

6. IDENTIFICATION, PREDICTION AND EVALUATION OF ENVIRONMENTAL IMPACTS

6.1 Construction Noise Impact Assessment

6.1.1 Net Impact

Given the proximity of the NSRs to the road improvement works, construction of the proposed engineering works is likely to generate excessive construction noise from the use of powered mechanical equipment on site and the haulage of construction materials on the public roads. As broadly illustrated by the preliminary construction programme in Figure 2-2, construction activities may, during a given period, be undertaken on an individual basis or concurrently. In order to assess the potential impact from possible combinations of construction activities, construction scenarios that would result in the lowest and highest construction noise levels have been identified from the construction programme and are presented in Table 6.1. The construction noise levels resulting from these combination scenarios on the existing NSRs, which include Hong Sing Garden, Verbena Heights, On Ning Garden, Chung Ming Court, King Lam Estate, Sheung Tak Estate, the schools, churches and hospital, have been predicted and are presented in Table 6.2. The above noise prediction has fully considered the presence of a 4m barrier along Road P1 in front of On Ning Garden and a 6-6.5 m plain barrier in front of the schools along P2 which will have been erected as part of other Contracts by the time the works commence.

Table 6.1 Combinations of Construction Activities

Scenario	Activities
Lowest Construction Noise Scenario	Roadworks - Stage II Bridge Works - Stage III Subway & Retaining Walls Works - Stage II
Highest Construction Noise Scenario	Roadworks - Stage I Bridge Works - Stage I Subway & Retaining Walls Works - Stage I

Note : Table 4.1 shall be referred for staging of activities

Table 6.2 Range of Anticipated Construction Noise Levels - Unmitigated

NSR	Range of Construction Noise Levels, dB(A)				
	Road Works	Bridge Works	Subway Works	Retaining Wall Works	Overall*
KL2	64-70	-	-	-	67-73
KL7	71-77	56-64	57-61	72-76	78-83
SC1	55-61	52-60	55-59	56-60	64-69
CM1	68-74	-	-	-	71-77
CM4	74-80	57-65	58-62	78-82	83-87
CM6	65-71	59-67	58-62	68-72	73-78
ON2	59-65	61-69	60-64	62-66	70-75
ON6	60-66	65-73	60-64	54-58	70-77
ON8	62-68	62-70	-	54-58	68-75
CH1	70-76	57-65	55-59	53-57	73-79
CR2	67-73	54-62	53-57	51-55	70-76
CH2	64-70	56-64	52-56	61-65	69-75
SC6	70-76	52-60	50-54	58-62	73-79
ST4	60-66	51-59	50-54	56-60	65-71
ST6	55-61	52-60	51-55	56-60	63-69
MC1	60-66	46-54	-	55-59	64-70

- * The overall noise levels have already included the +3 dB(A) facade effect.
- The facade is shielded from this activity.

The predicted overall construction noise levels at the worst-affected receiver, CM4, are in the range of 83-87 dB(A). The noisiest single activity at any given receiver is expected to be the construction of retaining walls which requires the use of an excavator and dumptrucks. Under the Lowest Construction Noise Scenario, only a handful of NSRs including KL7, CM4, CH1 and SC6 are expected to be exposed to noise levels exceeding the *EPD's Practice Note for Professional Persons ProPEEC PN 2/93* noise limit of 75 dB(A) by 1-8 dB(A). However, under the Highest Construction Noise Scenario, receivers KL7, CM1, CM4, CM6, ON6, CH1, CH2, CR2 and SC6 are expected to be exposed to maximum anticipated noise levels exceeding the noise limit by 1-12 dB(A). Hence, mitigation measures are required and the effectiveness of the mitigation measures is evaluated in Section 7.

6.2 Construction Dust Impact Assessment

- 6.2.1 Excavation, backfilling and other earthworks and the haulage of materials on-site and off-site are likely to give rise to considerable construction dust impacts on the adjacent sensitive receivers, which include Hong Sing Garden, Verbena Heights, On Ning Garden, Chung Ming Court, King Lam Estate, Sheung Tak Estate, and especially the outdoor sitting-out and recreational areas located in close proximity to the junction.
- 6.2.2 The potential dust impacts on the adjacent air sensitive receivers including the above-mentioned housing estates as well as the open space areas, have been calculated using the FDM. In order to provide a general picture on the construction dust impact of the Project at the local open space, the hourly and daily average TSP concentration contours at the open space are shown in Figures 6-1 and 6-2, respectively. The discrete concentrations at 1.5m above local ground level are shown in Table 6.3. It should be noted that a TSP background concentration of $77 \mu\text{g}/\text{m}^3$ has been included in all predicted concentrations. Impacts on representative discrete receivers are also assessed, and the hourly and daily concentrations at the first-floor receiver level are presented in Table 6.4.

