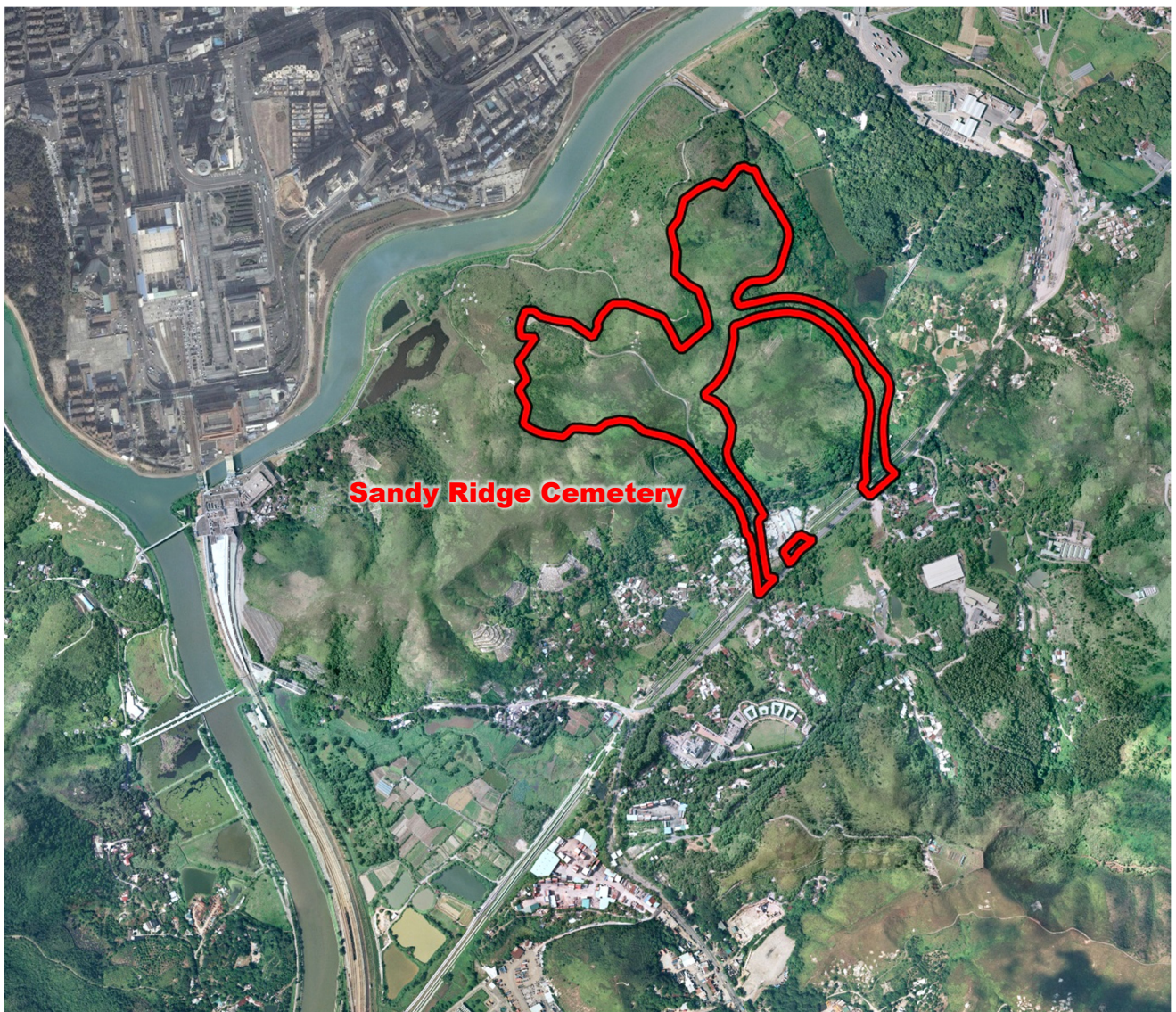


**Agreement No. CE 1/2013 (CE)
Site Formation and Associated Infrastructural Works for
Development of Columbarium, Crematorium and Related
Facilities at Sandy Ridge Cemetery
– Design and Construction**

**Environmental Impact Assessment Executive Summary
(Final)**

(Ref: REP-053-03)



Civil Engineering and Development
Department

Agreement No. CE1/2013 (CE)

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Environmental Impact Assessment
Executive Summary

231448-REP-053-03

Final | January 2016

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1 Introduction

1.1 Project Background

1.1.1.1 The main objective of the proposed site formation and associated infrastructural works for development of columbarium, crematorium (C&C) and related facilities at Sandy Ridge Cemetery is to increase the public cremation services and supply of public niches to meet the future demand.

