

Managing Services Affected by Road & Commuter Infrastructure Works



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1.0 INTRODUCTION

Industry professionals carrying out road and commuter infrastructure works may encounter situations where existing underground services conflict with the proposed works. A common solution is for these services to be diverted. However, there are several challenges in carrying out services diversion, namely:

- High costs
- Long duration is needed for services diversion before any development works can be carried out
- Some diversions can only be carried out by the appropriate service provider which can further delay project implementation
- Services layout plans may not accurately reflect the presence/position of services within the site, and the actual work required can surpass initial estimates due to discovery of new services etc.

As such, services diversion should not be the default solution to overcome such conflicts. The objective of this quick guide is to share with industry professionals the possible solutions which Qualified Persons (QPs) can adopt to minimize the need for services diversion. These solutions are generally agreeable to the relevant agencies and service providers.



1.1 KEY REASONS FOR DIVERTING SERVICES

The key reasons for services to be diverted away from the road are as follows:

- Closure of lanes for services maintenance may not be feasible for roads with high traffic volume
- Utility owners require easy access to the services for maintenance purposes
- Utility owners are concerned about the risk of damage due to the vehicular loads that the utilities would be subjected to.
- Services at shallow depth could cause defects to appear on the road, making it unsafe for road users.
- Physical conflict between utilities and road elements (structural foundations, scupper pipes etc.)

2.1 EXISTING SERVICES ON ROAD SIDETABLE WHICH AFFECT IMPLEMENTATION OF STANDARD ROAD TYPOLOGY

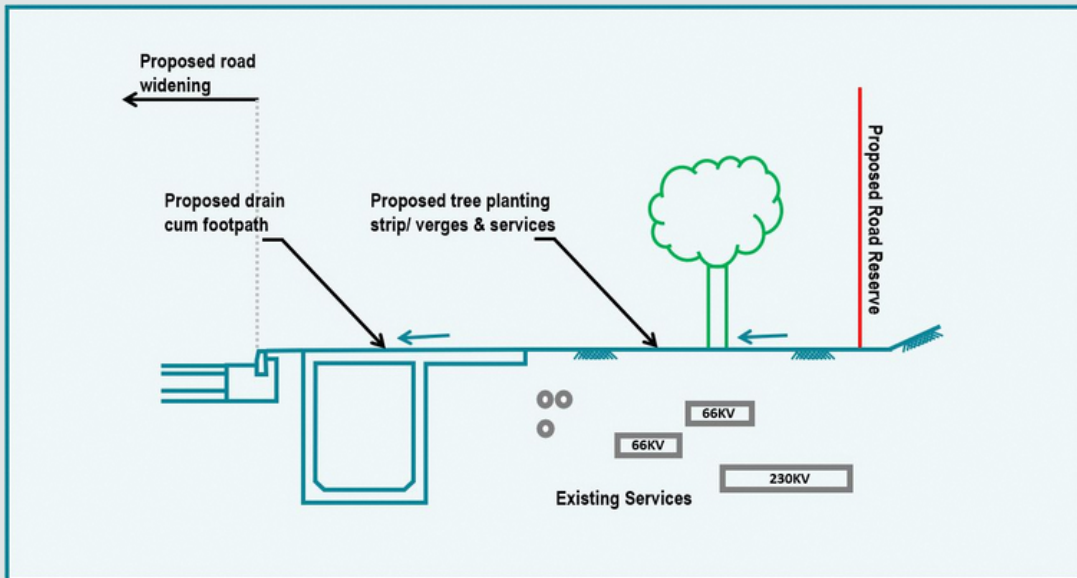
Background

When carrying out road widening/ improvement works to the road sidetable, services within the existing road sidetable may limit the implementation of a standard road sidetable typology.