Table 6.3 Hourly and Daily TSP Concentrations at 1.5m Above Local Ground Level at Open Space Areas

ASR	Buffer Distance in (m)	TSP Concentrations in $\mu\text{g}/\text{m}^3$ at Local Ground Level at Open Space Areas	
		Hourly	Daily
OS1	36	399	168
OS2	24	571	217
OS3	23	515	252
OS4	35	456	148
OS5	30	486	136
OS6	25	495	220
OS7	50	376	152

Note: Location of ASRs can be referred to in Figure 4-2.

Table 6.4 Hourly and Daily Average TSP Concentrations Contour at First-Floor Receiver Level

ASR	Buffer Distance in (m)	TSP Concentrations in $\mu\text{g}/\text{m}^3$ at First-Floor Receiver Level	
		Hourly	Daily
KL2	54	186	100
KL3	50	250	116
KL7	34	454	186
SC11	56	217	104
MC1	23	162	92
SC9	45	323	125
SC6	37	495	206
ST6	63	233	114
CR2	38	235	92
CH1	35	299	101
ON6	62	283	111
ON2	113	226	104
CM1	45	270	124
CM2	30	454	177
CM4	21	592	202
CM6	65	245	125
SC1	23	255	112
CH2	50	315	140
HS2	22	157	95
VH1	35	105	83

Note: Locations of ASRs can be referred to in Figure 4-2.

- 6.2.3 As presented in Table 6.3 and Figures 6-1 and 6-2, TSP hourly and daily average concentrations at 1.5m above ground level are predicted to exceed the respective limit levels ($500 \mu\text{g}/\text{m}^3$ and $260 \mu\text{g}/\text{m}^3$) at the open space areas along the alignment in Areas 24, 25, 41 and 45, and therefore, dust suppression measures should be required.
- 6.2.4 For the representative discrete receivers, TSP daily average concentrations would comply with the limit level at all the representative ASRs at the first-floor receiver level as shown in Table 6.4. As for the hourly concentration, an exceedance is found at CM4. Hence, dust suppression measures will be required as discussed in Section 7. Figures 6-3 and 6-4 present the contours for the ASRs at the first-floor level.

6.3 Road Traffic Noise Impact Assessment

- 6.3.1 The potential impact of road traffic noise on the representative existing and planned NSRs has been assessed based on the traffic forecasts described in section 4.3.2. For the purpose of this study, the latest available development layout plans for the relevant planning areas as described in section 5.5 and 5.6 have been obtained from private developers and Government. As a base case, all of the relevant noise mitigation measures recommended in the previous studies have been included in the calculations of noise levels for the "Do-Nothing Scenario" which includes the following measures :

- a 4m high noise barrier on the southbound side of Road P1 between On Ning Garden site to the beginning of the southbound slip road towards the roundabout, together with open textured pavement for the same section of road.
- a 4m high noise barrier on the southbound side of the proposed flyover over the junction of Chiu Shun Road along Road P1.
- a 6m/6.5m vertical noise barrier along a part of the slip road and southbound lane of Road P2 fronting the schools in Area 59.
- A 2m/2.5m vertical noise barrier along the southbound of TKO Tunnel Road near Verbena Heights.
- Low Noise Road Surfacing (LNRS) along Tseung Kwan O Tunnel Road north of the study junction, Road P1 between On Ning Garden and the roundabout at Chiu Shun Road as well as along Roads D1 and P2 surrounding Area 59.
- 0.8m crashed barrier along all the elevated structures (i.e. slip roads) and embanked roads.

6.3.2 The locations of the barriers and LNRS are shown in Figure 6-5.

6.3.3 For the purpose of assessing the potential noise impacts on the future development at the C/R site in site 38b, it has been assumed that the notional facades at Area 38 are located at 10m from the boundary line and 10m above a 15m podium similar to the adjacent development since the development is to be built over a committed Mass Transit Railway (MTR) station.

6.3.4 Table 6.5 presents the predicted noise levels at the representative facades for the "Do-Nothing Scenario," and Appendix G gives a breakdown of the noise contributions from existing and new roads. The overall noise levels are in the range of 40-83 dB(A) due to varying setbacks of the NSRs from the noise sources. Apart from a few NSRs, the majority of the existing NSRs are predicted to be exposed to noise levels above the EIAO-TM noise criteria of 70 dB(A) for residential dwellings, 65 dB(A) for educational establishments and worship places, and 55 dB(A) for clinical hospitals. The following sub-sections detail the potential noise impacts at each planning area under study:

Area 5 - Hong Sing Garden Neighbourhood

Hong Sing Garden is comprised of five high-rise PSPS blocks located up on the hill adjacent to Po Lam Road North overlooking Tseung Kwan O Tunnel Road. The predicted noise levels at Blocks 4 and 5 range between 76 dB(A) and 85 dB(A), and the major noise contributors are the existing Po Lam Road North and Tseung Kwan O Tunnel Road.