1.1.1.2 The C&C facilities are planned to provide synergistic one-stop services at the Sandy Ridge Cemetery by including at least a funeral parlour and a visitor service centre so as to maximise the convenience to the public. It is hoped that this project will set a new benchmark for the public C&C facilities and services in terms of its functional one-stop services, state-of-the art design incorporating artistic elements of aesthetic appeal where appropriate, greening and landscaping, user-friendly access for visitors and serene surrounding environment. It will be a place where those lost loved ones can rest in eternal peace in a dignified manner, and where family members, relatives and friends can part with and mourn for their loved ones in reasonable privacy, and where visitors will find it pleasant to stay to admire the landscape and the greenery.

1.1.1.3 The C&C facilities are located inside the Frontier Closed Area at the northern boundary of the New Territories. It is bounded by Man Kam To Road to the east and south, Lo Wu Village, MTR Lo Wu Station and Lo Wu Station Road to the west and Shenzhen River to the North. The plan for the proposed land platform is shown in **Figure 1.1**, and the plan for the proposed road widening work along Lin Ma Hang Road is shown in **Figure 1.2** and that for the proposed barging point at Siu Lam is shown in **Figure 1.3**.

1.1.1.4 The Project comprises the following which are classified as Designated Projects (DPs) as per Schedule 2, Part I of the Environmental Impact Assessment Ordinance (EIAO):

- Item A.8 – A road or railway bridge more than 100m in length between abutments; and
- Item I.1(b)(vii) – A drainage channel or river training and diversion works which discharges or discharge into an area which is less than 300m from the nearest boundary of an existing or planned conservation area.

1.1.1.5 One of the new road sections leading from Man Kam To Road up to the platform of the Project comprises of a viaduct section of approximately 300m long. Both ends of the viaduct would need to be in a form as abutments. Since the length between the abutments is

more than 100m, it will be a DP under Item A.8 of Schedule 2, Part I of EIAO.

1.1.1.6 The Conservation Area (CA) at Yuen Leng Chai is located approximately 45m north west of the Project and the CA is at a level lower than the proposed platform. Hence, a portion of the surface run-off from the proposed platform will be drained into this CA. Hence, it will be a DP under Item I.1(b)(vii) of Schedule 2, Part 1 of EIAO.

1.1.1.7 The locations of the above DPs under the Project are shown in **Figure 1.4**.

1.2 Project Scope and Implementation Programme

1.2.1.1 Scope for the Project include:

<u>Area</u>	<u>Proposed Works</u>
Works Within Study Area	<ul style="list-style-type: none"> • Site formation of about 8ha of land for proposed C&C Facilities (including the proposed pick-up and drop-off area for shuttle buses). • Widening of the existing Sha Ling Road (about 900m) - from existing 3m wide to a 7.3m wide single two-lane carriageway, including its associated noise barriers. • Construction of internal roads for C&C Facilities. • Widening of the existing Lin Ma Hang Road (about 1.4km long) – from existing 6m wide to a 7.3m wide single two-lane carriageway, including its associated noise barriers. • Construction of a new road (about 600m) including a section of viaduct connecting platform for Crematorium and Man Kam To Road. • Construction of the pick-up and drop-off point at Man Kam To Road.
Outside the Columbarium / Crematorium Site	<ul style="list-style-type: none"> • Temporary pick-up and drop-off points of shuttle buses for grave-sweepers during festive periods at MTR Kwu Tung Station, Sheung Shui Landmark North Public Transport Interchange, MTR Fanling Station, and layby at Pak Wo Road near Flora Plaza. • Necessary landscaping, sewerage, waterworks and utility works for the proposed development along Man Kam To Road. • Barging point in Siu Lam.

