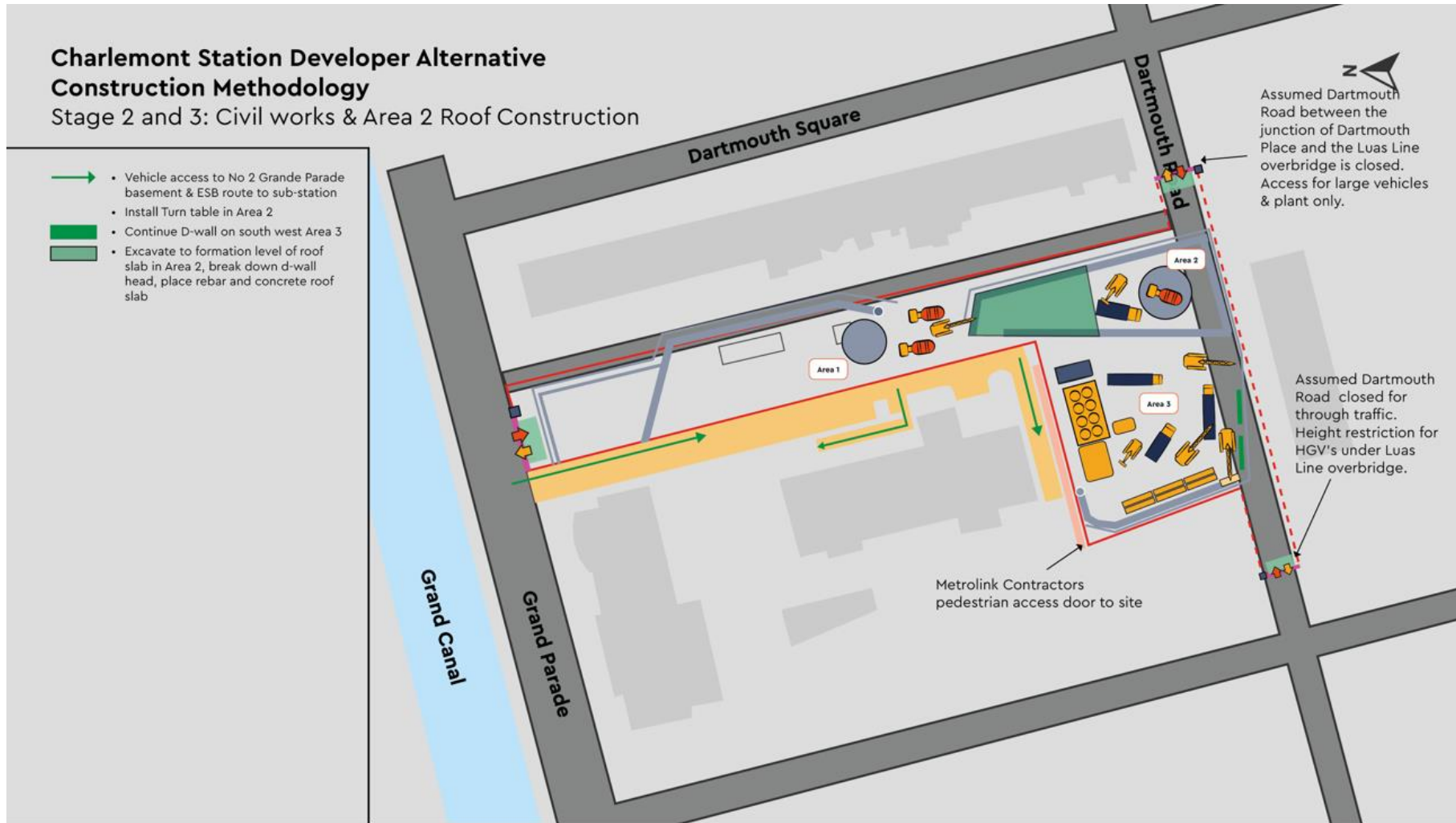


Figure 8-84 Charlemont Station – Stage 2 & 3 – Civil works & Area 2 roof construction

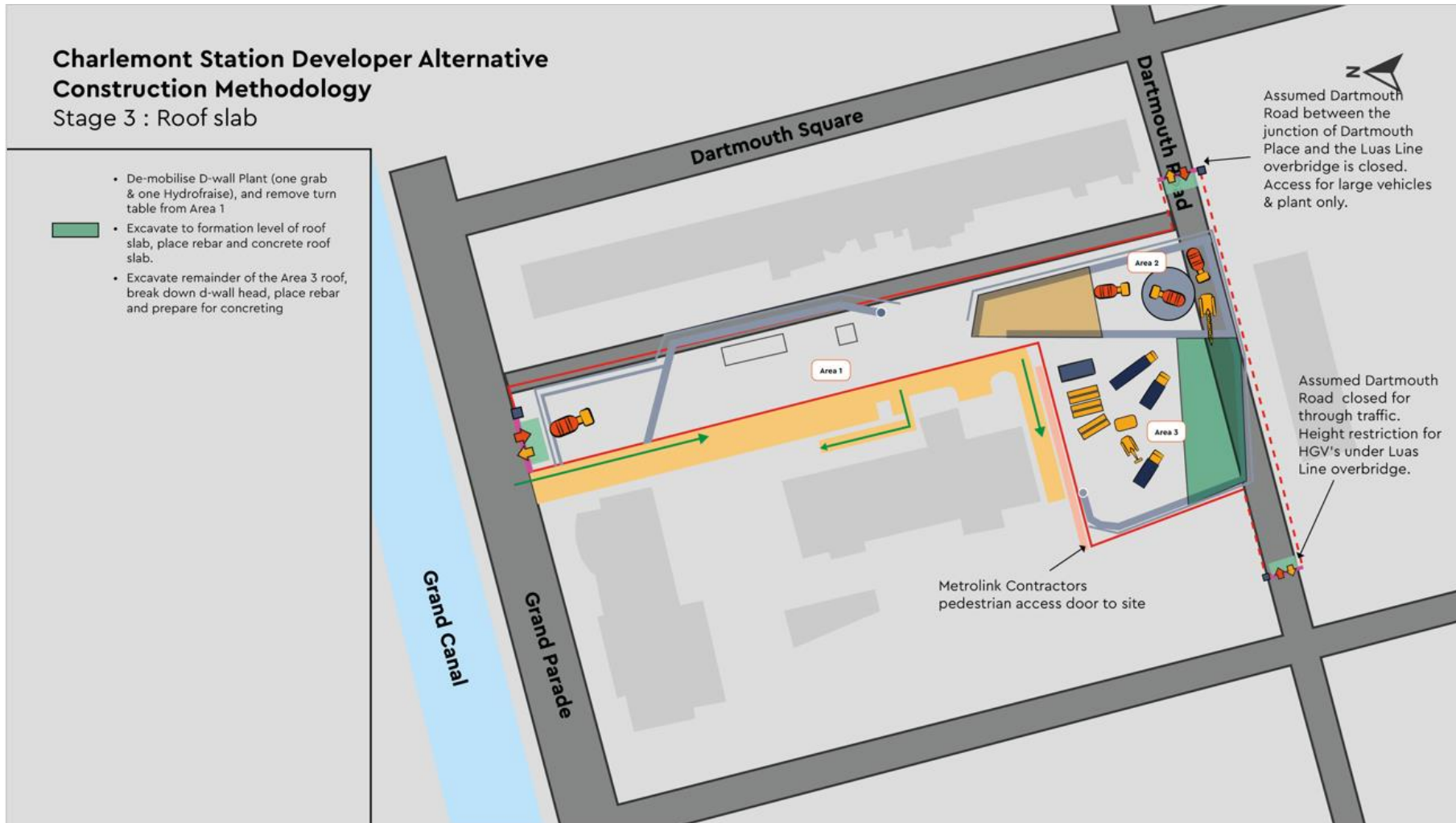


Figure 8-85 Charlemont Station – Stage 3 – roof slab

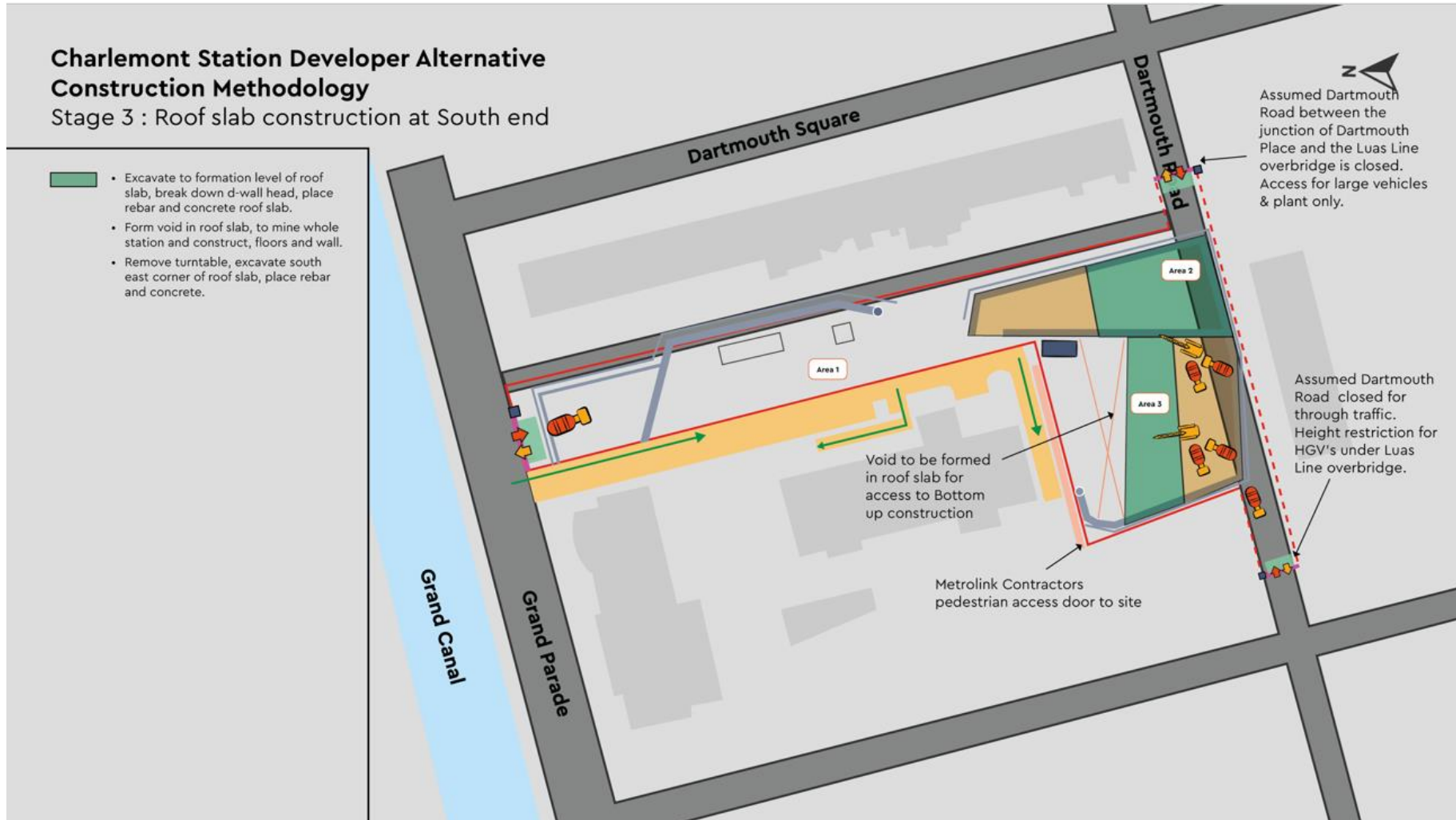


Figure 8-86 Charlemont Station – Stage 3 – roof slab construction at South end

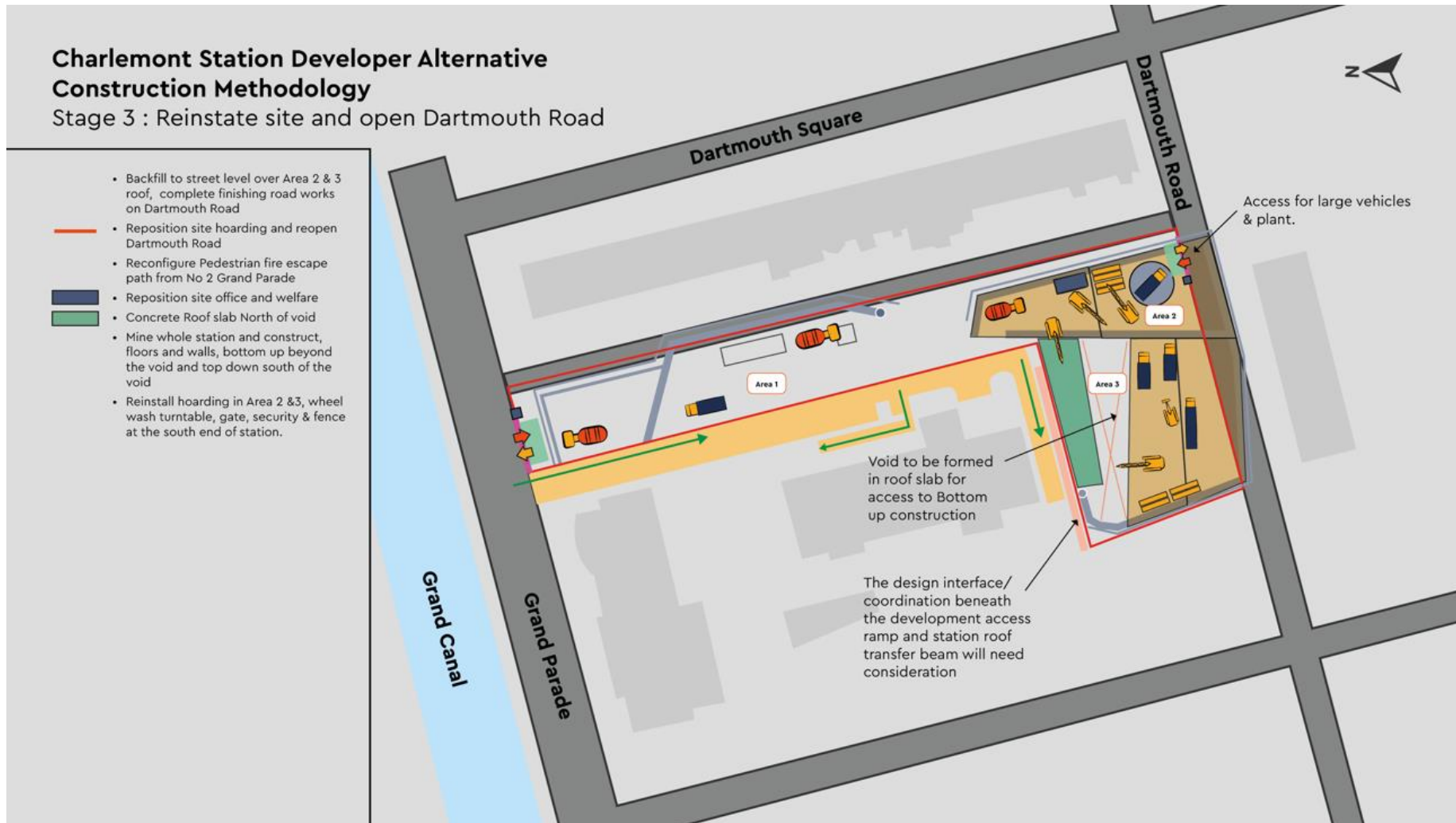


Figure 8-87 Charlemont Station – Stage 3 – reinststate site and open Dartmouth Road

9. Deep Station Cross Sections

9.1. Typical TBM First Station Cross Sections



Typical Deep, TBM First Station Cross Section

Stage 1: Excavate to formation of roof slab – [redacted]

Key Activities

- Excavate to formation of roof slab (this includes the depth for the drop beams at 3m from top of Roof slab)
- Water table levels varies from station to station. Prop location will vary depending on location.