Area 19 - Verbena Heights & Metro City Neighbourhood

Verbena Heights is comprised of two large and irregular shaped residential tower blocks located at the R(A) site in Area 19 facing Po Hong Road and Tseung Kwan O Tunnel Road. Due to its close proximity to high-traffic roads (i.e. Tseung Kwan O Tunnel Road), the design had already incorporated a podium at its lower floors and blank facades at its end walls. The overall noise levels at the sensitive facades facing this Project are predicted to be in the order of 61-77 dB(A). Lower noise levels are a result of the combined effect of setback and limited angle of view of the road at VH4, and higher noise levels are predicted at the most exposed facades (i.e. VH1-VH3) facing Tseung Kwan O Tunnel Road.

Metro City Phase I located south of Verbena Heights at the lot bounded by Po Hong Road, Wan Hang Road and Mau Yip Road is another group of NSRs in the vicinity. Metro City is a large private housing estate built atop a 15m podium, and the noise levels are distributed quite evenly in the range of 70-77 dB(A) except for NSR MC5 where the noise levels are predicted to comply fully with the noise criteria because of the shielding from the R1 site as well as from the school.

Areas 23 & 24 - King Lam Estate Neighbourhood

King Lam Estate is situated north of the Project site and bounded by Po Shun Road and Po Lam Road North to the northeast. The predicted noise levels in this neighbourhood range from 43 to 73 dB(A). The worst-affected facade is expected to occur at KL7 or at similar facades due to its close proximity to the roads. KL1, KL2, KL4 and KL5 are relatively well shielded with the result that their noise levels comply with the EIAO-TM noise criteria.

To the southwest of King Lam Estate, there are four Housing Society's residential blocks bounded by Wan Lung Road and Wan Hang Road. The most exposed facade is R2, where predicted noise levels exceed the EIAO-TM noise criteria by 1-4 dB(A). The entire facade of R4 is relatively well protected as their noise levels are 70 dB(A) or below owing to its setback from the roads.

Several schools are located in this neighbourhood, and their predicted noise levels are in the range of 52-74 dB(A). One of the schools located off Mau Yip Road next to the Housing Society site is completely shielded by the two schools in front. Even with substantial setback from the roads, the noise levels at the two schools (i.e. SC1 and SC2) exceed the EIAO-TM noise criteria by 1-4 dB(A) due to lack of screening as the areas in front of these schools are playgrounds with no screening structure. Finally, the worst affected school is the one located at the corner of Wan Hang Road and Wan Lung Road where predicted noise levels are in the range of 72-74 dB(A).

Area 27 - Outlying Sensitive Receivers

The predicted noise levels at Haven of Hope Sanatorium, the nursing home and the church up on the hill to the west of the junction are in the order of 69-77dB(A), which exceed the EIAO-TM noise criteria by 1-22 dB(A). The primary sources are Po Hong Road, Road P2 and Slip Road D.

Area 37 - C/R Site & Adjacent Sites

The C/R site, comprising of 5 residential towers atop a 2-storey podium, is located at the western end of the project limit facing Road P1. With a 4m high plain barrier already erected in front of the development, the noise levels at the sensitive facades are predicted to be in the range of 56-71 dB(A). The middle-floor receivers at CR2 and CR3 are predicted to marginally exceed the noise criteria by 1 dB(A) while the noise levels at CR1 and the lower and upper floors of CR2 and CR3 are expected to comply with the EIAO-TM noise criteria.

The site is bounded by two schools, one on each side and a self-protective church next to one of the two schools. The noise levels at the school site 37e (i.e. SC4) are predicted to comply with the EIAO-TM noise criteria of 65 dB(A), and the noise levels at the sensitive facade (i.e. CH1) of the self-protective church are predicted to be in the order of 64-68 dB(A). The main noise source at these facades is Road P1.

Area 40 - On Ning Garden Neighbourhood

On Ning Garden is comprised of six blocks of 40-storeys high residential towers located east of the works junction. The sensitive facades facing Po Shun Road and Wan Po Road are predicted to be adversely affected by traffic noise except ON1, ON3, ON4 and ON9 which are setback from and have limited angle of view of the roads. Other more exposed facades are predicted to have noise levels in the order of 58-73 dB(A) as they are literally surrounded by the Project.