- 1.2.1.2** For MTR Kwu Tung Station (including the PTI and shuttle bus services area), it will be constructed under the Planning and Development Study on North East New Territories (NENT) Contract and will be available by 2026. In addition, a barging point at Siu Lam currently used by the Express Rail Link project would also be required.
- 1.2.1.3** The barging point is located off-site along Tsing Fat Street in Tuen Mun (see **Figure 1.3**). In order to reduce the impact on road traffic, surplus inert construction and demolition (C&D) materials from the construction of the C&C facilities at Sandy Ridge Cemetery and Lin Ma Hang Road will be stored at a temporary stockpile area on-site. The surplus inert C&D materials will be transported to the designated barging point facility in Tuen Mun by lorries, and then transported by barges for the reuse of other concurrent projects. The current location is an existing barging point used by the Express Rail Link project according to the approved EIA report for Hong Kong Section of Guangzhou-Shenzhen-Hong Kong Express Rail Link (AEIAR-143/2009). Minor construction works for the tipping halls and a new ramps are required. No maintenance dredging is required and no night-time operation is anticipated.
- 1.2.1.4** It is anticipated that the site formation and associated infrastructural works for the development of columbarium, crematorium and related facilities will be commenced in 2017 and is targeted for completion by 2022. It should also be noted that the crematorium facilities is a separate DP and the respective project proponent will conduct a separate EIA under the EIAO.
- 1.2.1.5** A summary of the key dates for construction phase is given below. All these key dates are tentative and would be subject to amendment as the design evolves.

Table 1.1 Summary of key construction dates

Key Construction Elements	Tentative Dates	
	Commencement	Completion
Columbarium (site formation, retaining walls, slopes, internal roads, etc)	Q3 2017	Q4 2020
Crematorium (site formation, retaining walls, slopes, internal roads, etc)	Q3 2018	Q4 2021
New Road with viaduct	Q3 2019	Q4 2022
Widening of Sha Ling access road	Q3 2017	Q4 2020
Utilities laying	Q1 2020	Q2 2022
Lin Ma Hang Road Widening and associated slopes, etc	Q2 2019	Q2 2022

1.3 Need for the Project

1.3.1.1 With a growing and aging population in Hong Kong, the number of deaths and the corresponding number of cremations have been rising gradually every year, resulting in an increasing public demand for C&C facilities. Based on past data, the average annual numbers of deaths and cremations in the next 20 years (i.e. from 2014 to 2033) are estimated to be about 54,000 and 51,000 respectively. Upon completion of the latest reprovisioning projects of Wo Hop Shek and Cape Collinson Crematoria by late 2015, the total annual capacity of all public cremators will be increased from 38,000 sessions to 53,000 sessions. This will sufficiently meet the cremation demand up to around 2024. There is genuine need to construct new crematoria at Sandy Ridge Cemetery to address the demand beyond 2024. As for columbarium, the supply of public niches is uncertain after the completion of the Diamond Hill Columbarium extension, the new public columbarium at Kiu Tau Road in the Wo Hop Shek Cemetery and the Cheung Chau Cemetery extension in 2012 and 2013 providing about 1,500, 43,700 and 1,000 respectively of which allocation of niches would be largely completed in mid 2015. Hence, there is a need to construct new columbarium facilities.

1.4 Environmental Benefits of the Project

1.4.1.1 The environmental benefits of the Project are summarised below:

1.4.2 Existing Visitors

1.4.2.1 All the existing users and visitors to the cemetery and the graves would need to rely on the existing Sha Ling Road to access Sandy Ridge. During the festive days in particular, they are required to make their own transport arrangement to Man Kam To Road. From there, most of the visitors would need to either walk up the existing Sha Ling Road or take franchised mini buses to access Sandy Ridge Cemetery. However, the existing Sha Ling Road is only 6m wide without a proper pedestrian walkway and the gradient at some sections are relatively steeper. On the other hand, the capacity of the franchised mini buses is limited. Under such circumstance, a small portion of users would drop off at MTR Lo Wu Station and use an existing footpath to reach Sandy Ridge area. This existing footpath is only 1.5m wide and is not paved, which would be inconvenient especially during rainy days.