Key:

-  Constructed structures
-  Structure under construction

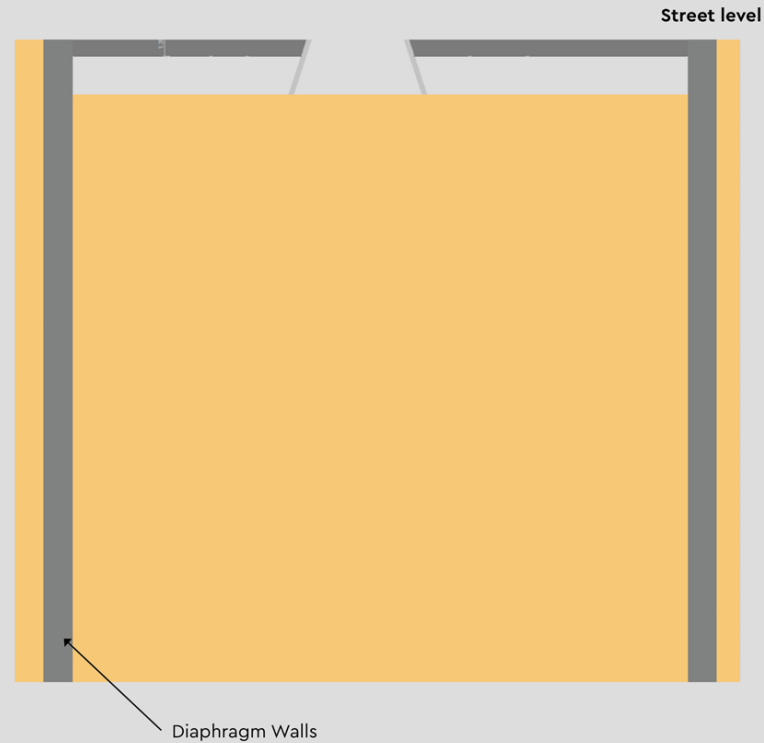


Figure 9-1 TBM First Station - Stage 1

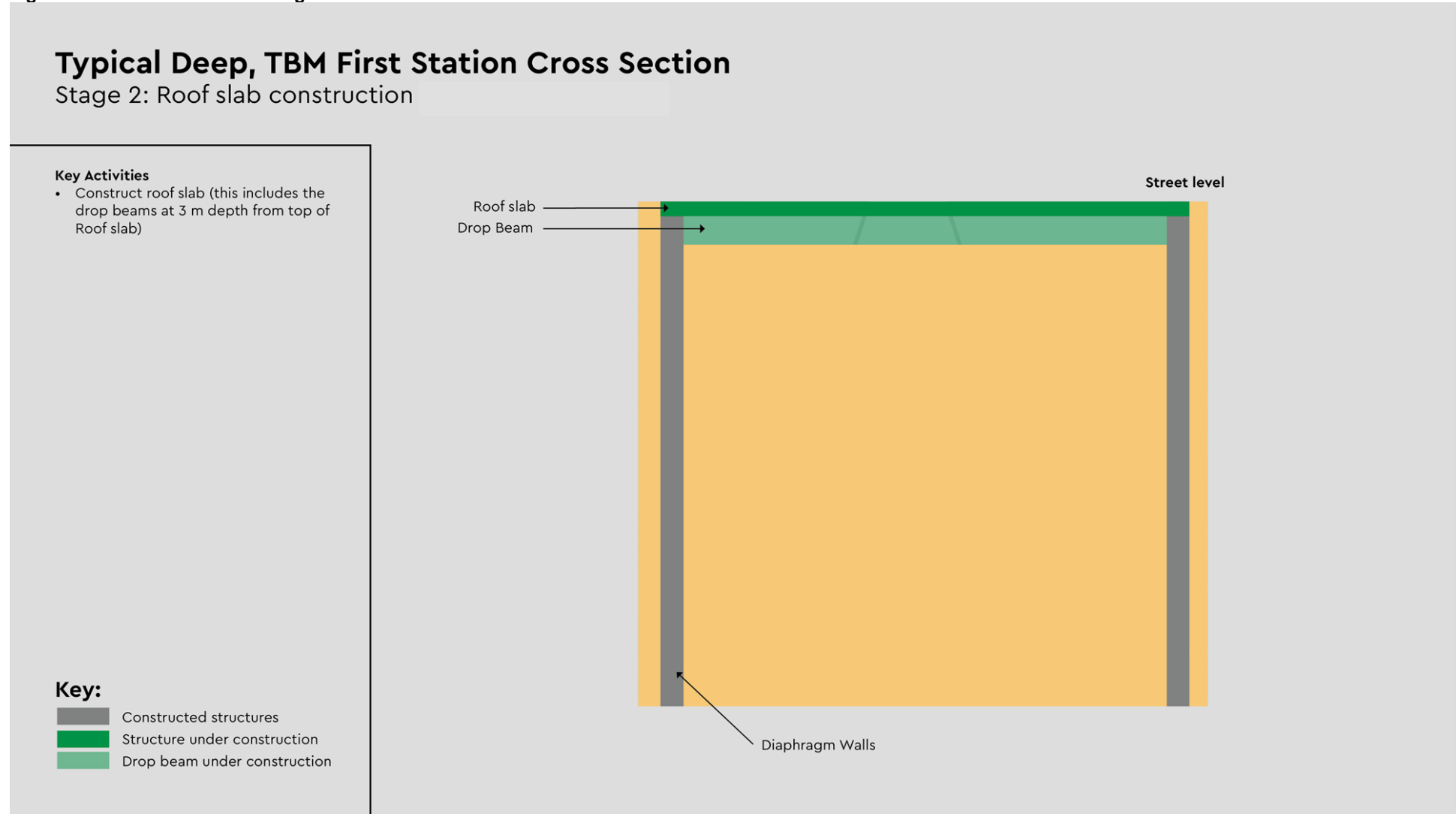


Figure 9-2 TBM First Station - Stage 2

Typical Deep, TBM First Station Cross Section

Stage 3: Top-Down Station construction

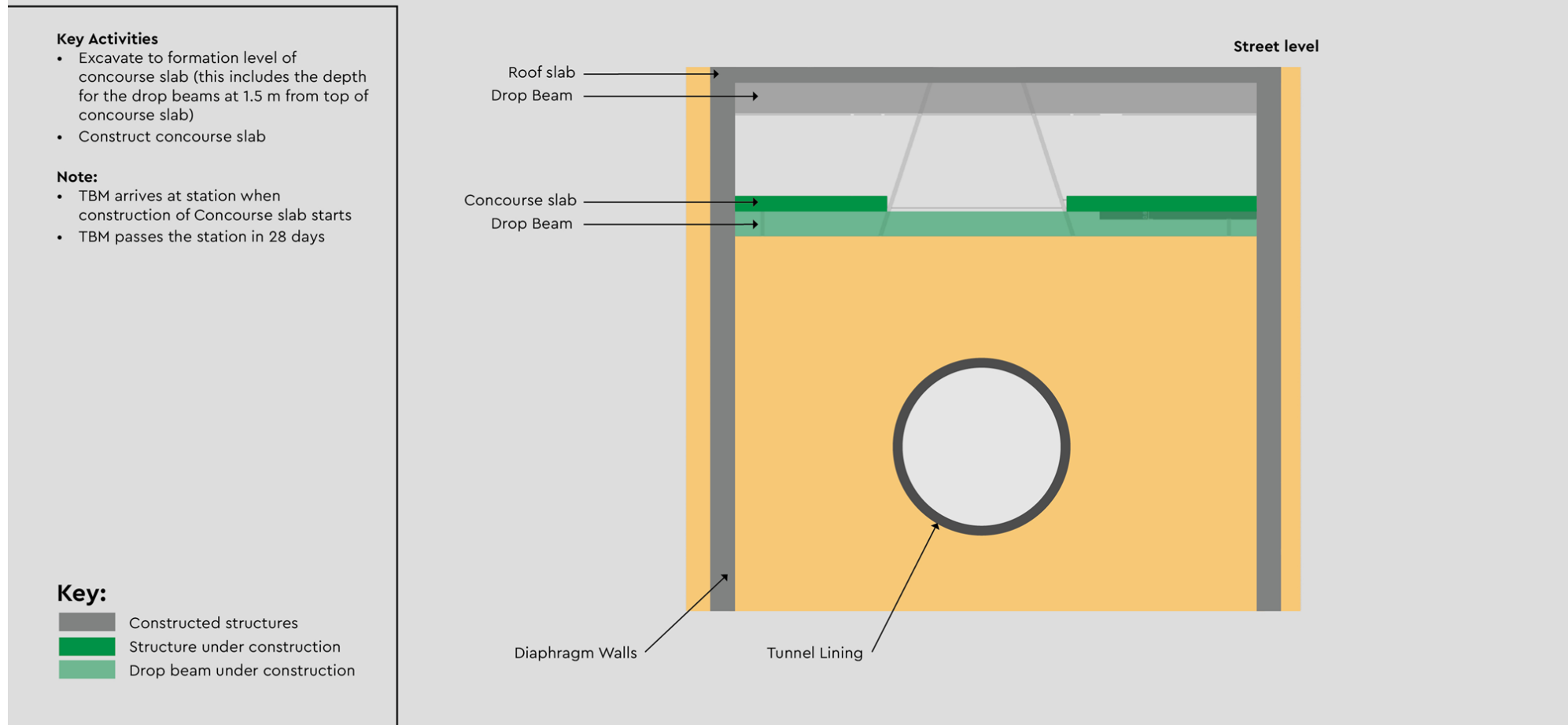


Figure 9-3 TBM First Station - Stage 3

Typical Deep, TBM First Station Cross Section

Stage 4: Excavation to first level of props – Mezzanine slab

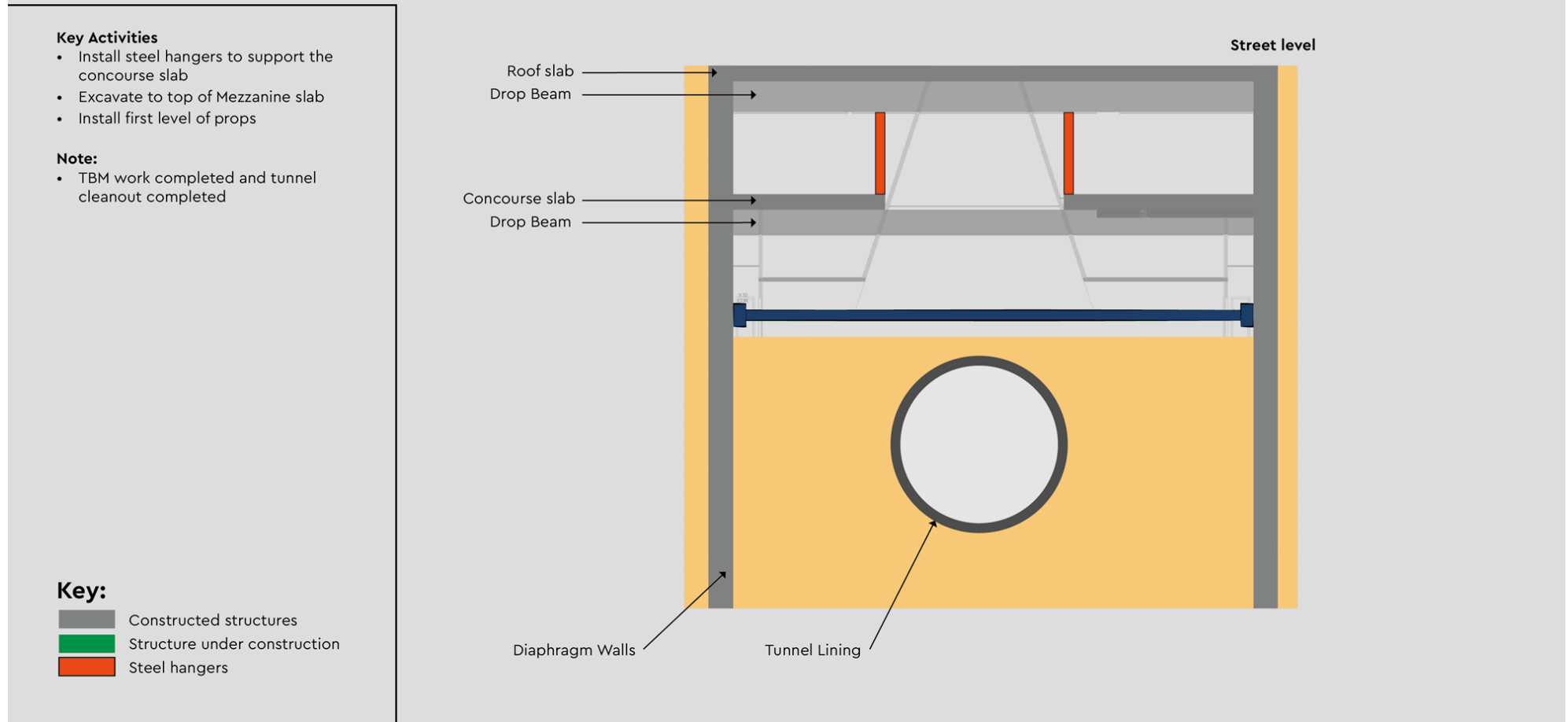


Figure 9-4 TBM First Station - Stage 4

Typical Deep, TBM First Station Cross Section

Stage 5: BoH North end Mezzanine slab -

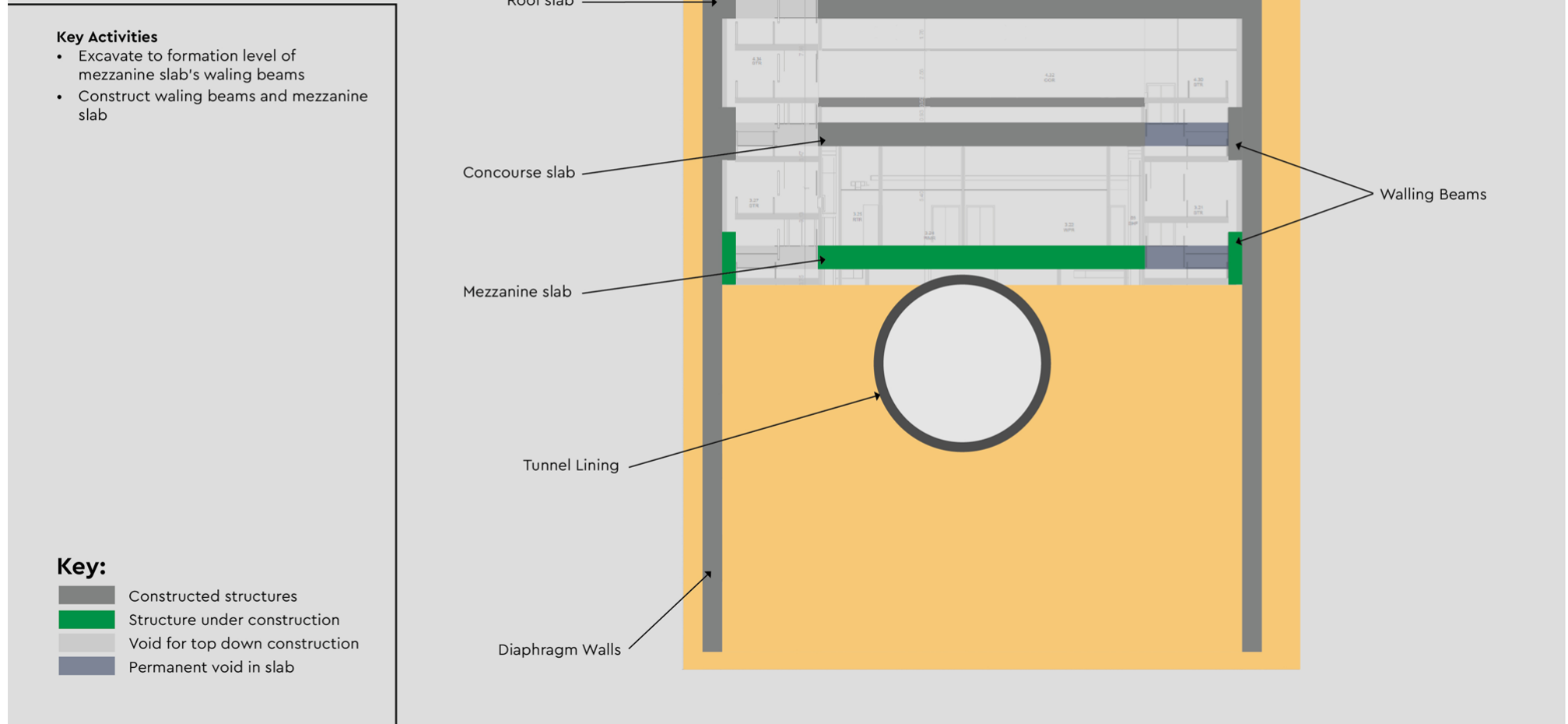


Figure 9-5 TBM First Station - Stage 5

Typical Deep, TBM First Station Cross Section

Stage 6: BoH South end Mezzanine slab

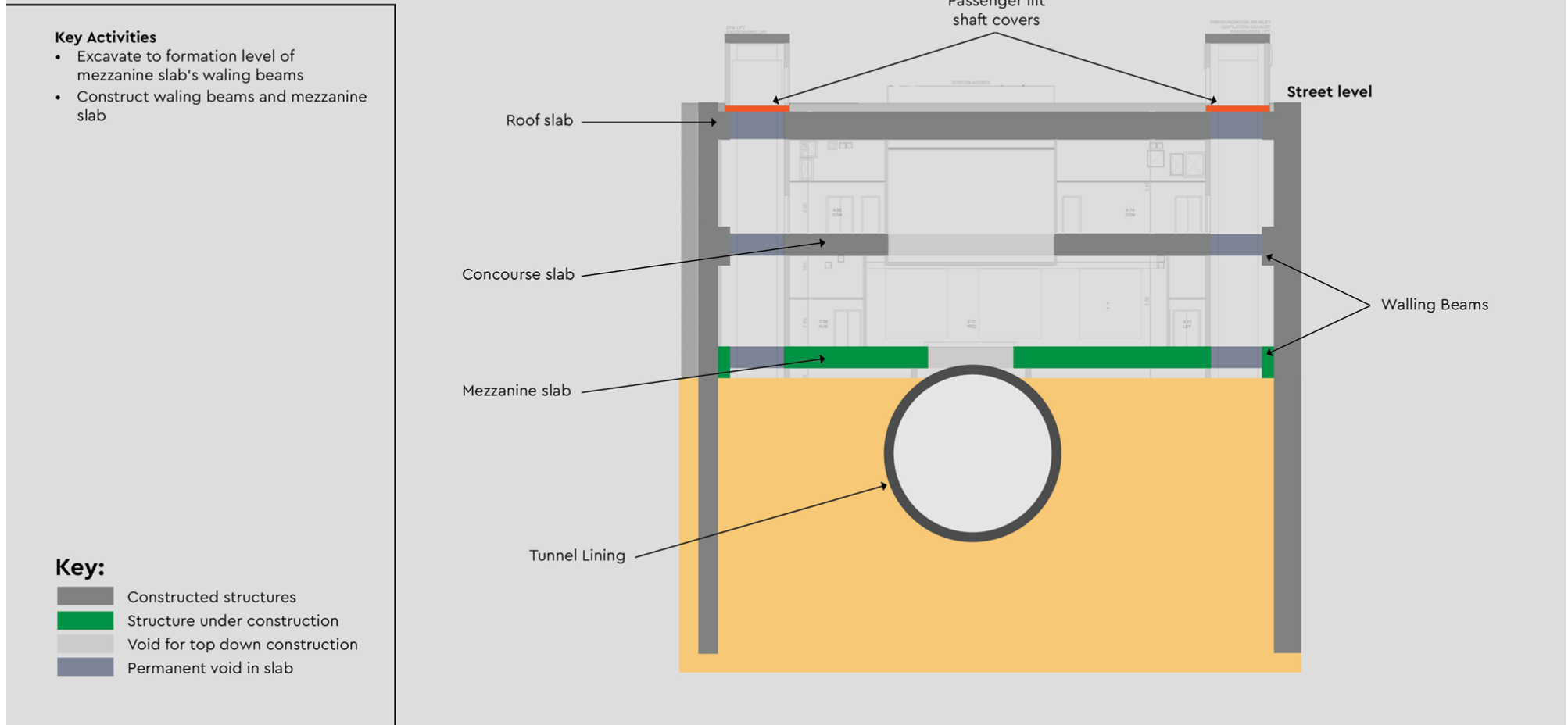


Figure 9-6 TBM First Station - Stage 6

Typical Deep, TBM First Station Cross Section

Stage 7: Excavation to second level of props

Key Activities

- Excavate to second level of props
- Breakdown top half of tunnel lining
- Install second level of props

Note:

- TBM is dismantled and removed prior to installation of 2nd prop
- Tunnel finishing is completed prior to installation of 2nd prop

Key:

- Constructed structures
- Structure under construction
- Steel hangers

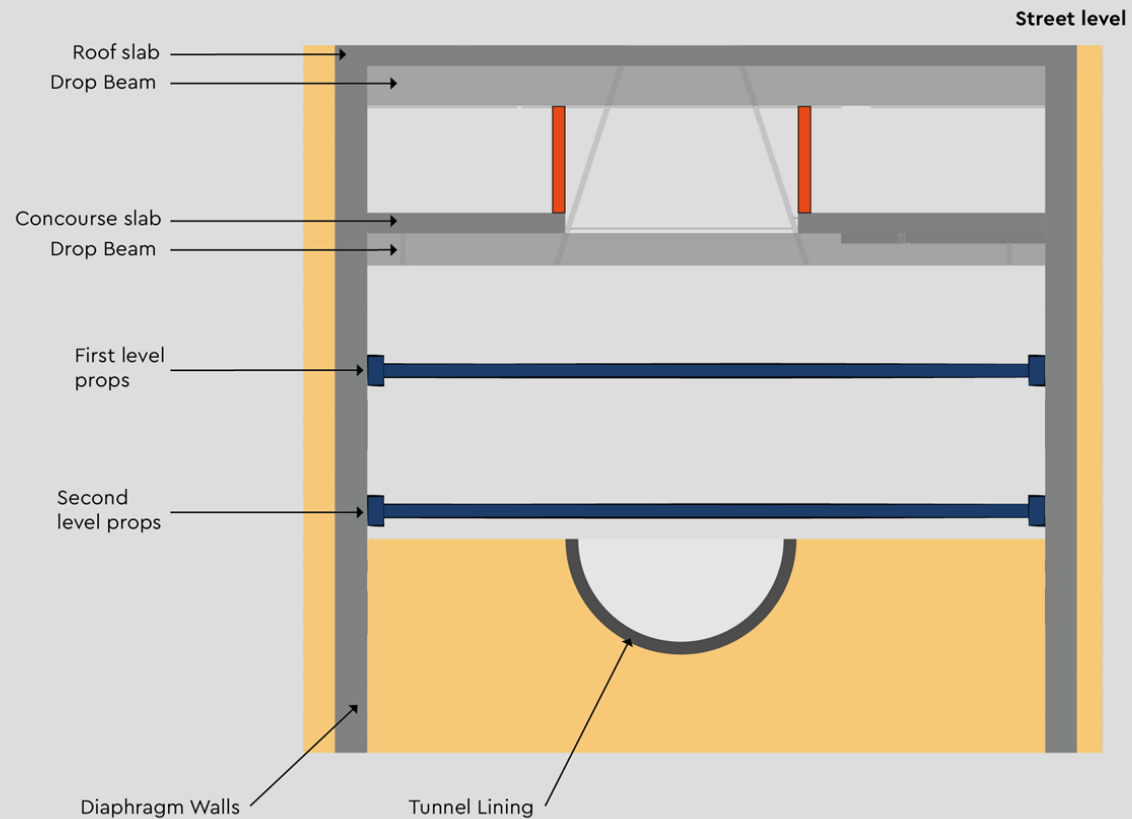


Figure 9-7 TBM First Station - Stage 7

Typical Deep, TBM First Station Cross Section

Stage 8: BoH North end first level temporary props

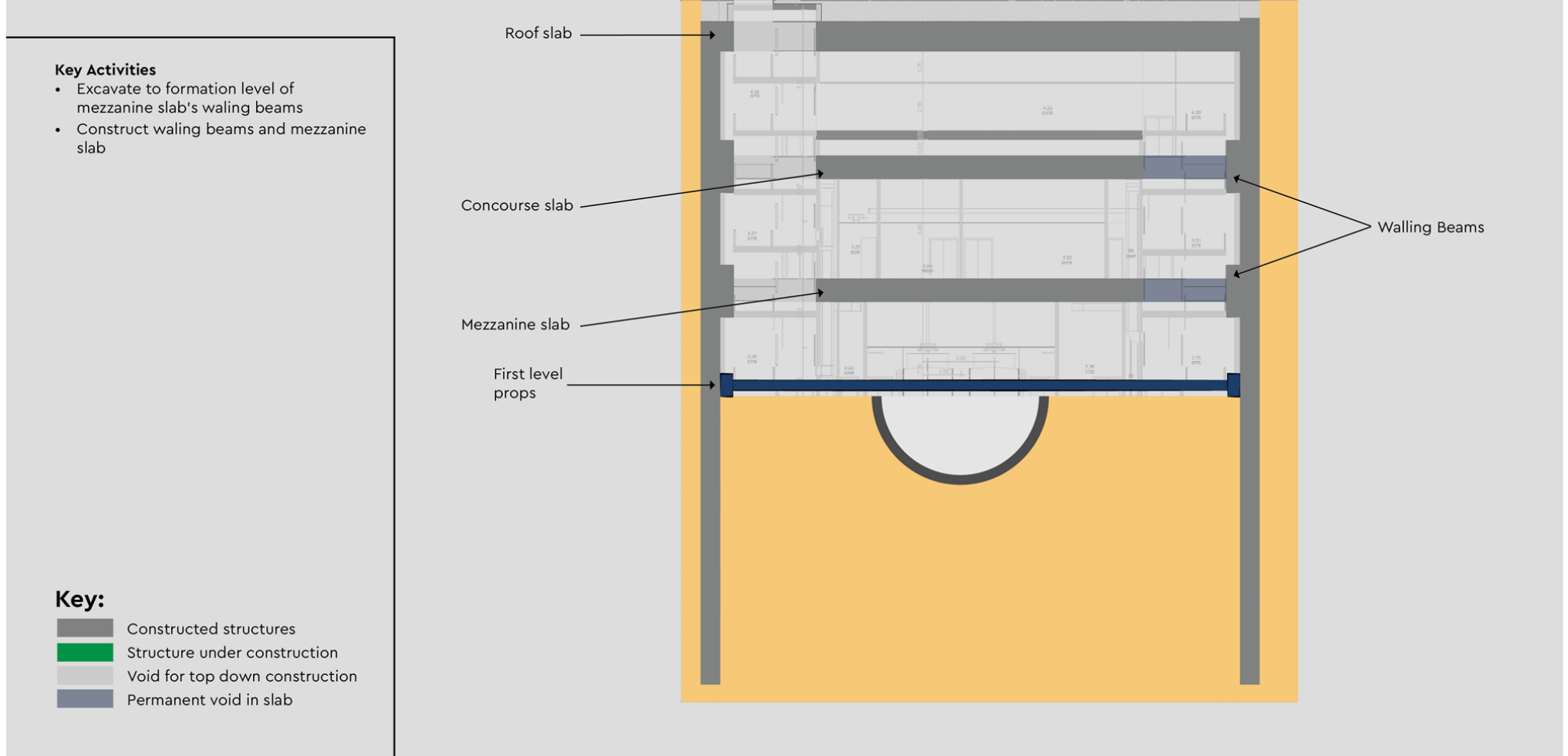


Figure 9-8 TBM First Station - Stage 8

Typical Deep, TBM First Station Cross Section

Stage 9: BoH South end first level temporary props

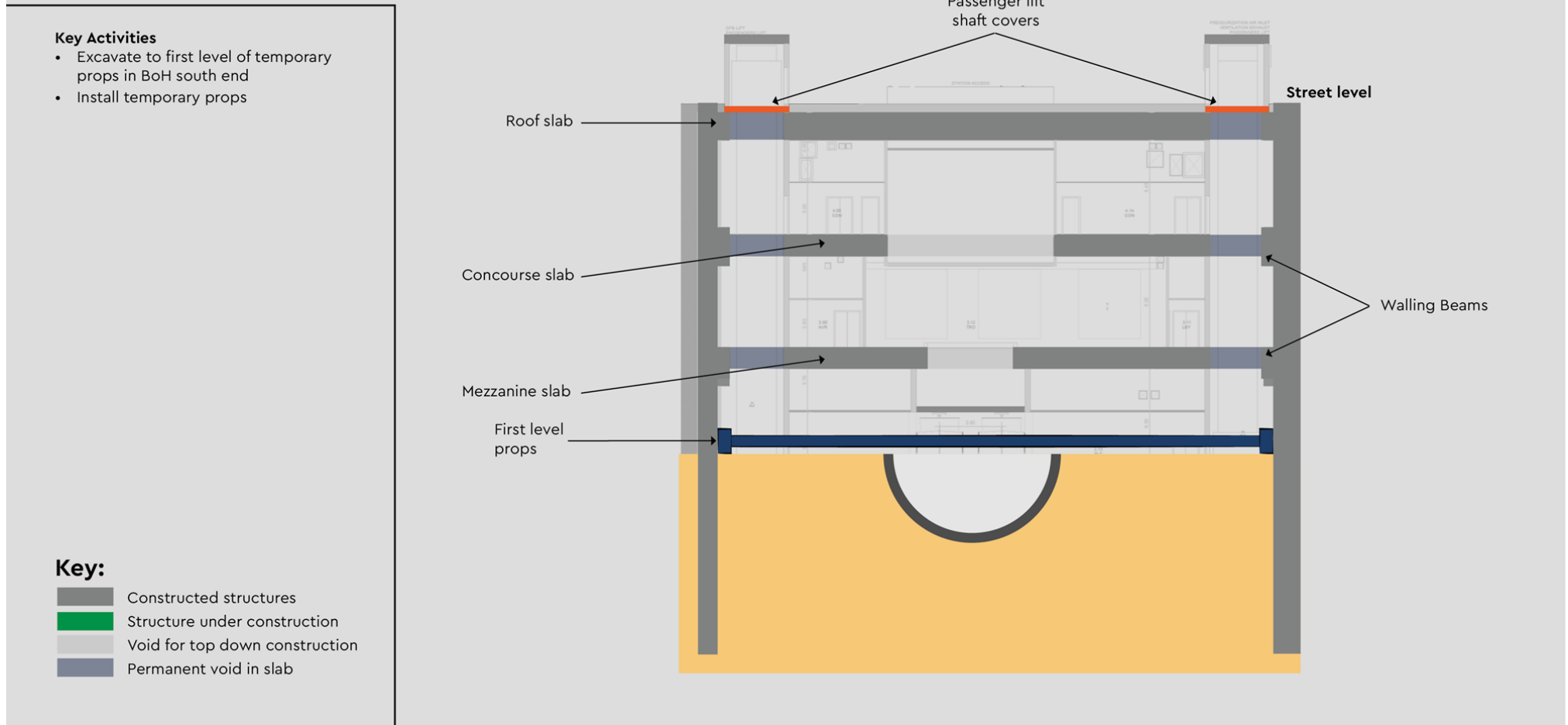


Figure 9-9 TBM First Station - Stage 9

Typical Deep, TBM First Station Cross Section

Stage 10: Excavation to formation level of base slab

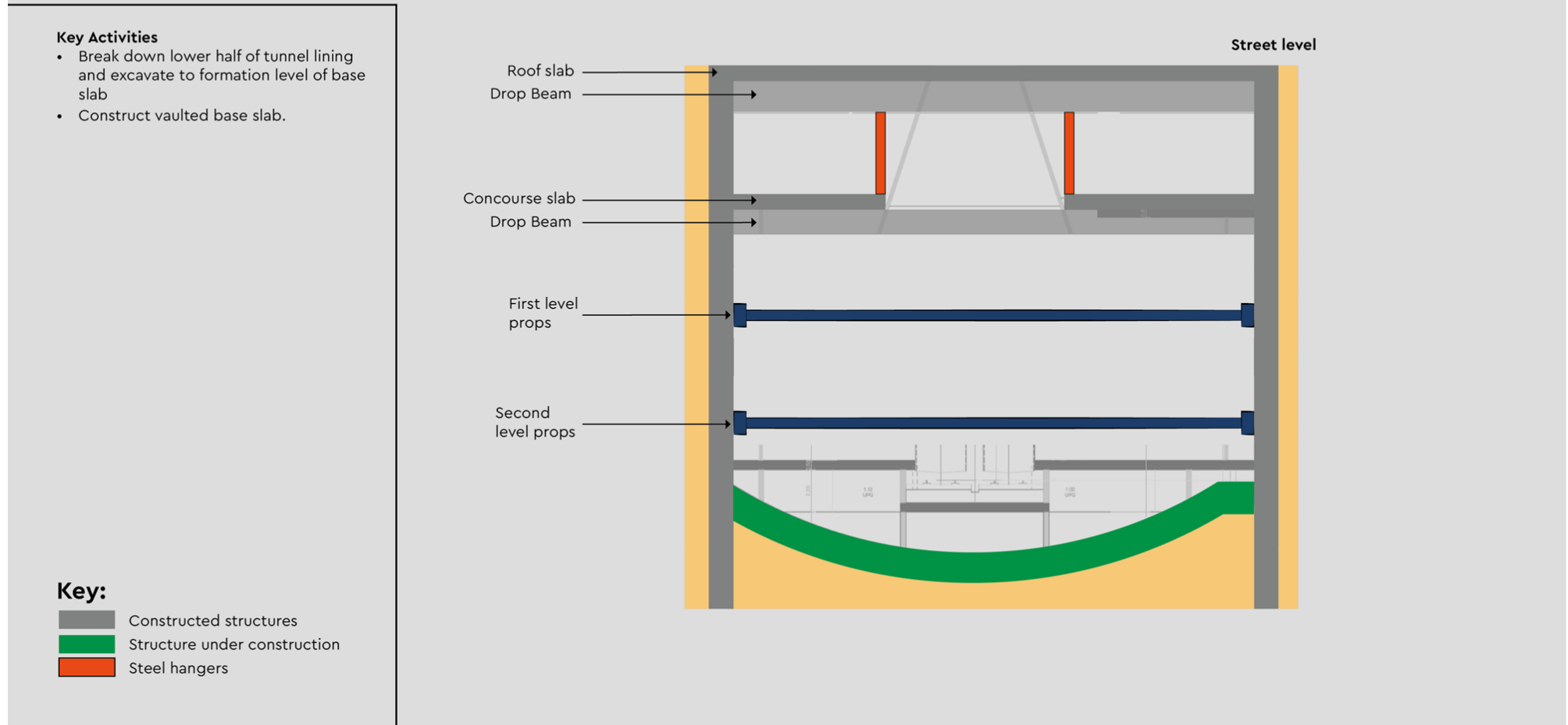


Figure 9-10 TBM First Station - Stage 10

Typical Deep, TBM First Station Cross Section

Stage 11: BoH North end underplatform slab

Key Activities

- Excavate to formation level of underplatform slab
- Construct underplatform slab

Key:

- Constructed structures
- Structure under construction
- Void for top down construction
- Permanent void in slab

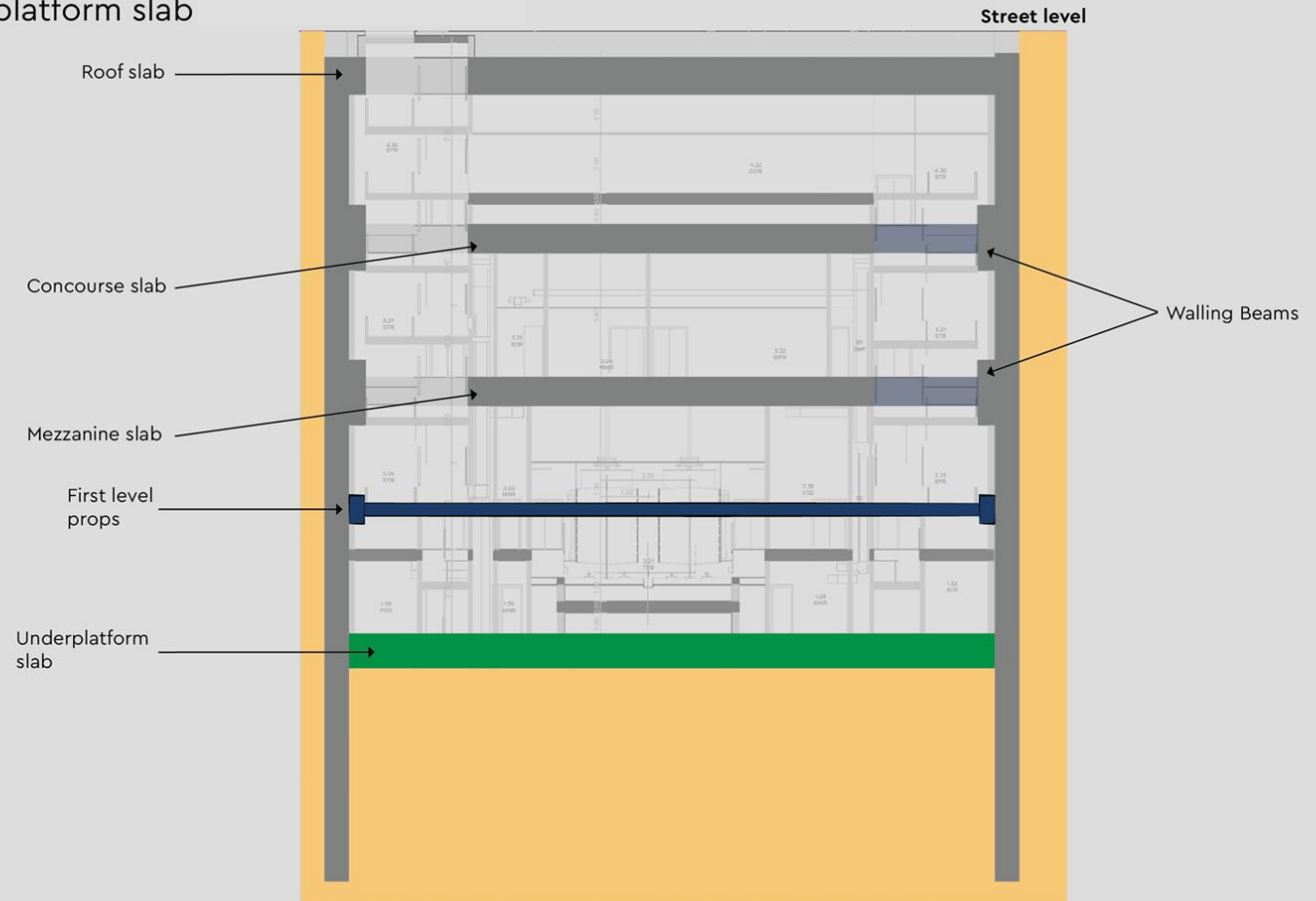


Figure 9-11 TBM First Station – Stage 11

Typical Deep, TBM First Station Cross Section