Area 41 - Chung Ming Court Neighbourhood

Five HOS blocks of 35-storeys high are located in the 'R1' site between Po Shun Road and Sheung Ning Road. The predicted noise levels in this neighbourhood range from 61-76 dB(A). The highest noise level exceeding the EIAO-TM noise criteria by 1-6 dB(A) is expected to occur at CM4 which is close to the roads, but noise levels at CM3, CM5, CM7, CM8 and CM9, on the other hand, are predicted to comply with the noise criteria due to the combined effect of setback and limited angle of view of the roads.

As the contiguous HOS blocks form a physical barrier screening traffic noise towards Po Leung Kuk Tseung Kwan O Primary School which is located behind Fai Ming Court and Yin Ming Court, the predicted noise levels at the school (i.e. SC5) are predicted to comply with the 65 dB(A) noise criterion.

Area 59 - Sheung Tak Estate

The NSRs of concern at Sheung Tak Estate are the first layer of HOS blocks and the schools located along Road P2. The predicted noise levels at the sensitive facades in this neighbourhood range from 55-74 dB(A). Although the overall noise levels are high at some of the sensitive facades, the primary contributions come from existing roads such as Roads D1, P2 and a nearby slip road.

With the erection of a 6m/6.5m high plain barrier in front of the schools along Road P2, the noise levels at these schools are in compliance with the 65 dB(A) noise criterion.

Table 6.5 Predicted Noise Levels in the 'Do-Nothing' Scenario

NSRs	Noise Levels in dB(A) at Various Floors								
	1/F	5/F	10/F	15/F	20/F	25/F	30/F	35/F	Top/F
HS1	78	79	79	78	78	77	77	76	76
HS2	82	82	81	80	80	79	79	78	78
HS3	79	78	78	78	77	77	76	76	76
HS4	85	83	82	81	80	80	79	79	78
VH1	76	76	76	76	76	-	-	-	-
VH2	76	76	76	-	-	-	-	-	-
VH3	77	77	76	76	76	76	76	76	-
VH4	61	65	66	67	71	72	72	72	-
MC1	74	76	77	77	76	76	76	76	76
MC2	70	71	72	73	73	72	72	72	72
MC3	70	72	73	74	73	73	73	73	73
MC4	66	70	71	71	71	71	71	71	71
MC5	64	67	69	69	70	70	69	69	69
R1	68	69	71	71	72	72	72	72	72
R2	68	70	73	73	73	73	74	74	73
R3	68	70	71	71	71	71	71	71	71
R4	67	68	69	70	70	70	70	70	70
R5	68	70	71	72	72	72	72	72	72
R6	66	69	70	71	71	71	71	71	71
KL1	43	49	60	61	61	61	61	61	61
KL2	69	70	70	70	69	69	69	69	69
KL3	71	72	71	71	71	70	70	69	69
KL4	69	70	69	69	69	68	68	67	67
KL5	60	62	63	63	63	63	63	63	63
KL6	71	72	71	71	71	70	70	69	69
KL7	69	73	72	72	71	71	70	70	70
KL8	66	70	71	71	70	70	70	69	69
CM1	71	73	72	72	-	-	-	-	-
CM2	74	75	75	74	73	72	72	71	71
CM3	67	70	69	69	68	68	67	67	66
CM4	72	76	75	74	73	73	72	72	71
CM5	65	70	70	70	70	69	69	68	68
CM6	64	70	71	70	70	70	70	69	69
CM7	61	66	68	68	68	67	67	67	67
CM8	61	65	67	68	67	67	67	67	67
CM9	59	61	64	65	66	66	65	65	65
ON1	58	61	65	65	65	65	65	65	65
ON2	66	69	71	71	72	71	71	71	71
ON3	64	67	69	69	70	70	70	70	70
ON4	61	64	66	67	67	67	66	66	66
ON5	67	71	72	73	73	73	73	73	72
ON6	67	70	72	73	73	73	73	73	72
ON7	66	70	72	73	73	73	72	72	72
ON8	65	69	71	72	72	72	72	72	72
ON9	60	63	65	68	68	69	68	68	68
CR1	56	65	67	68	68	68	68	68	68
CR2	64	70	70	71	70	70	70	69	69
CR3	69	69	71	71	70	70	69	69	69
ST1	55	57	62	67	67	67	67	67	67
ST2	56	60	66	70	70	70	70	70	70
ST3	62	68	70	71	71	71	71	71	71
ST4	61	68	69	69	70	70	69	69	69
ST5	64	71	72	72	72	72	71	71	71
ST6	70	73	73	73	73	73	72	72	72
ST7	72	74	74	73	73	72	72	72	72
ST8	70	71	71	71	71	71	70	70	70
ST9	71	73	72	72	71	71	71	70	70

Table 6.5 Predicted Noise Levels in 'Do-Nothing' Scenario (Cont'd)

NSR	Noise Levels in dB(A) at Various Floors		
	1/F	3/F	6/F
SC1	66	66	67
SC2	67	68	69
SC3	52	54	61
SC4	61	63	65
SC5	63	64	64
SC6	63	65	-
SC7	53	55	60
SC8	51	53	62
SC9	60	62	-
SC10	58	60	64
SC11	72	73	74
CH1	64	65	68*
CH2	77	77	-
H1	72	72	-
H2	69	70	71
H3	72	72	-

* The top floor of the church and hospital is at 5/F.