1.4.2.2 With this project in place, the Sha Ling Road will be upgraded to a 7.3m wide with 2 lanes and pedestrian walkway, and the gradients along the road have also been optimized. Besides, additional public transport will be provided to allow for a more convenient access from Man Kam To Road up to the future platform. All these improvements in infrastructure would benefit the existing users and visitors to provide an easier and more convenient access. This improvement in accessibility may also encourage some of the visitors to consider visiting Sandy Ridge Cemetery at alternative days other than festive days. This would help alleviating the traffic demand during festive days and hence the associated environmental issues.

1.4.2.3 As discussed in **Section 1.1**, the proposed development would provide the site formation that integrates columbarium, crematorium and other related facilities at one location. This arrangement would definitely minimise generation of any unnecessary off-site traffic (e.g. From Kwai Chung Crematorium to Hong Kong Cemetery) that would otherwise need to travel between columbarium and crematorium. Hence, the off-site traffic would be minimised and hence any nuisance that may have caused on the communities in the vicinity of the access roads would also be reduced as much as practicable.

1.4.3 Existing Sewerage System

1.4.3.1 In addition, there is no existing sewerage system for Sandy Ridge Cemetery. With the Project in place, the disposal of waste water from the visitors will be collected properly through the proposed sewerage system. This would also help to improve the existing conditions.

1.4.4 Green Transportation

1.4.4.1 The other environmental benefit that would be brought about by the Project is from the arrangement for off-site pick-up / drop-off locations for shuttle buses. As discussed in **Section 1.2**, shuttle buses would be arranged at a number of MTR Stations at MTR Kwu Tung Road Station, MTR Fanling Station, existing Sheung Shui Landmark North Public Transport Interchange (PTI) and layby at Pak Wo Road near Flora Plaza. Instead of making their own arrangement (such as private cars, public transport to existing shuttle bus location at Sheung Shui), all the way from urban area to Man Kam To Road or areas in the vicinity, the future visitors could choose to use the shuttle bus route that is more convenient to them. Obviously, this convenience of using shuttle buses would encourage all the visitors to use public transport during festive days and hence help reducing vehicular emissions which would in turn be beneficial for air quality.

1.4.5 Existing Communities along Lin Ma Hang Road

1.4.5.1 The existing Lin Ma Hang Road is only 6m wide in some sections and with footpath of inconsistent width. As discussed in **Section 1.3**, part of the Project proposal is to widen the existing Lin Ma Hang Road to 7.3m up to standard requirement as given in Hong Kong Planning Standards and Guidelines (HKPSG) and a 2m wide of footpath would be provided. The footpath would also be designed with appropriate landscape features such as tree planting and would enhance aesthetic appeal of the surrounding environment and provide a more convenient means of vehicular and pedestrian access for the local community.

1.5 Concurrent Projects

1.5.1.1 The site formation for C&C facilities that would have interface of various extent with other major projects and has the potential to lead to cumulative impacts. Concurrent / interfacing projects that have been considered include:

- Operation of the Crematorium at Sandy Ridge;
- Development of Organic Waste Treatment Facilities, Phase 2 (OWTF);
- Police Facilities in Kong Nga Po;
- Widening of Lin Ma Hang Road (Section outside the Project boundary);
- Liantang / Heung Yuen Wai Boundary Control Point and Associated Works;
- Development of Lok Ma Chau Loop;
- North East New Territories New Development Area; and
- Widening of Tolo / Fanling Highway between Island House Interchange and Fanling.

1.6 Alternative Designs

1.6.1.1 Environmental considerations have been an integral part of the overall review process to optimise the original design. The general preferred criteria of the options are that, 1) to avoid woodland loss to the maximum extent, if possible; 2) to avoid affecting historic clan graves; 3) to minimise surplus inert construction and demolition (C&D) material; 4) to minimise population affected. A number of factors have been considered in the evaluation of alternative designs as below:

- Optimization of platform configuration;
- Optimization of road network; and

- Selection of pick-up and drop-off locations (off-site) along existing MTR stations and highway corridor.