Proposed Solutions

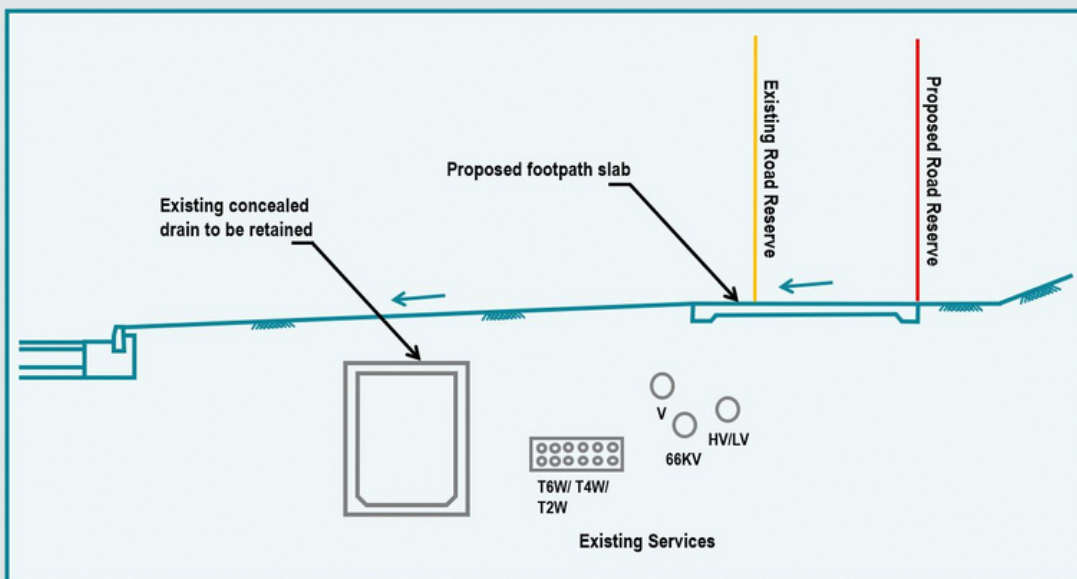
With proper justification of technical constraints on site (i.e. conserved trees, and congested major services within the sidetable), LTA will consider modified/ non-standard road typology and features.

Case 1: Retention of Drain & Footpath Within Existing Road Sidetable Position



Due to significantly high costs and time to divert existing major services (66 kV/230kV cables and Singtel lines), reconstructing existing drain to abut Road Reserve Line (RRL) was not feasible. Drain/footpath was hence retained at the existing location.

Case 2: Realignment of Drain (with Decoupling from Footpath)



Due to existing major services, reconstruction of existing drain to abut RRL was not feasible. As such, the drain was retained at its existing position and turfed over. A new footpath slab abutting the RRL was provided.

Note: The widened road carriageway should not extend over the drain.

2.2 EXISTING SERVICES AFFECTED BY PEDESTRAIN OVERHEAD BRIDGE (POB)

Background

Existing services along the road sidetable may be affected by the columns, staircase and lift shaft of proposed POB.