NSR	Noise Levels in dB(A) at Various Levels Above a 15m Podium		
	10m	20m	30m
381	62	63	64
382	60	60	61

Future & Planned NSRs in Site 38b

The predicted noise levels at the notional facades in site 38b range from 61 to 64 dB(A) at 10m from the boundary line and above a 15m podium. Noise levels at this site are well within the EIAO-TM noise criteria because of adequate screening from On Ning Garden, Chung Ming Court, and the C/R buildings in Area 37.

6.3.5 Cumulative Impact Assessment

No additional traffic noise impact is anticipated from the operation of the TKO Extension as the alignment will be underground or covered if at-grade.

6.4 Vehicle Emissions Impact Assessment

6.4.1 The air-sensitive uses in the vicinity of the Project are setback at least 20m from the trunk roads in order to satisfy the requirement stipulated in the EIAO-TM. Hence, the local air quality should not be a major issue. A quantitative vehicle emissions impact assessment taking into account the proposed noise mitigation measures will be addressed in the next section.

6.4.2 Cumulative Impact Assessment

No cumulative air quality impact is anticipated in the operation stage.

6.5 Landscape and Visual Impact Assessment

6.5.1 Landscape Impact Assessment

For the purposes of this study seven landscape character units have been identified and assessed. These are (refer to Figures 6-6 to 6-12):

- *High-rise Residential Areas*

There are substantial areas of recent, new, ongoing and future high-rise residential areas within the study area, comprising both public and private housing developments. The high-rise residential areas are a dominant part of the study area and occupy a substantial part of the available land. They are located in the north, east and south of the study area. This is primarily a residential new town and is, consequently, dominated by modern high-rise blocks rising to thirty or more stories. The town layout is based around the major infrastructure network and is unregimented, although the estate layouts are relatively ordered arrangements. Commercial retail developments are associated with most of the estates but the main ones are primarily adjacent to Hau Tak Estate and East Point City.

The buildings are of concrete construction and are of designs common to Hong Kong residential high-rise units. A number of the more recent buildings are rendered in more vivid colours such as pink, with the older ones being white or grey. All estates contain residential amenity areas comprising a mix of ball courts, shade structures, feature gardens, children's play areas and seating areas. Substantial use of ornamental tree and shrub planting has been used adjacent to and within the residential areas.

The general streetscape of the feeder roads within the estates is simple, comprising concrete pavements, shrub or grass amenity strip and recent tree planting often with species such as *Ficus microcarpa* and *Bauhinia* sp. The extensive pedestrian network is supplemented by many subways rendered with white or coloured tiles.

There are no areas of particular cultural or heritage interest within these areas due to TKO New Town being such a recent development. This factor, together with TKO New Town being distinctly urban and hard in nature, potentially tolerant to change and being adjacent to a major transport network results in a landscape value that is **medium**.

- *Low-rise Village Settlements*

There is one small area of village settlement included within the study area. This is located at the north-east edge and is Hang Hau Village. The village comprises a regimented and close arrangement of modern three storey village houses rendered in white tiles. A number of small shops and restaurants are associated with the village. The streetscape within this village area is simple with much of the detail and materials being similar to those on other modern villages in Hong Kong, namely concrete pavements, *Bauhinia* sp. street trees and tubular metal railings. A large recently built archway is located at the entrance to the village. The landscape quality of this area is **medium**.

- *Hospital*

The Haven of Hope Hospital is located on the wooded hillside to the east of the existing roundabout in the centre of the study area. The hospital comprises a number of white medium-rise medical faculty buildings with a number of amenity areas comprising ornamental shrub beds and trees, together with parking and service access facilities. A chapel is located adjacent to the hospital on the east. The landscape quality of this area is **medium**.

- *Natural Hillside*

There are two natural hillsides within the study area. These are:

- in the north-east, comprising the southern slopes of the hills to the north, and;
- in the west, comprising the eastern slopes of Mau Wu Shan.

The former of these occupies only a small section of the north-eastern section of the study area. It rises from 60mPD to over 150mPD, with slopes at approximately 1 in 3, and has a primarily grass/scrub vegetation matrix on its upper slopes. A number of local walking trails are present running south-north directly up the hill.