Optimization of platform configuration

1.6.1.2 The original platform for the columbarium would encroach onto a total of 2.0ha of woodland. The original slope works would also encroach onto 0.0017ha of wet woodland. The current design has been refined to avoid direct impact (i.e. encroachment) on the wet woodland which has a high ecological value. Moreover, the minimisation of indirect impacts has also been considered by increasing the separation distance between the western toe of the slope and the wet woodland by installing a retaining wall and a hammer head arrangement instead of the conventional roundabout configuration for the end of the Emergency Vehicular Access (EVA).

Optimization of road network

1.6.1.3 Based on the latest traffic arrangements, the western access road in the original design is no longer required. In the original design, the existing Sha Ling Road remains as a single carriageway with minimum improvement works to serve as an emergency access and a pedestrian route, which will encroach on 0.06ha of woodland by the tunnel and viaduct.

1.6.1.4 Alternatively, using Sha Ling Road as a major access to the development by upgrading existing Sha Ling Road, instead of constructing a new road tunnel and viaduct connecting to the western part of the columbarium, would reduce waste generation significantly.

1.6.1.5 Also, the current design has maximised the possibility of using vehicular access via Man Kam To Road, and therefore the original pedestrian link near MTR Lo Wu Station is no longer required.

1.6.1.6 From environmental perspective, this alternative approach would avoid approximately 0.05ha of woodland. Preliminary estimation suggests that this would also avoid cutting the existing terrain and an additional amount of 260,000m³ of spoil.

1.6.1.7 In addition, the upgrading of an existing short section of Sha Ling Road to MacIntosh Fort and the proposed roundabout as turnaround facility for vehicles is considered necessary. The internal roads with dead end aligned on the slope near the proposed open car park are emergency vehicular access (EVA) for the columbarium buildings, and EVA is required according to Architectural Services Department's (ArchSD) design standard to comply with the Code of Practice for Fire Safety in Buildings.

Selection of pick-up and drop-off locations (off-site) along existing MTR stations and highway corridor

1.6.1.8 The original design recommends a major pick-up / drop-off location at MTR Sheung Shui Station during festive periods. The design at that time would require certain road improvement works such as widening and hence may require certain noise mitigation measures in the form of noise barrier and enclosures.

1.6.1.9 However, the current design would adopt multiple pick-up / drop-off locations at a number of MTR Stations during the festive periods.

1.6.1.10 The proposed pick-up / drop-off points would be located in either existing PTI or bus laybys, and no major road improvement works (e.g. road widening) is required. No excavation works would be required and only road furnishing would be conducted.

1.6.1.11 With the above consideration during design process, a number of environmental improvements of the current design over the original design has been achieved and are summarised below:

- The area of woodland directly affected would be decreased from 2.0 ha to 1.0ha, by a reduction of 1.0ha which is equivalent to a 50% reduction;
- The area of wet woodland affected by slope works would be decreased from 0.0017ha to 0ha with at least 15m separation distance, by a reduction of 0.0017ha which is equivalent to a 100% reduction;
- The area of grassland affected would be decreased from 16.4ha to 10.4ha, by a reduction of 6.0ha which is equivalent to a 36% reduction;
- All of the 4 seasonal watercourses directly feed into the wet woodland would be avoided;
- All clan graves within the original boundary of the platform would be avoided;
- The total surplus inert construction and demolition (C&D) materials generation would be decreased from about 706,000m³ to 481,800m³, by a reduction of 224,200m³;
- The road widening works for a section of Choi Yuen Road are no longer required. Hence, noise and air quality impacts arising from the construction and operation along a section of Choi Yuen Road are not anticipated. And the secondary impacts induced from provision of noise barrier are also avoided. No major road improvement works and no excavation works are required for the proposed pick-up / drop-off points; and

- As the platform and works area have been significantly reduced, the environmental impacts such as air quality, noise, waste management, ecological, landscape and visual impacts to the nearby sensitive receivers are anticipated to be significantly reduced.