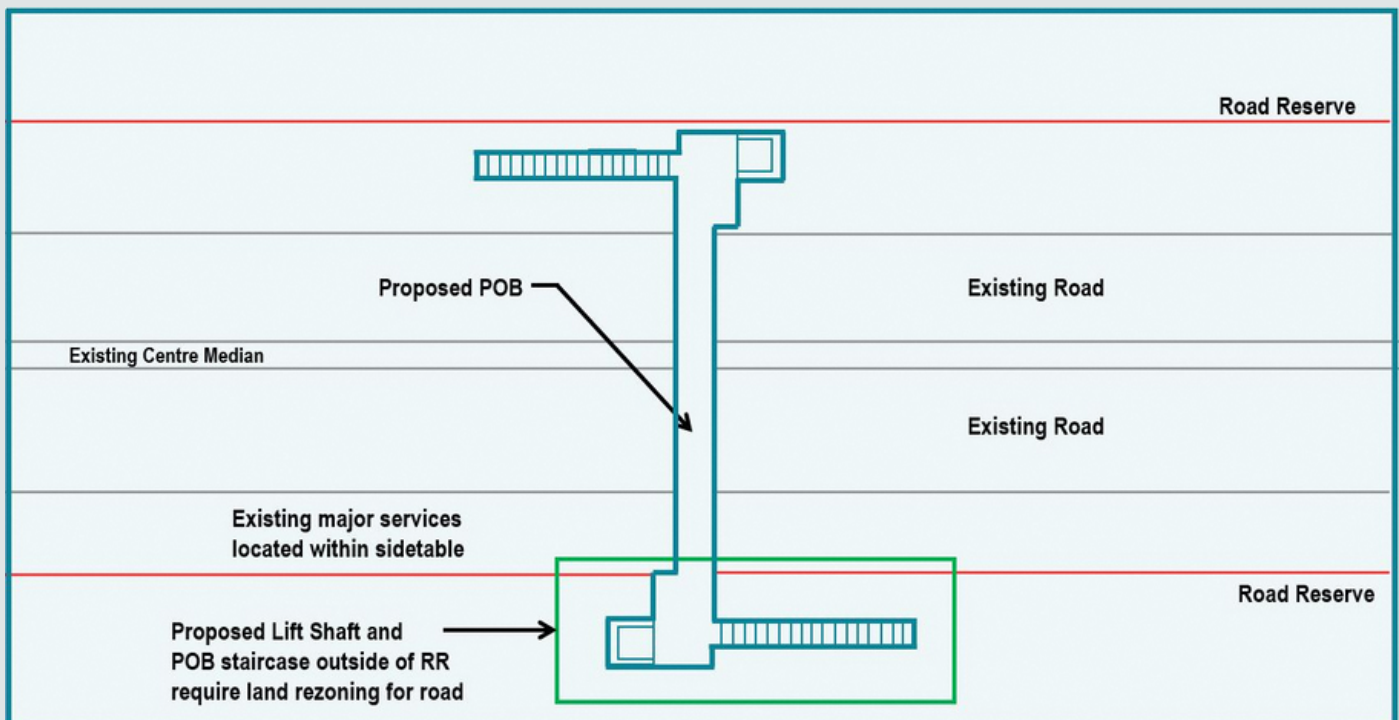
Proposed Solutions

All existing services should be identified prior to the design of the POB, and land should be secured for the POB structure, as well as space for the diverted services and drains. In an unforeseen circumstance where the services are detected at a late-stage, QPs may consider the following solutions:

- Redesign / realign the columns, lift core or the staircases layout (e.g. dog-legged staircase) to avoid the services and consult the relevant utility owners if the columns fall within their respective clearance distances.
- If there are technical reasons for any part of the POB to fall outside the road reserve, QP can propose to revise the Road Reserve and rezone land to accommodate the space required to deconflict with existing services. (Please note that the QP shall obtain the necessary clearances from agencies such as NParks, PUB, and URA for the rezoning to expand the Road Reserve).

Note: If realignment of the drains is required to avoid the footings/ columns of the POB, QP's shall ensure that there is a smooth transition in drain alignment (i.e. there should not be 90 degree bends)

Case 3: Amendment of Road Reserve Line (with Land Re-zoning) to accommodate POB



Proposed lift core, columns and staircases of POB are located outside of Road Reserve due to existing services located within sidetable.

2.3 EXISTING SERVICES AFFECTED BY COVERED LINKWAYS

Background

Existing services may be affected by proposed covered linkways. When determining the location of the covered linkway's footing and the services underneath, consideration should be given to the need for service providers to access and carry out maintenance works.

Proposed Solutions

- The depth of affected services would need to be established, and the owners of affected services be consulted.
- QPs may consider providing demountable covered linkway roof/ canopy, at the affected stretch where the covered linkway crosses the services. Please note that demountable bus shelters are not allowed in view of operational needs.
- For scenarios where maintenance/ machinery access is required for the affected services, QPs should consider providing high linkway instead of low linkway at the affected stretch. The footings of the covered linkway columns should have sufficient clearance from existing services.
- Where footings of the columns can only be installed on top slab of drain due to existing services, the drain has to be designed/ modified and strengthened to withstand the additional loading of the linkway structures. LTA will maintain the top slab and linkway structure and PUB maintains the remaining drain structure.