The second of these slopes occupies much of the western part of the study area and rises from 10mPD to over 200mPD with gradients at approximately 1 in 3. It is primarily naturally vegetated with a scrub/woodland mix, although much of the woodland is affected by widespread vine growth. A number of small rural settlements are present within the hillside, together with local walking trails and a public ball court. The hillside provides a natural setting for the Haven of Hope Hospital.

These hillsides are a major natural resource for the local TKO New Town and provide important vegetated buffers adjacent to the urban and hard nature of the town. The landscape quality of these areas is **high**.

- *Engineered Slopes*

There are two substantial areas of engineered slopes, located at the bases of the natural hillsides described previously. They are located:

- adjacent to Po Lam Road North at the base of the hillside in the north, and;
- adjacent to TKO Tunnel Road (Road T1).

Both of these slopes have been created to allow for the construction of roads at their bases. The slopes comprise both stone wall retaining structures, due to the degree of slope required, and formed soil slopes. They have subsequently been planted with trees, primarily with following species:

Acacia confusa
Casuarina equisetifolia
Pinus sp
Bauhinia sp
Leucaena leucocephala

Despite these areas being planted engineered slopes, they provide important vegetative buffer zones to the urban TKO New Town. The landscape quality is **good**.

- *Public Recreational Facilities and Open Space*

There is one large area of public facilities and open space centrally located to the study area. Within this area only Po Hong Park is completed and includes provision for both active and passive recreation with ball courts, exercise trails, shade structures, seating areas and viewing tower, all within a setting of ornamental tree and shrub planting.

A major indoor swimming pool and sports facility is currently undergoing construction to the north of the existing roundabout. Additionally, two further areas of land (Area 40 & 45) within TKO New Town are designated to the Tseung Kwan O Outline Zoning Plan, Plan No. S/TKO/6 for Open Space. In the context that all three of these areas will be comparable to the existing public park and they will become major landscape and recreational resources for the local residents of TKO New Town and that they provide much vegetative relief to the urbanisation, the landscape quality of these areas is **high**.

- Since the two proposed temporary works sites situated at Area 27 and Area 56 are currently fenced off with paved ground and with no landscape feature, there will be no landscape impact result from the proposed site. Planting works will be carried out in accordance to the Engineering Conditions under the land allocation if DLO requires.

6.5.2 Landscape Impacts

The scheme proposes the following improvements to the existing roundabout junction of roads T1/P1/P2:

- widening of Road P2 between Roads D1 and D2,
- replacement of the existing T1/P1/P2 roundabout with a grade separated junction with a Road T1 overbridge over Road P2, including at grade slip roads on embankment,
- elevated slip road between Road T1 southbound and Road P2 westbound, and;
- elevated slip road between Road P2 westbound and Road T1 northbound.

A number of noise mitigation measures are recommended in the Noise Impact Assessment. These are:

- full enclosure of Road P2 between Chung Ming Court and King Lam Estate;
- 5.5m inverted-L barrier on the T1 south-bound / P2 west-bound access slip road; and,
- 5m plain barrier on the P2 westbound / T1 north bound access slip road;

The proposed improvements are remote from many parts of the study area and, in general, no visual impact will be created. However, the scheme will result in the following impacts to the existing landscape character, (refer to Figure 6-10):

- *Impacts to High-rise Residential Areas*

The scheme proposals will not cause any direct impacts to the existing or future high-rise residential development. However the widening of Road P2, together with the full enclosure noise mitigation, between Roads D1 and D2 will result in the local infrastructure becoming more dominant adjacent to the Hau Tak and King Lam Estates, particularly the enclosure structure. Additionally, the high level slip roads and inverted-L barrier system connecting Roads T1 and P2 to the east of the scheme will be major landscape features neighbouring the On Ning Garden estate.

In the context that the proposals will not cause any direct impacts to these estates and that the majority of the high-rise residential areas will be unaffected the landscape

that the majority of the high-rise residential areas will be unaffected the landscape impact is **slight adverse**.

- *Impacts to Public Recreational Facilities and Open Space*

The proposed scheme is adjacent to a number of existing, ongoing and planned recreational facilities and open spaces. The new public park to the east of T1 will not be affected by the scheme as the proposed works are remote from the park itself. The ongoing indoor swimming pool and sports facilities will not suffer any direct impacts as the proposed connection between T1 southbound and P2 eastbound will be as existing on the current slip road access. However, the planned open space between On Ning Garden residential estate and the T1/ P1/P2 junction will be affected by the high level slip roads, inverted-L barrier system and plain barriers between T1 southbound / P2 westbound and P2 westbound / T1 northbound. These slip roads and noise barriers will become major features within the planned open space causing shade effects in the western section of the park. Although much of the recreational facilities and open space Area 40 area will not be affected this encroachment over the open space adjacent to On Ning Garden will result in **significant adverse** landscape impact.