1.7 Construction Methodology

1.7.1.1 A summary of the construction methods for the C&C facilities is given in the table below:

<u>Key Stages</u>	<u>Construction Methodology</u>
Site Clearance	<p>Firstly, trees will be cleared by backhoes and transported out of the site by crane lorries. After that, the top soil, rock and inert debris will be cleared by backhoes and transported to the stockpiling area for temporary storage. The top soil will be considered to be used for grassland reinstatement. The remaining top soil, rock and inert debris will be transferred to public filling area by trucks.</p> <p>The surplus inert C&D materials will be transferred to the barging point at Siu Lam for the reuse of other concurrent projects.</p>
Construction of haul road	<p>Construction of access route mainly involves temporary cut and fill works. Therefore, excavators and bulldozers will be deployed to excavate and place the fill material to the desired slope angle of the proposed access road. After placing the fill material on the haul road, vibratory rollers will be used for compaction.</p>
Earth filling and excavation	<p>The existing soil will be excavated by excavators while the general fill will be placed by backhoes. After finishing the filling and excavation works, the surface of soil will be further compacted by vibratory rollers.</p>
Construction of Bored Pile Foundation and Soldier Pile Foundation for the Retaining Walls	<p>For the construction of retaining walls with bored pile foundation, piling rigs will be mobilized to drill the holes. The steel case will be inserted and the piles will be tremie concreted by concrete pump. For the construction of retaining walls with soldier pile foundation, piling rigs will be mobilized to drill the holes. The H piles will be inserted and tremie grouting will be carried out. This method is mainly used in site formation to allow minimise the change in the groundwater hydrology connecting to the wet woodland.</p>
Construction of Reinforced Concrete	<p>For the construction of L-shape retaining wall, backhoes will be deployed for the excavation of soil and then</p>

(RC) L-shape retaining walls for roads

excavation lateral support will be installed for temporary support against the pressure of soil. These two steps will be repeated until reaching the formation level. After that, construction of the L-shape retaining wall will be started and follow by the backfilling of soil to the finish level. This retaining structure will be mainly used in road widening work.

Construction of soil nailing

For the soil nailing works, metal scaffolding will be erected and nail locations will be set out on site. Drilling rigs will be mobilized to form the holes and the steel reinforcement will be inserted. Tremie grouting will be carried out and the sprayed concrete will be applied on the nail heads. Where applicable, the construction method of soil nail is faster and causes less environmental impact compared to other retaining structures.

2 Summary of Key Findings in EIA Study

2.1 General

2.1.1.1 The EIA Study has been conducted in accordance with the EIA Study Brief No. ESB-271/2014 and followed the guidelines on assessment methodologies in the Technical Memorandum on Environmental Impact Assessment (TM-EIAO). Cumulative impacts with other concurrent projects have also been taken into account in the assessment.

2.1.1.2 This Executive Summary highlights the keys impacts identified and the proposed mitigation measures. The key findings of the EIA study are summarised in the following sections.

2.2 Air Quality

2.2.1 Construction Phase

2.2.1.1 Potential dust impact would be generated from the soil excavation activities, backfilling, site erosion, storage of spoil on site, transportation of soil, stockpiling etc. during the construction of Sandy Ridge Cemetery and road widening work along Lin Ma Hang Road.

2.2.1.2 Quantitative fugitive dust assessments have been conducted, taking into account the cumulative impact caused by nearby concurrent sources. It is recommended to implement effective dust control following the requirements given in the Air Pollution Control (Construction Dust) Regulation and in accordance with the Environmental Monitoring and Audit (EM&A) programme during construction. The recommended mitigation measures include covering up the excavated or stockpile of dust material; enclosing the skip hoist for material transport by impervious sheeting etc. Assessment results also suggest that watering at site once per hour would be required to control the fugitive dust impact to acceptable levels. The predicted cumulative 1-hr TSP, 24-hr RSP, annual RSP, 24-hr FSP and annual FSP are summarised in **Table 2.1** below.

Table 2.1 Summary of predicted construction dust level (in $\mu\text{g}/\text{m}^3$)

	TSP	RSP		FSP	
	Max. 1-hour	24-hour (10 th highest)	Annual	24-hour (10 th highest)	Annual
Concentrations at ASR (Unmitigated)	467 - 3,554	92 - 210	45 - 107	63 - 83	31 - 39
Concentrations at ASR (Mitigated)	161 - 384	85 - 98	44 - 50	63 - 67	30 - 31
Criteria	500	100	50	75	35

2.2.1.3 As mentioned in **Section 1.2**, there is a barging point located off-site in Siu Lam which is currently being operated with the Express Rail Link project. The construction activities within this area would be limited to the unloading of spoils. Other dust activities, such as site clearance and site formation, would not be undertaken concurrently. After unloading, vehicles would be required to pass through vehicle washing facilities with high pressure water jet before leaving the barging point area. The tipping halls would be 3-sided enclosure with a top cover, water spraying and dust curtain would be provided at the unloading points. With implementation of measures as mentioned, no adverse dust impact arising from the operation of the barging point is anticipated.