Stage 12: BoH South end base slab

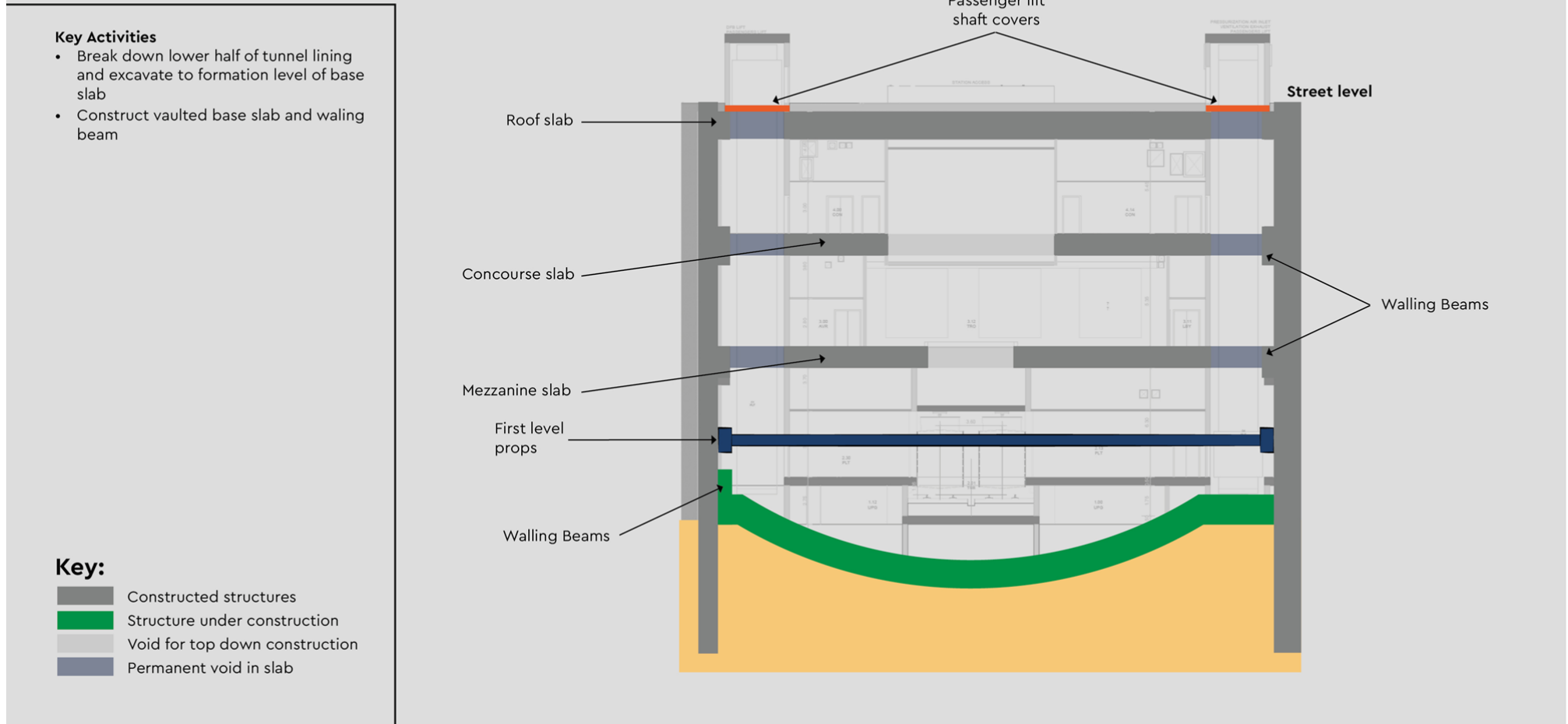


Figure 9-12 TBM First Station - Stage 12

Typical Deep, TBM First Station Cross Section

Stage 13: Construction of the platform level

Key Activities Sequence

1. Remove second level temporary props
2. Pour mass concrete invert
3. Construct reinforced concrete track trough base
4. Construct vertical walls to support the platform
5. Construct the platforms
6. Install steel frames comprising of HEB400 columns at 5.4m centres and IPE300 lintels

Key:

- Constructed structures
- Structure under construction
- Steel hangers

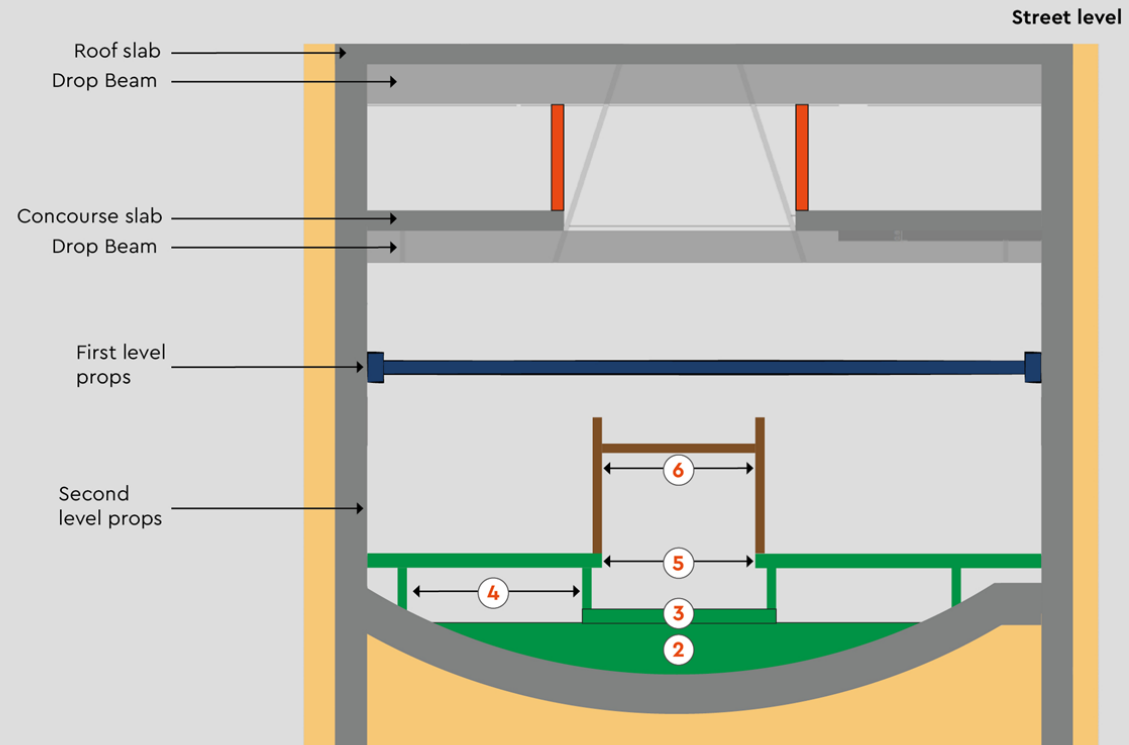


Figure 9-13 TBM First Station - Stage 13

Typical Deep, TBM First Station Cross Section

Stage 14: BoH North end bottom slab and platform

Key Activities

- Remove temporary props
- Excavate to formation level of bottom slab
- Construct bottom slab
- Construct connecting walls between bottom slab and underplatform slab and supporting platform once the bottom slab has gained strength
- Construct platform

Key:

- Constructed structures
- Structure under construction
- Void for top down construction
- Permanent void in slab