2.4A EXISTING SERVICES DISPLACED ONTO ROAD CARRIAGEWAY DUE TO ROAD WIDENING

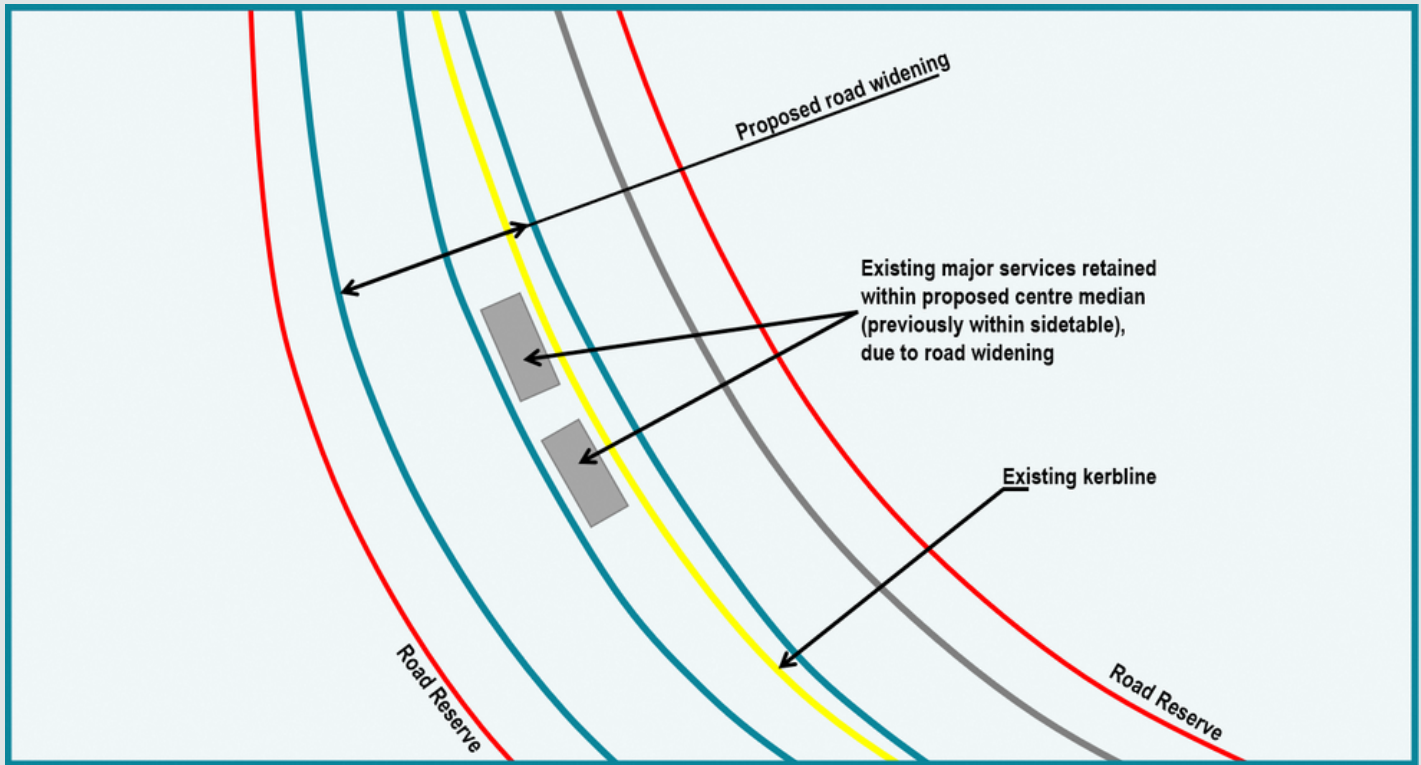
Background

When carrying out road widening, existing services within the existing road side table or centre median could be displaced onto the widened carriageway.

Proposed Solution 1: Review proposed road alignment

QPs should review the alignment of the road to avoid displacing the services on to the carriageway.

Case 4: Redesign of road geometry to allow services to avoid alignment of carriageway



The diversion of 400kV cables and its ancillaries was strongly discouraged by SPPG as it is an important component of the Singapore Power Grid. Therefore, the road alignment was adjusted such that the existing feeder tank and apparatus (previously located within road sidetable) were retained within proposed centre median.

2.4B EXISTING SERVICES DISPLACED ONTO ROAD CARRIAGEWAY DUE TO ROAD WIDENING

Proposed Solution 2: Implement services protection measures (e.g. concrete haunching)

Generally, services are required to be laid at minimum 1.2m depth within the sidetable. Hence, the services shall meet the minimum depth requirement of 1m below the road carriageway should they be required to be displaced onto the road carriageway (even for cases where services were shallower on existing sidetable).

QPs should also consult the respective utility agencies on the proposed service protection measures to ensure that access for maintenance and renewal works will not be hindered.