The proposed scheme will result of approximately 1,100m² loss of shrub 1,100m² loss of tree, and 10,800m² loss of grass (see Fig. 7-19).

6.5.3 Visual Impact Assessment

Existing Visual Envelope (refer to Figure 6-11)

To the north the existing visual envelope is generally contained by the high-rise residential developments of Hong Sing Garden, Area 19 and King Lam Estate. To the west it is contained by the ridgeline of the north-eastern hills, Hau Tak Estate and On Ning Garden. Southwards it extends over the planned open space at Area 45 and southwards towards the further reclamation and development areas of Area 77, although this is too remote to be affected. Further west it is again contained by high-rise developments, namely Sheung Tak Estate. The ridgeline of Mau Wu Shan contains the envelope westwards.

Existing Visual Context

The density of the neighbouring high-rise developments adjacent to the scheme results in many views towards the site being screen particularly from the north, east and south. Additionally, the proposed reuse of a number of the existing slip roads on embankments will screen many of the views from street level, particularly from the north, south and west.

The visually sensitive receiver (VSR) groups and their existing views are as follows, (refer to Figure 6-10):

- *High-rise Residential VSRs*

Within this group are the residents of many apartments who have views to the proposals, including:

- residential development at Area 19 (part),
- King Lam Estate (part),
- Hau Tak Estate (part),
- On Ning Garden (part),
- Sheung Tak Estate (part), and;

The views from the mid to upper storey apartments are generally dominated by the existing roundabout interchange and other high-rise apartment blocks. However, they all benefit from the naturally wooded Mau Wu Shan hillside to the west which provides much visual relief to the hard and high-rise urbanisation of TKO New Town itself.

The residential development at Area 19 benefits additional visual relief from the intermediate public park, while the mid-level apartments are also screened from much of the site by the swimming pool and indoor recreation centre at Area 24. In the background of their views will be the planned open space at Area 45 providing further visual interest.

On Ning Garden, in particular, is in close proximity to the site, and currently experiences views which are dominated by the existing roundabout with Mau Wu Shan in the background. King Lam and Hau Tak Estates experience similar views although they benefit slightly by being slightly more remote. Sheung Tak Estate has views which are dominated by the existing infrastructure with other high rise estates in the background. It does benefit slightly, however, by the visual relief that it will gain from the intermediate open space at Area 45.

The residents in apartments of Hong Sing Garden experience remote and non-direct views of the site. Their views benefit greatly from the intermediate dense planting on the Mau Wu Shan hillside.

The dominance of the local infrastructure, together with the limited visual relief results in the existing visual quality of these views generally being **low**.

- *Public Recreational Facility and Open Space VSRs*

This group includes the users of the following facilities:

- Po Hong Park at Area 25,
- Swimming Pool and Indoor Recreation Centre at Area 24,
- Planned Open Space at Area 40, and;
- Planned Open Space at Area 45.

The users of the Po Hong Park at Area 25 have only partial views towards the site. Much of it is screened by the existing planting and features within the park itself while the T1 part of the site adjacent to the interchange is much screened in views due to the road being on high embankment.

The future users of the swimming pool and indoor recreation facility at Area 24 have direct views towards the site for the windows on the southern side of the building. Their views comprise the high embanked dual carriageway Road P2 in front of On Ning Garden.

Views from both the Planned Open Space at Area 40 and the Planned Open space at Area 45 towards the site are dominated by the high embankments of the Road P2, restricting their views to its ridge with only remote views of high-rise residential blocks in the background.

The existing visual quality of the existing and future views of these public areas is **high** due to their extreme sensitivity.

- *Pedestrian VSRs*

Views experienced by Pedestrian VSRs arise from the paths associated with the local roads. Generally, their views are dominated by the high-rise developments and the local infrastructure. They are softened by the roadside planting and by having the vegetated hillside in the background, where present. Additionally, many of their views towards the site, particularly from close to the site are screened due to the road being on high embankment. The existing visual quality of their views, in the context that they are also transitory, is **low**.

- *Vehicular VSRs* (including the planned bus depot at Area 26)

The views experienced by the vehicular VSRs are similar in a number of aspects as those experienced by the Pedestrian VSRs. They are dominated by the high-rise developments and the local infrastructure while being softened by the roadside planting the vegetated hillside in the background where present. The existing visual quality of their views, in the context that they are also transitory, is **low**.

- *Hillside Trail Walkers*

Views from a number of local hillside trails are possible from the hill to the east and also from Mau Wu Shan. However, views are generally screened by the local topography and vegetation. Those views which are possible are dominated by the local infrastructure and TKO New Town urbanisation as a whole. The visual quality of these views is **medium**.