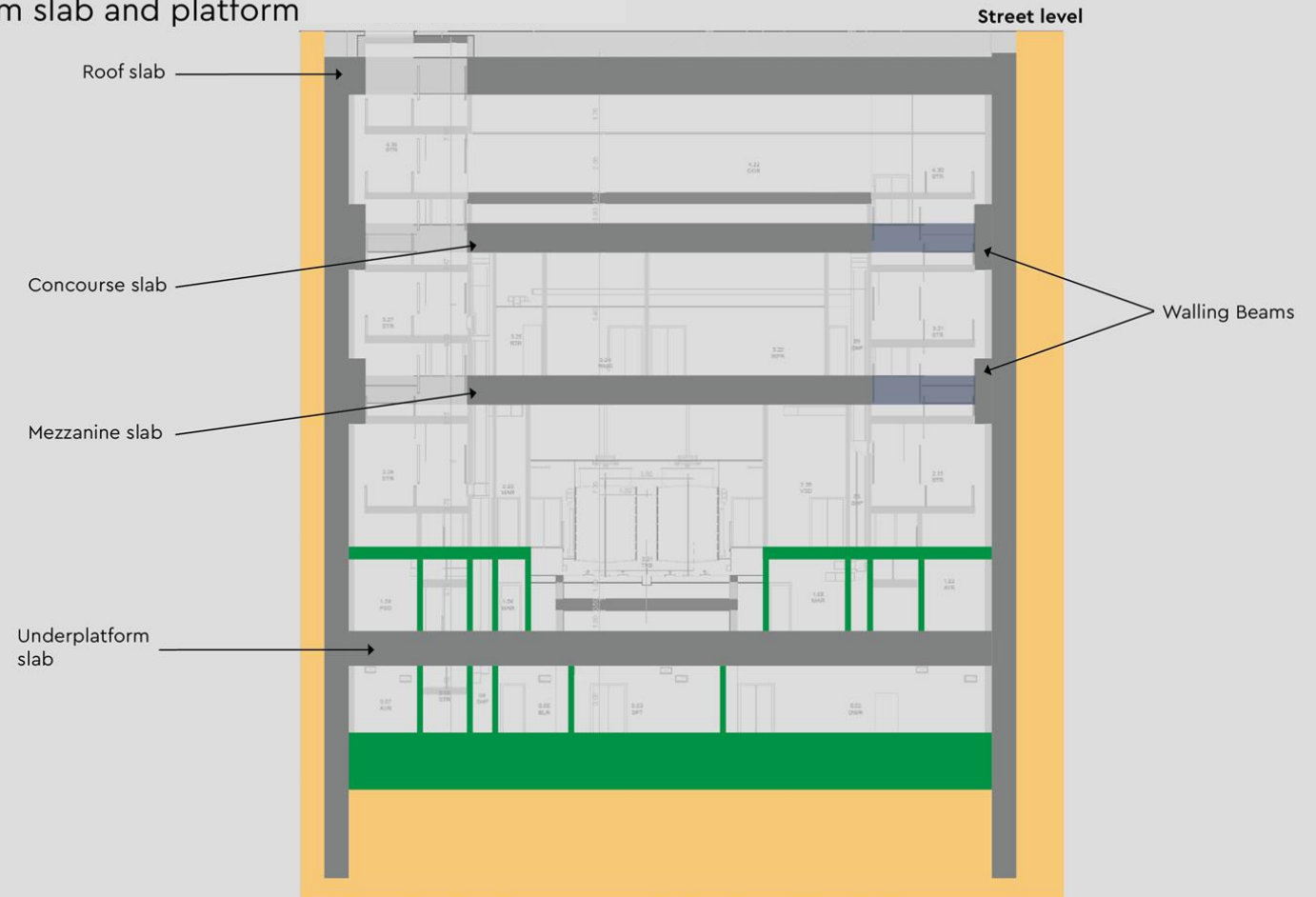


Figure 9-14 TBM First Station - Stage 14

Typical Deep, TBM First Station Cross Section

Stage 15: BoH South end platform level

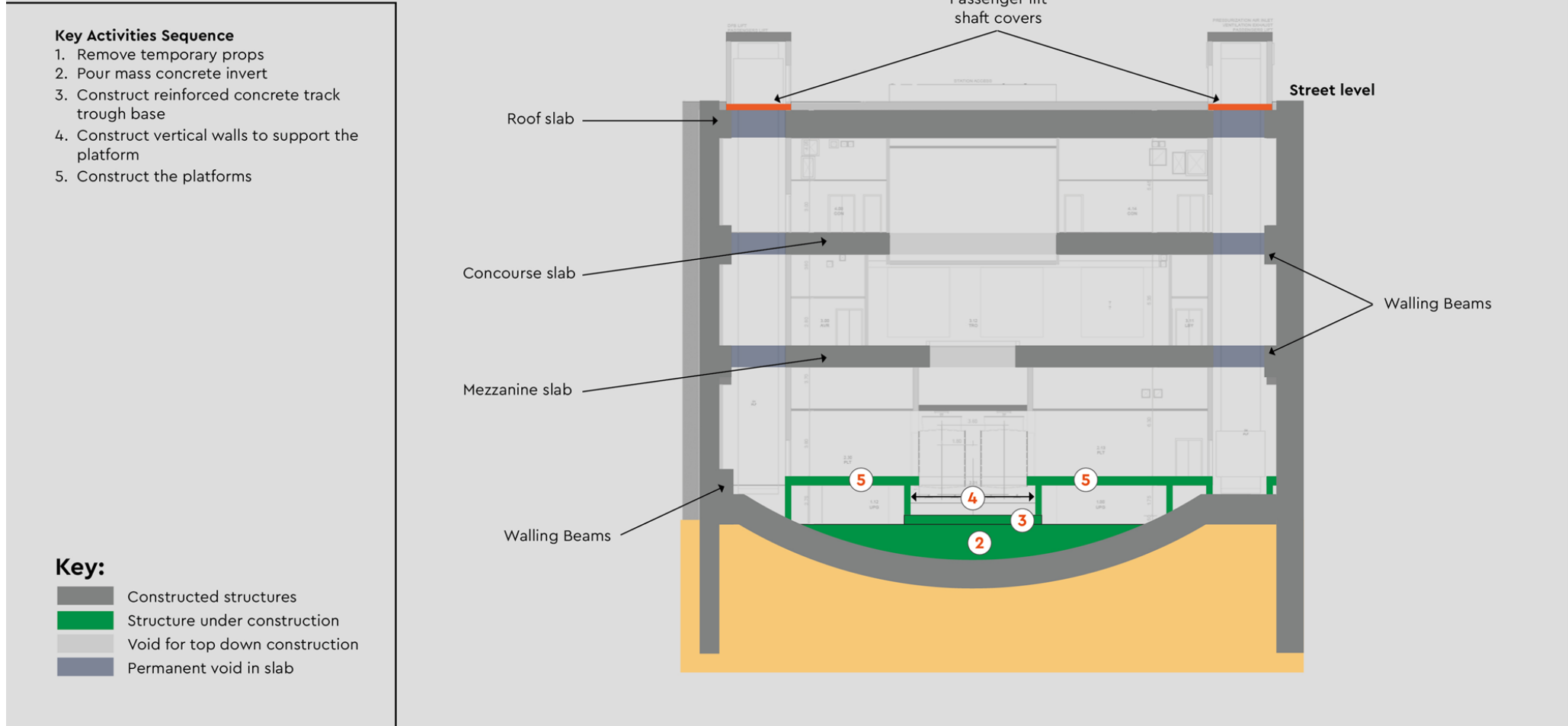


Figure 9-15 TBM First Station – Stage 15

Typical Deep, TBM First Station Cross Section

Stage 16: Construction of the mezzanine slab

Key Activities

- Install formwork/rebar for mezzanine slab, mezzanine permanent props and permanent waling beam.
- Cast concrete mezzanine slab, mezzanine permanent props and permanent waling beam

Key:

- Constructed structures
- Structure under construction
- Steel hangers
- Drop beam under construction