Details of the proposed protection measures shall be submitted to both LTA and the relevant utility companies. agencies (i.e. SPPG, PUB, etc.) for approval.

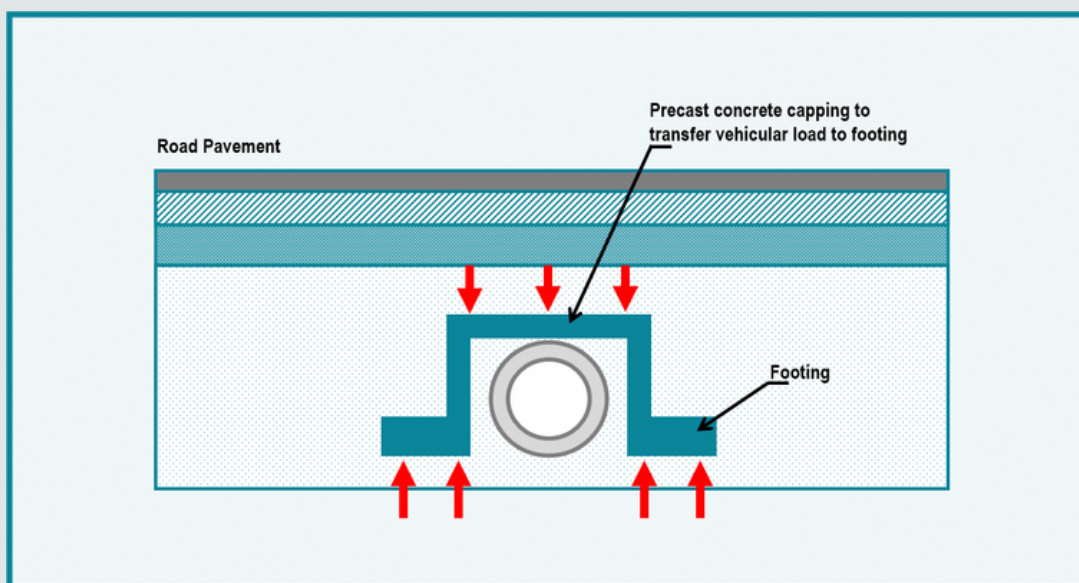
For shallow underground watermains (<1m depth below the road carriageway), markers should be provided to indicate its location. If it is not feasible to place the markers on the carriageway, they can be placed on the surface of the concrete capping for identification.

Affected sewers may be protected either by precast concrete capping (shown below) or Type D haunching (in accordance with PUB's standard drawing PUB/WRN/STD/001B).

QPs shall ensure that the concrete capping will not move and exert load onto the gas pipelines, which may damage the pipes and result in a gas leak. The concrete capping shall be designed in short length section such that it will not cause cumulation of escape gas, and that it can be easily removed for access to the gas pipelines.

There shall be no other services, structures above the concrete capping which would complicate its removal.

Case 5: Protection of services under road pavement with precast concrete capping



Future maintenance of underground services would involve lifting up the precast concrete capping for access to the services

2.5 EXISTING SERVICES RUNNING UNDER A BUS SHELTER

Background

Existing services within the sidetable may be affected by planned bus bay and bus shelter structure.

Proposed Solutions

LTA will accept the provision of services protection measures under proposed bus shelter platform (such as concrete haunching). This eliminates the need for services to be diverted around the bus shelter. QPs are required to design and ensure that the protection is able to accommodate services setback requirements stipulated by their respective services providers.

QPs should take note that the repair and maintenance of services under rigid pavements would take longer and be more costly.

For gas services, due consideration should be taken to ensure that the services protection measures do not result in movement or loading onto the gas pipes, and result in gas cumulation, or impede maintenance access (see section 2.4).