- *Hospital VSRs*

Views are possible from the ground of the Haven of Hope Hospital, although they are primarily screened by the local topography and vegetation on the Mau Wu Shan hillside. Those views which are possible are dominated by the local infrastructure and TKO New Town urbanisation as a whole. The visual quality of these views is **medium**.

6.5.4 Visual Impacts

The scheme proposes a re-arrangement of the T1/P1/P2 interchange and will result in the following visual impacts:

- *Impacts to High-rise Residential VSRs*

The proposals will result in severe intrusion to all views arising from all those blocks adjacent to the elevated slip roads on the eastern side of the interchange. In particular, the lower and mid-level apartments of the western blocks of On Ning Garden will suffer severe intrusion from the introduction of two additional dominating road structures and the tall noise barriers within their views. The high level roads will also screen a number of apartments from any existing views that they have towards the wooded hillside of Mau Wu Shan.

The apartments of Hau Tak will suffer similar intrusion as those in On Ning Garden apartments, however it will be less severe, with them not losing their existing views of the Mau Wu hillside. The views at lower levels will be detrimentally affected by the full enclosure of the road.

The remaining residential VSRs within this group will not suffer as severe intrusion as their views are more remote and not as dominated by the local infrastructure. They will experience detrimental intrusion to their views due to the extension of the infrastructure within their views. The replacement of the roundabout by a split level interchange will not cause substantial change in the existing visual character of their views.

The overall visual impact of these views is **moderate adverse**. However, the views from the apartments of On Ning Garden and Hau Tak Estate will suffer **significant adverse** visual impact.

- *Public Recreational Facility and Open Space VSRs*

The proposals will primarily affect the users of the planned open space in Area 40. They will suffer severe visual intrusion primarily due to the two slip roads and noise barriers required between T1 and P2. They will be dominating visual elements causing detrimental shade effects within the open space and screen views towards the Mau Wu hillside. Additionally, the loss of the road embankments will result in the new elevated T1 overbridge being within views.

The users of the swimming pool facility at Area 24 will not suffer as severe effects, due to it being an indoor facility with a limited number of windows facing the proposals. Much of the scheme will be screened by the retention of the access slip road embankment.

The users of the open space at Area 45 will suffer due to the introduction of the T1 overbridge and the two high level access roads, together with the tall enclosure noise mitigation, into their views. However, this effect will not be as severe as for the users of Area 40.

The users of the Po Hong Park at Area 25 will not suffer any visual impact due to the retention of the existing road embankment of the T1 southbound / P2 eastbound access slip road, which screens all views towards the site.

Due to the high sensitivity of the users and the proximity of the scheme to the planned open space at Area 40 the visual impact is **significant adverse**.

- *Pedestrian VSRs*

The proposed pedestrian system will not alter significantly. Most views experienced by the pedestrian VSRs will remain the same in character to the existing ones. However, the full enclosure of road P2 between Ching Ming and King Lam Estates will cause severe intrusion to the pedestrian VSRs in this locality due to tunnelling and enclosure of the views. Additionally, the VSRs will suffer due to the extension of the local infrastructure and the loss of tree planting along the Road P2 widening. The intrusion caused by the proposals are highly localised resulting in a **moderate adverse** visual impact.

- *Vehicular VSRs*

The scheme will cause similar impacts as those suffered by the Pedestrian VSRs but will be less due to their speed. The visual impact will be **slight adverse**.

- *Hillside Trail Walker VSRs*

Most of the views arising from the hillsides to the east and west of the site are screened by the local topography or vegetation, with only a small number of views possible. These will suffer slight intrusion to these views but they will be within their existing visual context. The resulting visual impact is **slight adverse**.

- *Hospital*

The scheme will cause similar visual impacts as those suffered by the Hillside Trail Walkers. The visual impact will be **slight adverse**.

- The statutory town plans indicate a town park and an indoor recreation centre in Area 45 and a district library and an open space, swimming pool complex in Area 24. Other planned development includes commercial / residential development with public transport interchange on sites in Area 17, 38 and 56 and bus depot in Area 26. The proposed roadworks will not conflict with this planning framework.

6.6 Land Use Impact Assessment

6.6.1 Land Use Impact Assessment Context

This land use impact assessment is to identify and describe the likely impact of the project on the existing and future land use and proposed mitigation measures to overcome the likely impacts that the proposed alignment of Project would cause.

6.6.2 Land Use Impact Assessment

The proposed road development falls wholly on government land and any private land or structures adjoining are unlikely to be affected by the works. The proposed improvement of grade separated interchange T1/P1/P2 will therefore have no significant land use impact in planning terms.

However, noise and air sensitive receivers may include the residential developments of On Ning Garden, Hau Tak Estate and King Lam Estate, Chung Ming Court and the proposed Town Park and recreational centre, which are in close proximity to the proposed interchange. Mitigation measures for noise and air are included within relevant sections of the report.