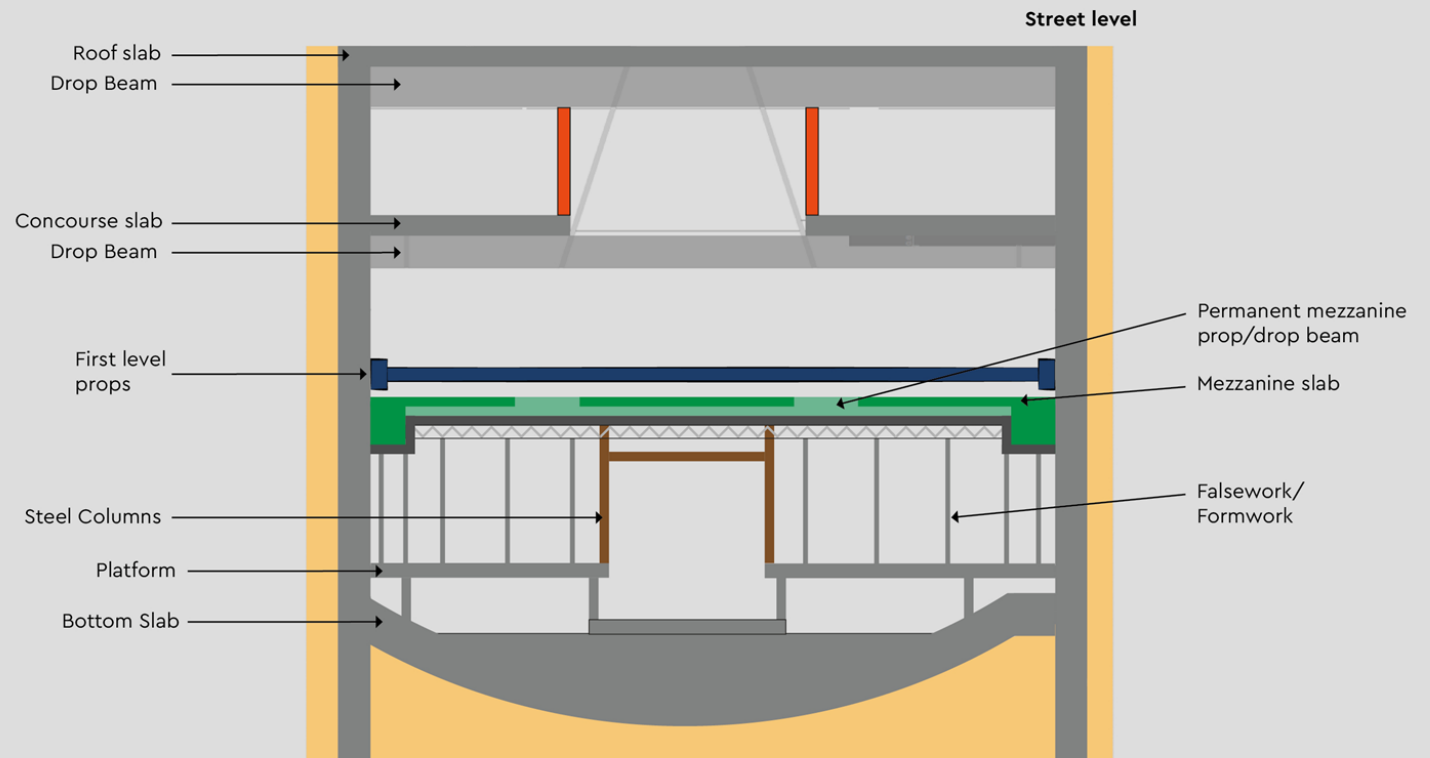


Figure 9-16 TBM First Station - Stage 16

Typical Deep, TBM First Station Cross Section

Stage 17: Removal of temporary props and lining walls

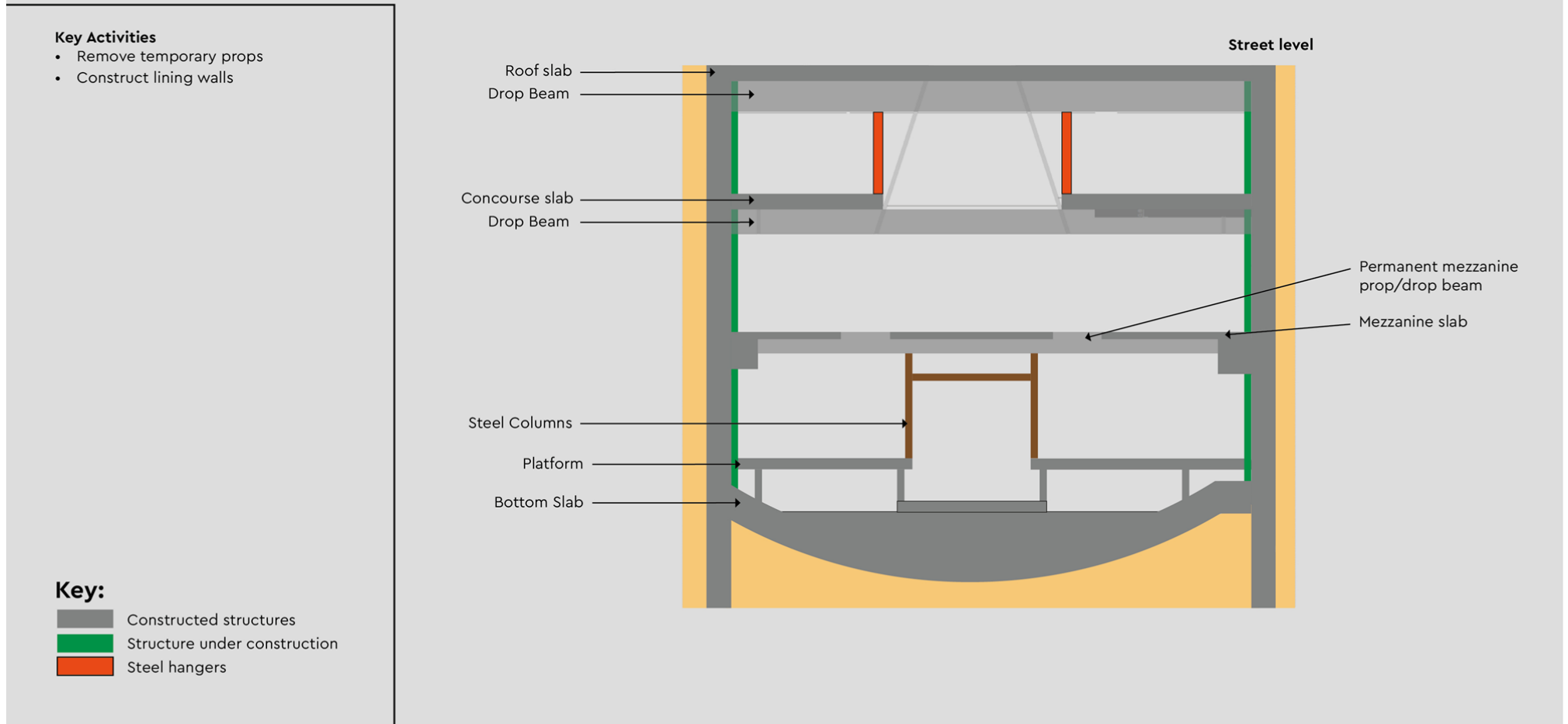


Figure 9-17 TBM First Station - Stage 17

Typical Deep, TBM First Station Cross Section

BoH North end Stage 18: Lining walls -

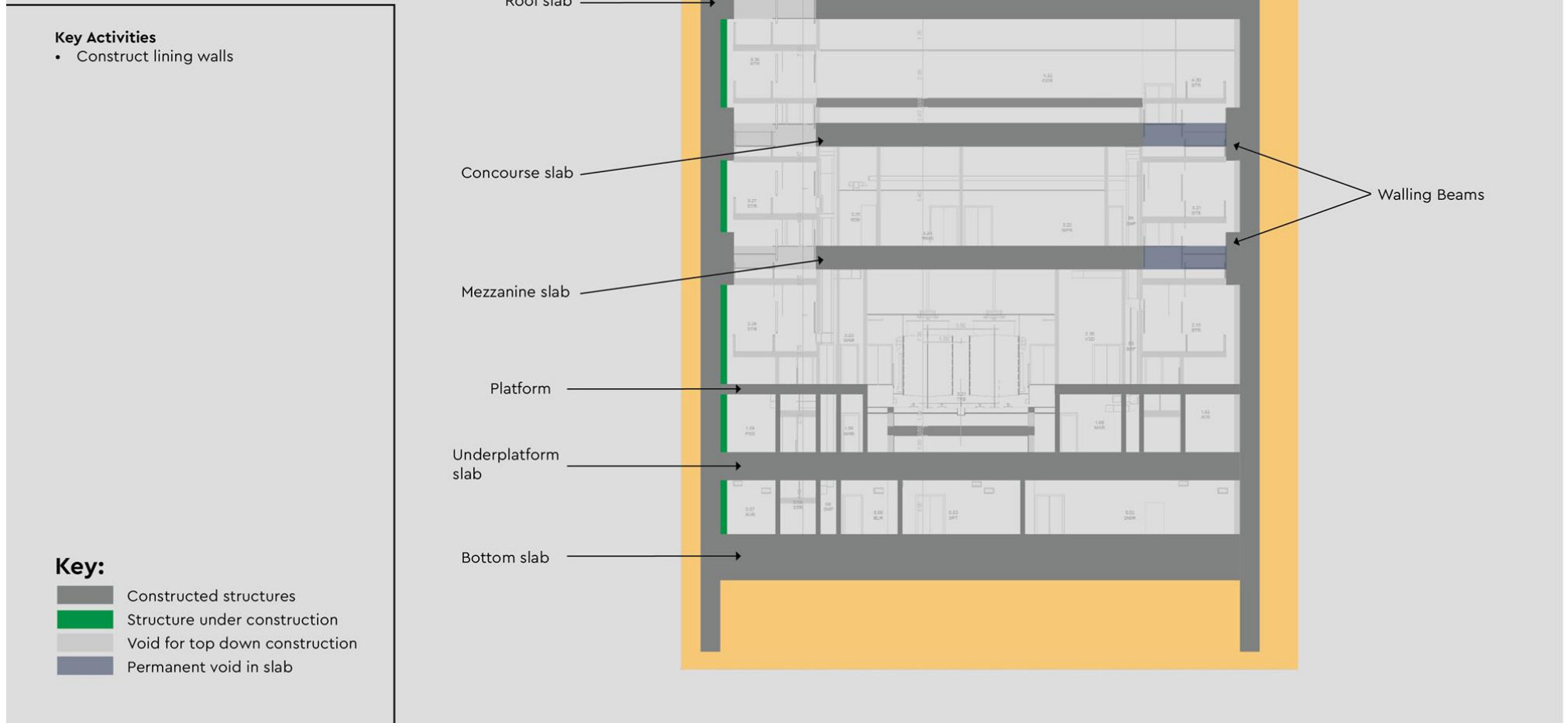


Figure 9-18 TBM First Station - Stage 18

Typical Deep, TBM First Station Cross Section

Stage 19: BoH South end lining walls

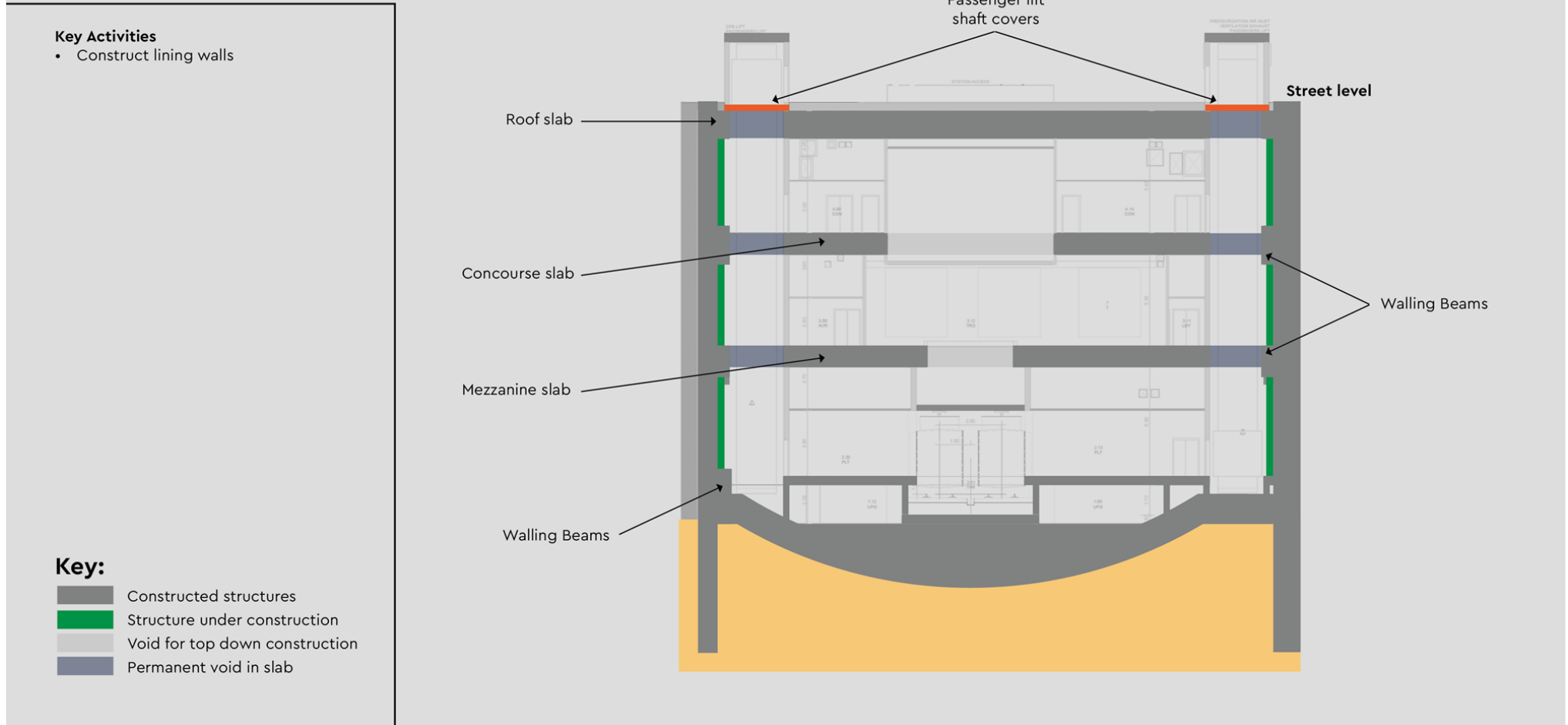


Figure 9-19 TBM First Station - Stage 19

9.2. Typical Station First Cross Sections

Typical Deep, Station First Cross Section

Stage 1

- Install Diaphragm walls, including a soft eye for the tunnels to pass through; in this section the Diaphragm walls will comprise GRP reinforcement and a lower grade of concrete

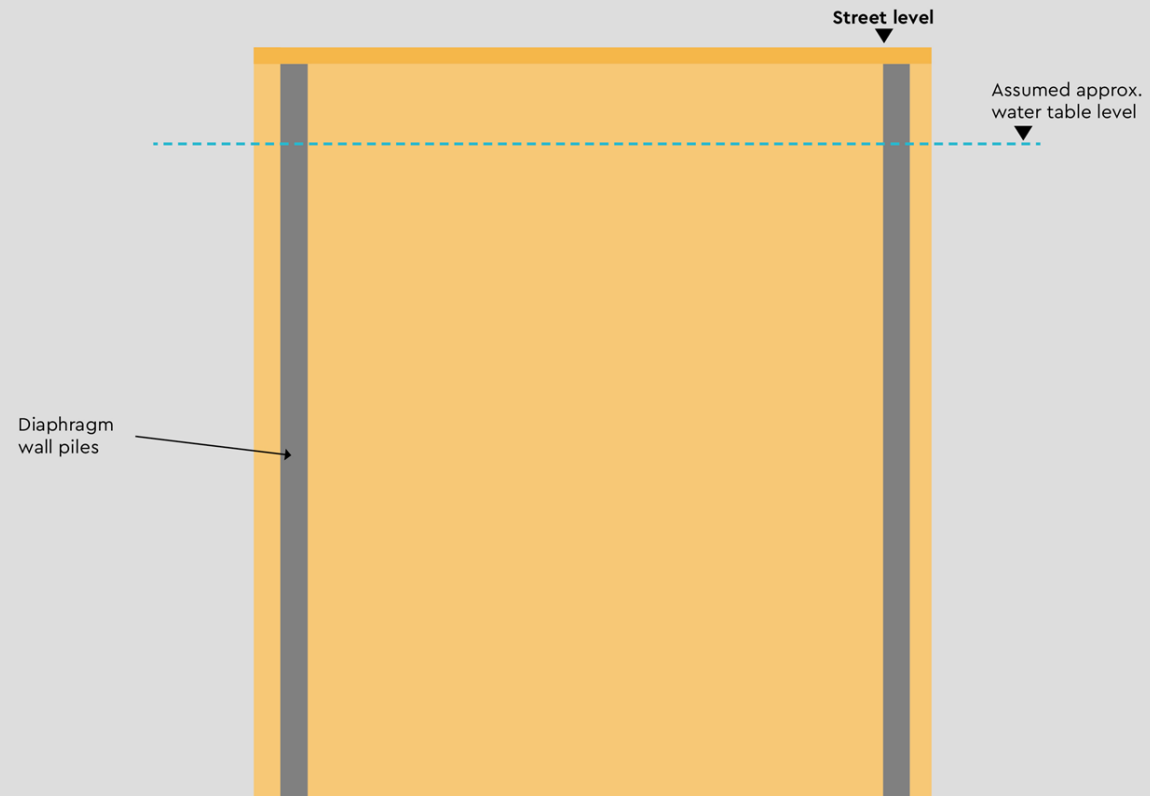


Figure 9-20 Station First Stage 1

Typical Deep, Station First Cross Section Stage 2

- Excavate and cast roof slab

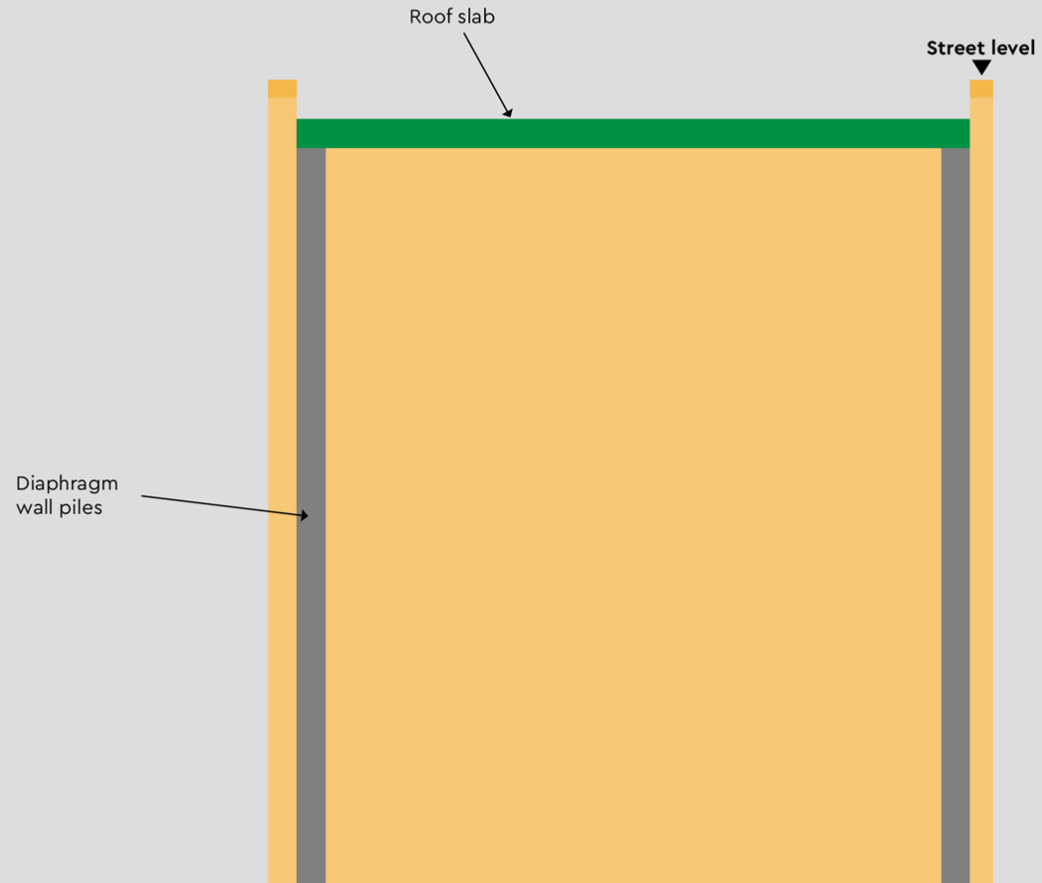


Figure 9-21 Station First Stage 2

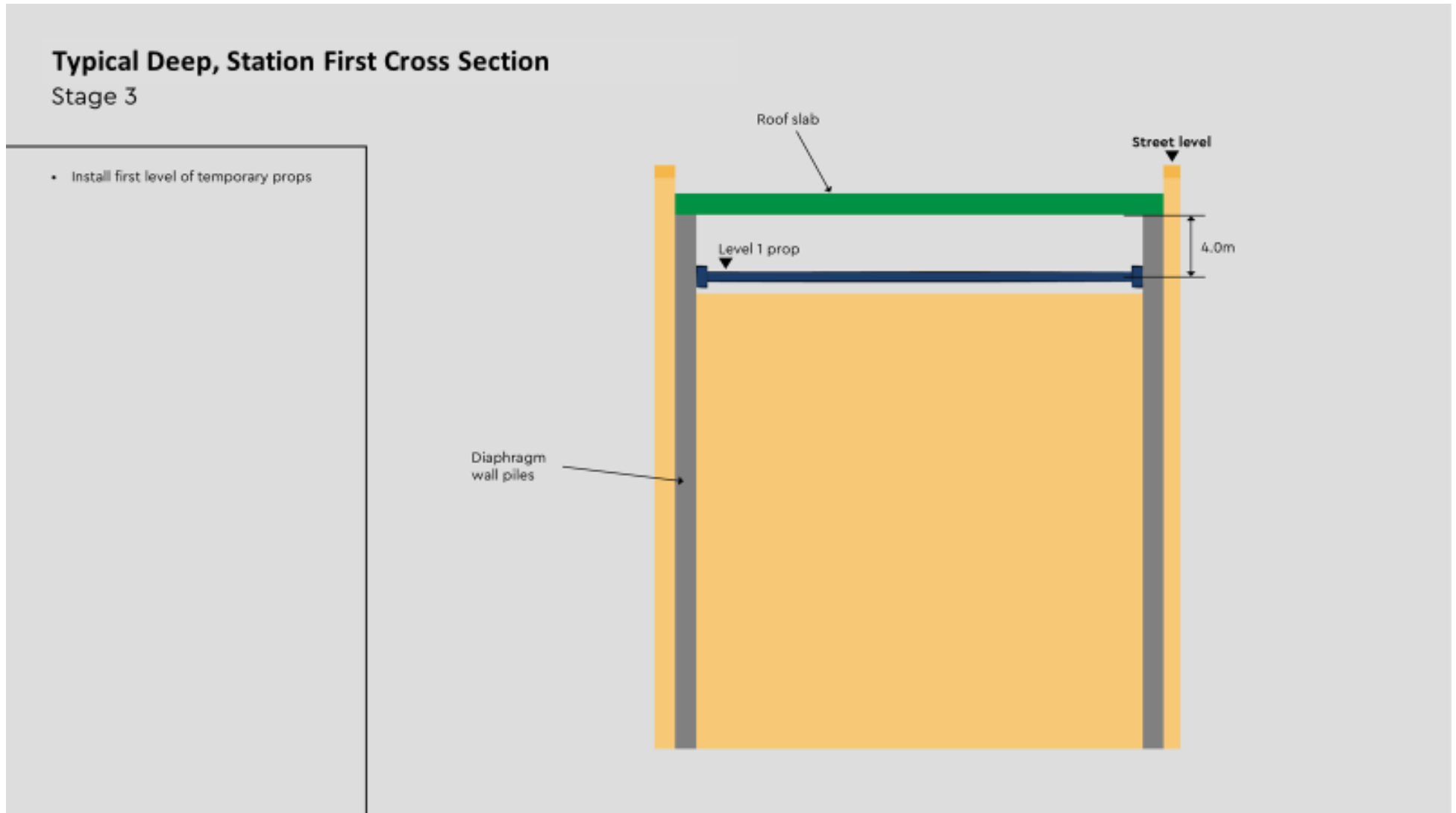


Figure 9-22 Station First Stage 3

Typical Deep, Station First Cross Section

Stage 4

- Excavate to underside of Concourse slab
- Cast Concourse slab
- Install steel hangers to the Designer's details and props across the voids as required by the design