Watermains should be diverted wherever possible. If diversion is assessed to be not feasible, the following protection/ enhancement shall be applied:

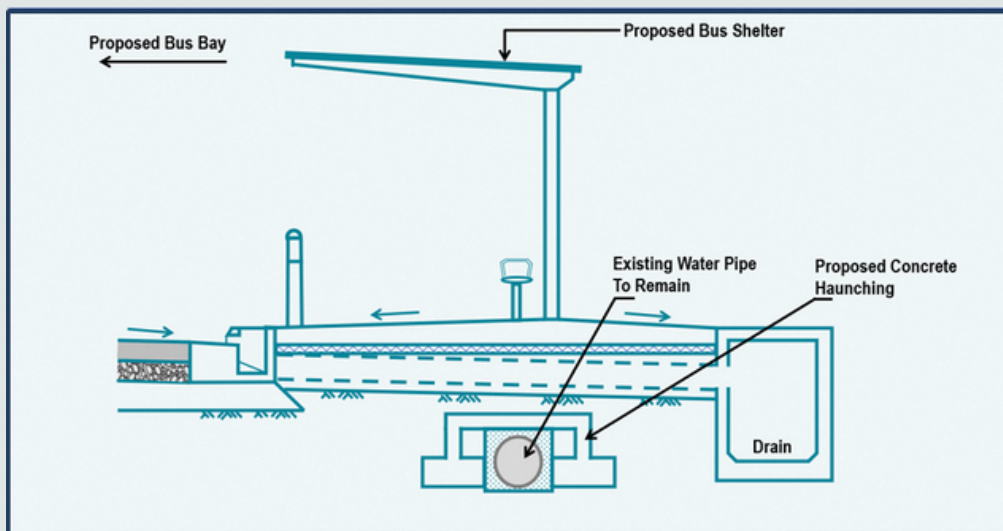
For Transmission Pipes:

1. Provide corrosion protection wrapping for bitumen coated steel pipes
2. Provide RC haunching and bedding for PU coated steel pipes;
3. Provide access manholes on watermains that are more than 1,200mm diameter on both sides of the bus shelter
4. Provide isolation valves, where necessary

For Distribution Pipes:

1. Provide corrosion protection wrapping and backfill with required bedding for bitumen coated steel pipes
2. Backfill with required bedding for PU coated steel pipes
3. Replace localised ductile iron pipes with PU coated steel pipes
4. Provide isolation valves

The presence of permanent structures on top of sewers is not acceptable due to difficulty for maintenance access and risk of damage, and all permanent structures shall maintain the minimum set back from sewers.



A generic schematic of the haunching of services under bus shelters can be located in LTA's Standard Details of Road Elements (SDRE).

3.0 OVERVIEW OF SCENARIOS AND SOLUTIONS

The table below summarizes the common scenarios and their solutions as covered in greater depth in the above pages:

S/N	Common Scenarios	Possible Solutions
2.1	Existing services within road sidetable which affect implementation of standard road typology.	<ul style="list-style-type: none"> To consider non-standard road typology and features.
2.2	Existing services affected by pedestrian overhead bridge (POB)	<ul style="list-style-type: none"> To review and design commuter facilities structure (POB) and layout to avoid the existing services. Amend road reserve line and rezone land to accommodate the larger space required to deconflict with existing services.
2.3	Existing services affected by covered linkways	<ul style="list-style-type: none"> Provide demountable covered linkway structures at the affected stretch. Provide high linkway at affected stretch for ease of maintenance/ machinery access (where required). Establish agreement between authorities/ agencies on maintenance of commuter facilities and affected provision/ structures.
2.4	Existing services displaced onto road carriageway due to road widening	<ul style="list-style-type: none"> Review road alignment to avoid services diversions. Develop services protection measures (e.g., concrete haunching) for shallow services.
2.5	Existing services running under a bus shelter	<ul style="list-style-type: none"> Develop services protection measures (e.g., concrete haunching) for services affected by proposed bus shelter

4.0 IMPORTANT NOTES WHEN MAKING A ROAD / COMMUTER FACILITY INFRASTRUCTURE SUBMISSION TO LTA

Considering that services diversion can be a protracted and costly process, project teams should ensure that the proposed design minimises impact on existing services, and that alternative solutions to services diversion have been thoroughly considered.

- At the layout plan (DC) stage, QPs (Architect) are required to work with the team of Engineers (Civil and M&E) / Contractors in advance to study the possible solutions to avoid services diversion arising from the proposed road / commuter infrastructure works.
- As part of QPs' submission to LTA, QPs should declare that he/she has considered the impact and implications on the surrounding utilities infrastructure as part of his/her proposed road / commuter infrastructure design. Do note that QPs would also need to take into consideration factors beyond LTA's regulatory requirements, e.g. requirements by utility companies and implications to the development proposal.

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