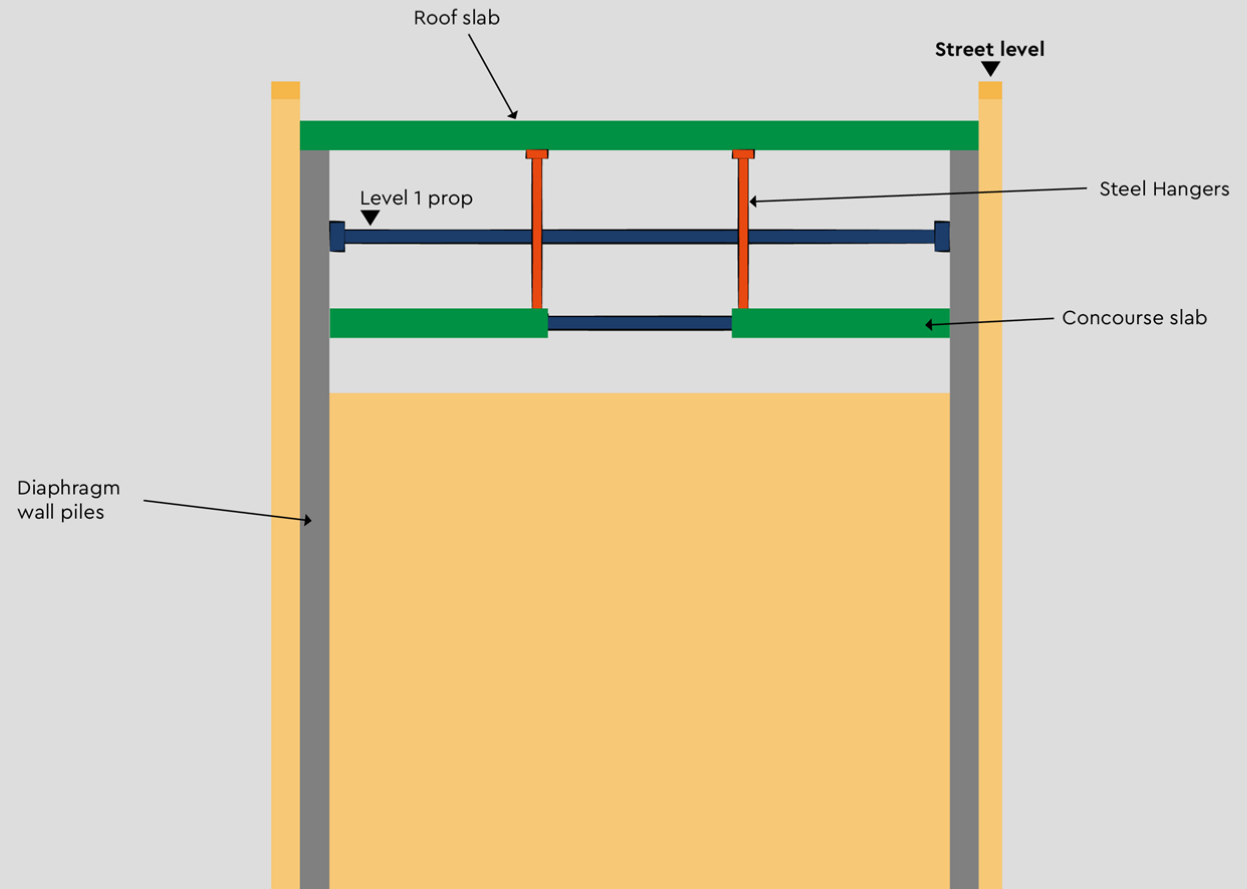


Figure 9-23 Station First Stage 4

Typical Deep, Station First Cross Section

Stage 5

- Excavate down to underside of level 2 temporary props
- Dismantle level 1 props and install level 2 temporary props

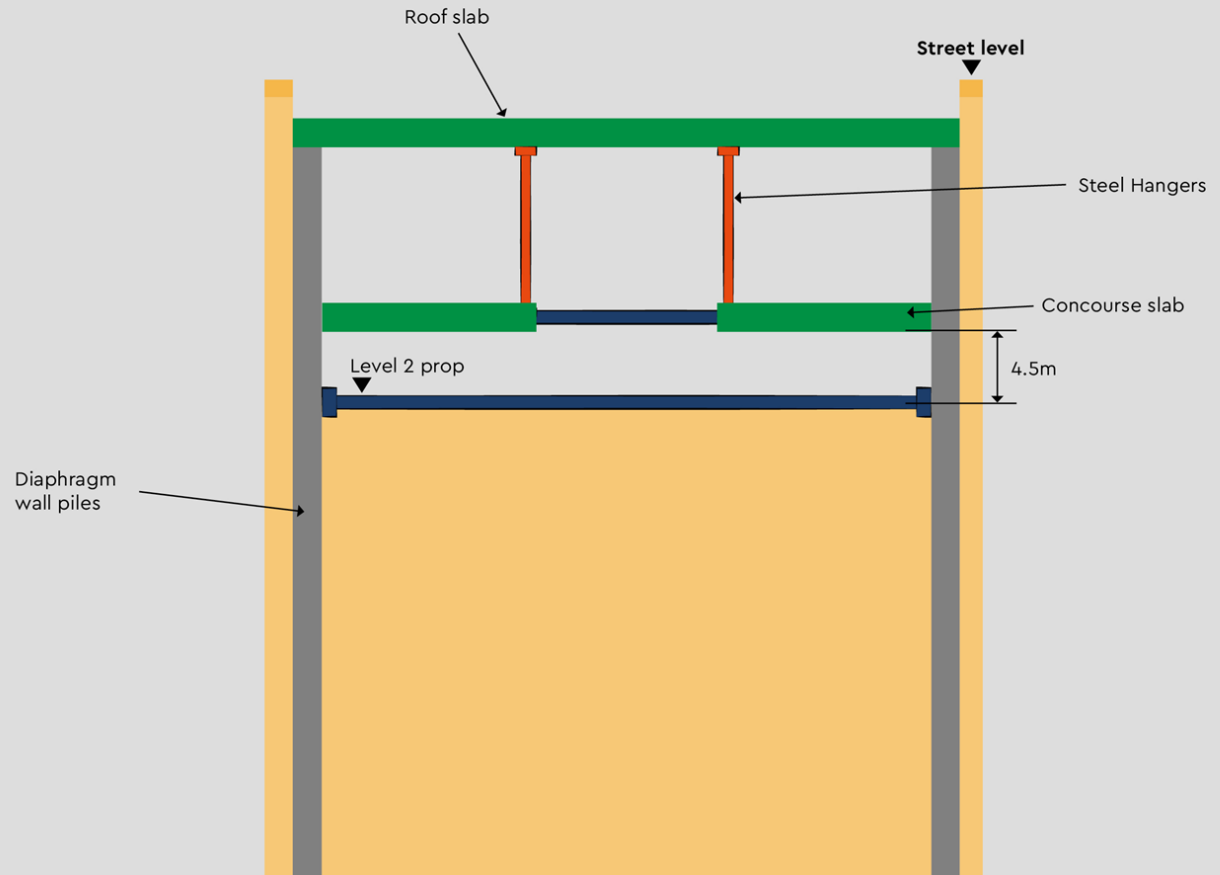


Figure 9-24 Station First Stage 5

Typical Deep, Station First Cross Section

Stage 6

- Excavate to underside of level 3 props
- Install level 3 props

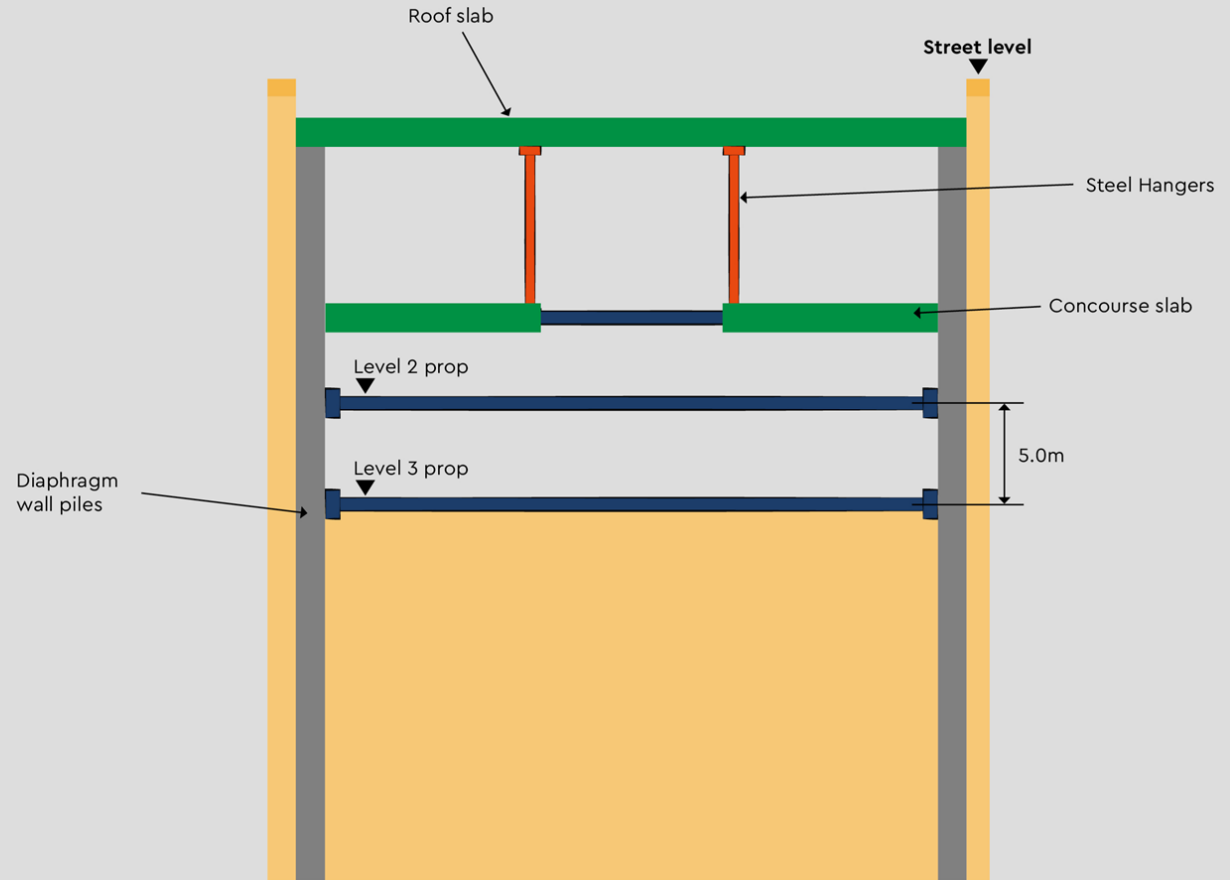


Figure 9-25 Station First Stage 6

Typical Deep, Station First Cross Section Stage 7

- Drill & blast, excavate to formation level of base slab
- Lay blinding, waterproof membrane, place reinforcement and cast the central section (1) of the vaulted base slab, followed by sections 2 & 3.

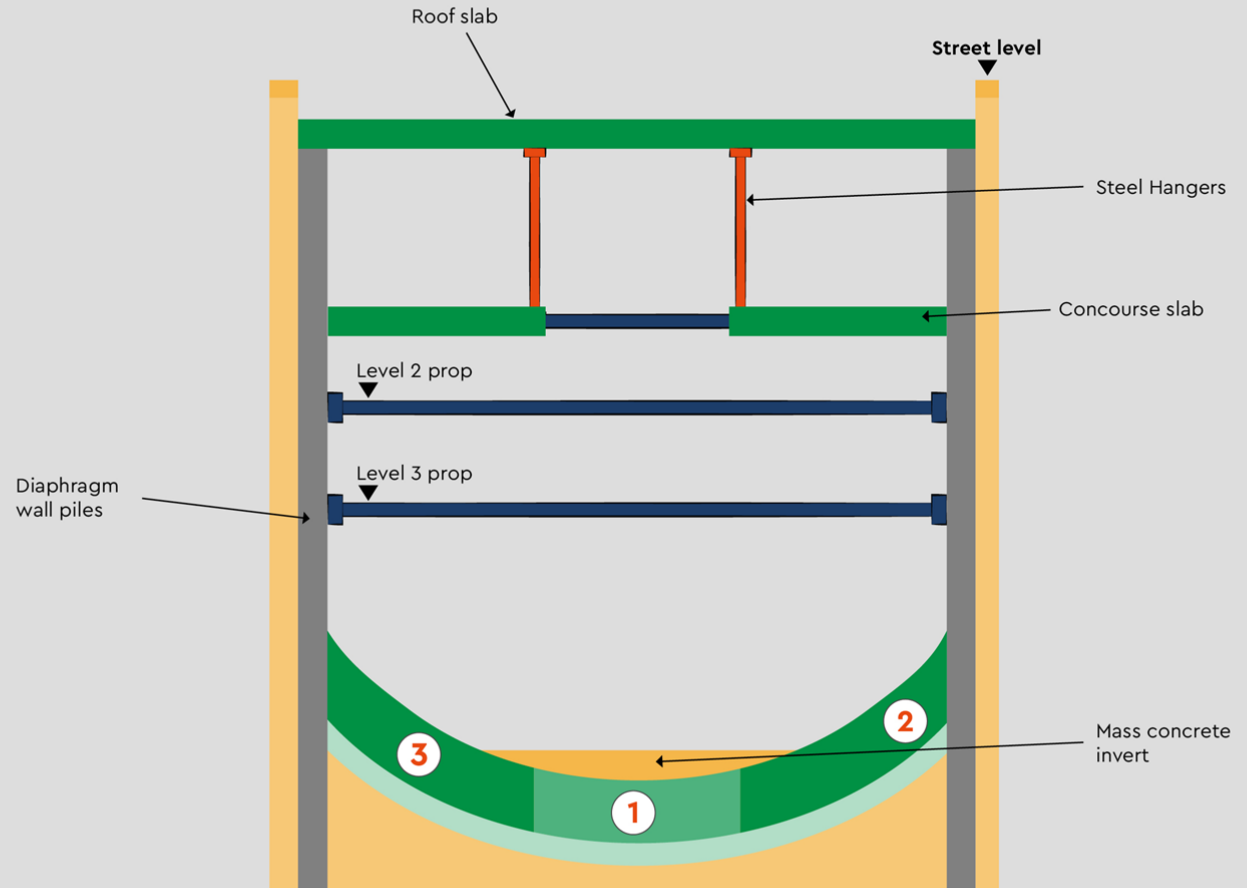


Figure 9-26 Station First Stage 7

Typical Deep, TBM First Station Cross Section Stage 8

- Station following the TBM passage through the station

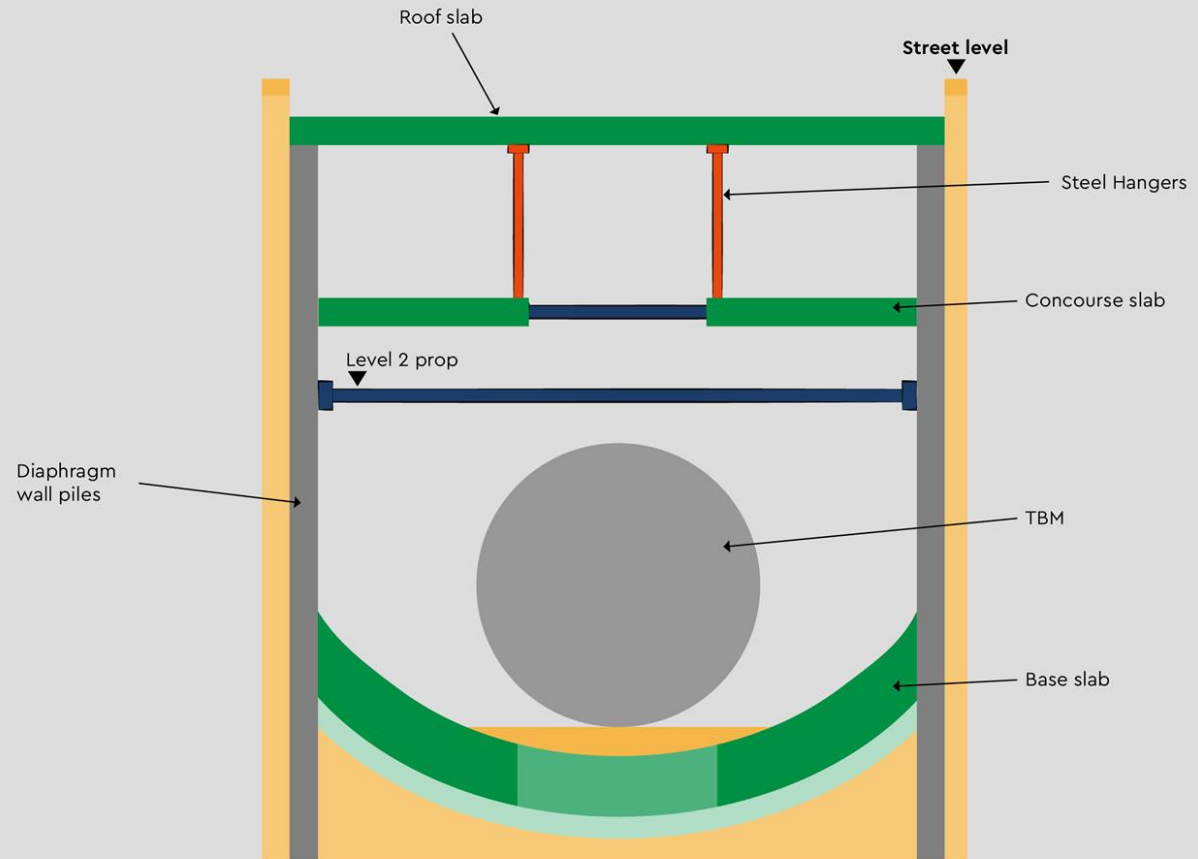


Figure 9-27 Station First Stage 8

Typical Deep, Station First Cross Section

Stage 9

- Cast mezzanine slab at the north and south ends (approx. 28m lengths) of the station where there are no drop beams and remove level 3 props when sufficient strength is achieved
- When tunnelling operations are complete, or during an extended delay to the TBM such as a planned cutter head maintenance, the thrust frame, temporary tunnel rings, and any cradles for TBM and back-up passing through the station will be removed. Backfill will be placed to reinstate the supply route to the TBM

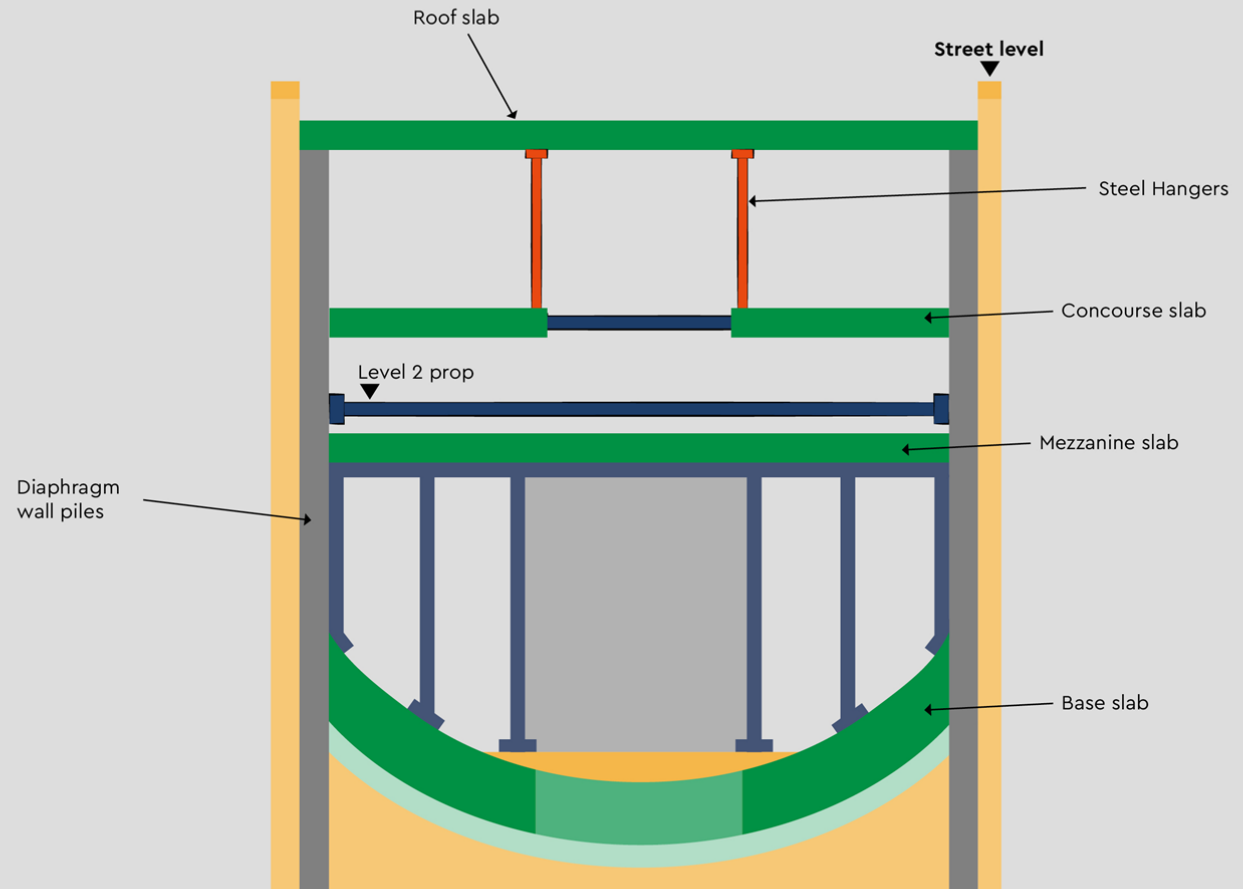


Figure 9-28 Station First Stage 9

Typical Deep, Station First Cross Section

Stage 10

- Where these works are not yet complete and the TBM operation is over:
- Install rebar, and shutters for the lower section of lining wall, and cast lining walls
- Install scaffolding / formwork and cast Mezzanine slab, central sections with drop beams (approx. 50m length)

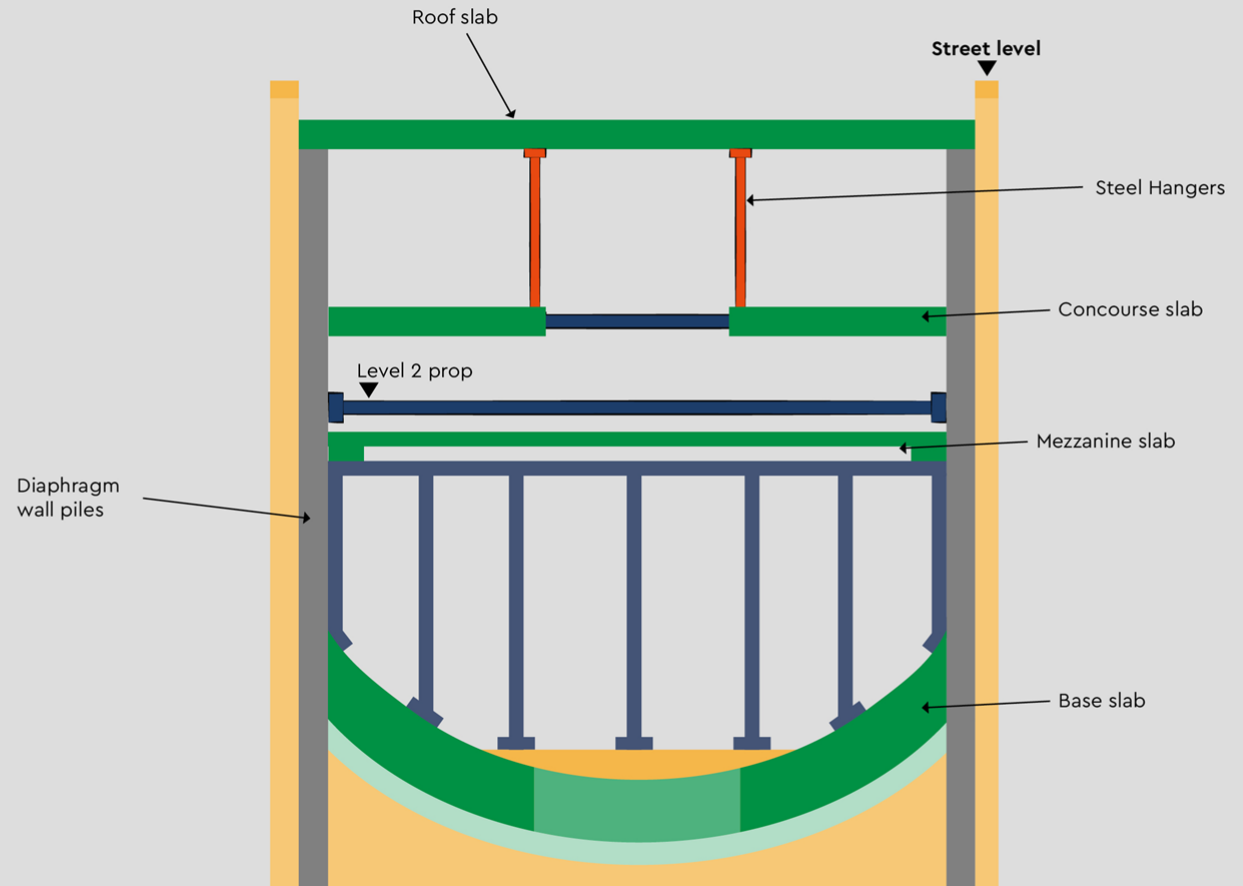


Figure 9-29 Station First Stage 10

Typical Deep, Station First Cross Section

Stage 11

- When the mezzanine slab has reached the required strength, remove the level 2 props
- Continue with waterproofing and lining walls to the underside of the roof slab
- Remove temporary steel hangers from concourse slab
- When the supply of materials is no longer required through the tunnel:
- Cast the mass concrete section of invert under the platforms
- Install precast platform sections and infill sections with in-situ concrete

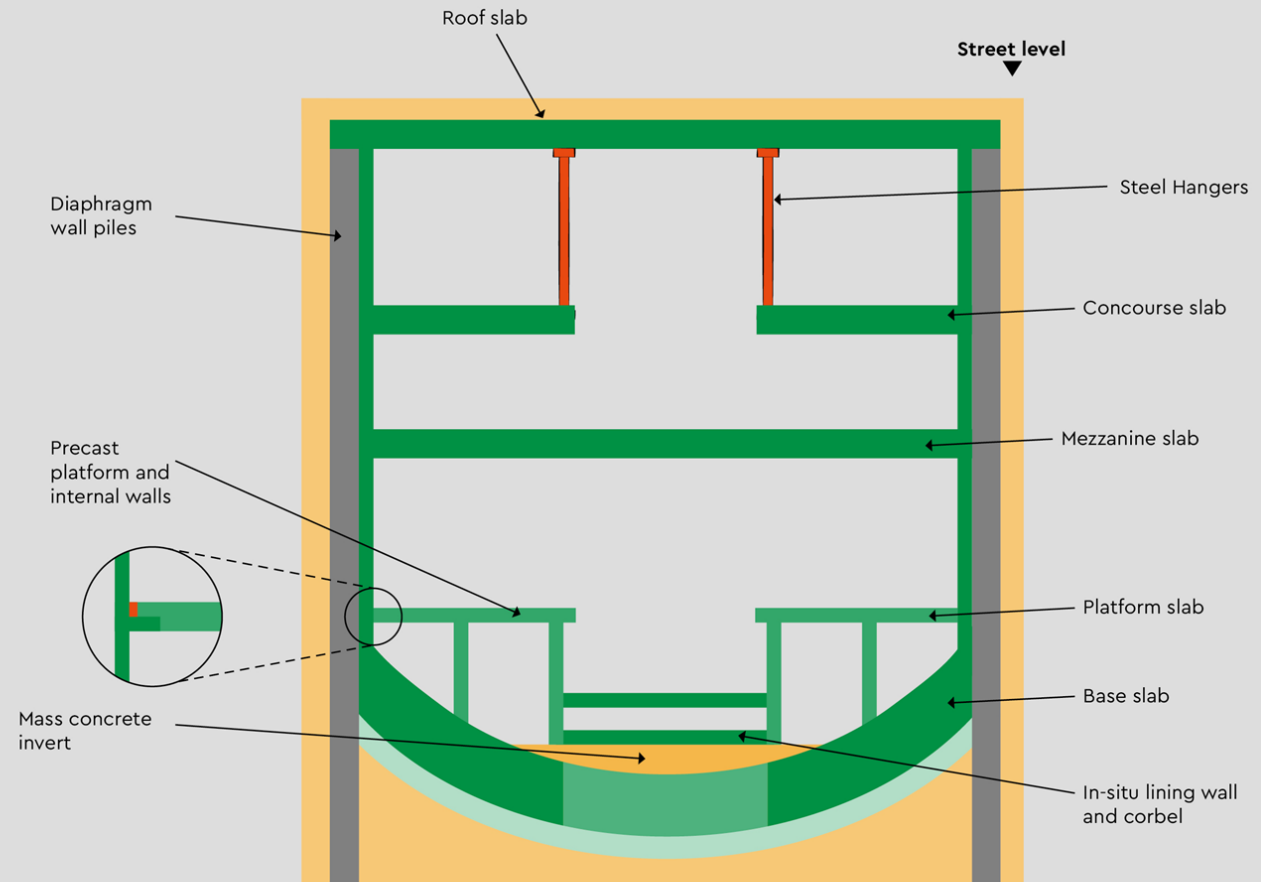


Figure 9-30 Station First Stage 11