2.2.2 Operational Phase

2.2.2.1 A quantitative air quality assessment has been conducted to assess the cumulative impacts from all neighbouring pollution sources. PATH model has been adopted to simulate the regional air quality effects, which has included various pollution sources in Hong Kong and the Pearl River Delta Economic Zone (PRDEZ). For the emission inventory in Hong Kong, various sources have also been included in the PATH model, including the power stations, Chek Lap Kok International Airport, marine emission, roads.

2.2.2.2 For the road networks associated with the Sandy Ridge Cemetery and nearby existing roads, the vehicular emission from open road has been estimated by EMFAC–HK (ver. 2.6), whilst the vehicular emission from idling vehicles at Man Kam To Boundary Control Point has been estimated based on the emission factors with the latest report on “Road Tunnels: Vehicle Emissions and Air Demand for Ventilation” (from PIARC, 2012). CALINE4 and ISCST3 models have been used to simulate the local dispersion.

2.2.2.3 The output of PATH, CALINE and ISCST3 have been combined and compared against the Hong Kong Air Quality Objectives (HKAQOs). Results shown in **Table 2.2** indicate that the cumulative air quality impacts at sensitive receivers would comply with the AQO and hence mitigated measures are not required.

Table 2.2 Summary of predicted cumulative NO₂, RSP and FSP concentrations (in µg/m³)

Year	NO ₂		RSP		FSP	
	1-hour (19 th highest)	Annual	24-hour (10 th highest)	Annual	24-hour (10 th highest)	Annual
2022	114-134	18-32	84-86	42-44	63-65	30-31
2030	114-129	18-28	84-86	42-44	63-65	30-31
Criteria	200	40	100	50	75	35

2.3 Noise

2.3.1 Construction Phase

2.3.1.1 Potential construction airborne noise impacts would be caused by various construction activities including site clearance and formation activities, construction of retaining wall, viaduct, access roads, noise barrier, slope works, road widening works, diversion of utilities and construction of new ramps and tipping halls at barging point in Siu Lam, etc.

2.3.1.2 Construction noise assessment has concluded that the unmitigated construction noise impacts would exceed the noise criteria at some Noise Sensitive Receivers (NSRs). Suitable noise mitigation measures such as implementation of good site practices (e.g. mobile plant should be sited as far away from NSRs as possible and practicable, and silencers or mufflers on construction equipment should be properly fitted and maintained during the construction works, etc.), temporary noise barriers, use of site hoarding and quiet plants have been proposed. With the implementation of the above mitigation measures, all sensitive receivers would comply with the stipulated noise criterion. The predicted cumulative construction noise impacts are summarised in **Table 2.3**.

Table 2.3 Summary of predicted construction noise level (in dB(A))

Scenario	Noise Level, L_{eq} (30mins)	Criterion, L_{eq} (30mins)
Noise level (Unmitigated)	57-93	75
Noise level (Mitigated)	57-75	75

2.3.2 Operational Phase

2.3.2.1 Noise impacts during the operational phase of the project include road traffic noise impact from Sha Ling Road and Lin Ma Hang Road widening.

2.3.2.2 Road traffic noise calculations have been conducted taking into account of the traffic conditions during both normal days and festive days. Without mitigation measures, the predicted road noise levels at representative receivers along Sha Ling Road and Lin Ma Hang Road would exceed the criteria. With the implementation of the proposed direct noise mitigation measures, including low noise road surfacing materials and absorptive noise barriers, most of the NSRs would comply with the noise criteria. For the above NSRs with residual traffic noise impacts, the contribution of traffic noise from the project roads are insignificant (i.e. smaller than 1.0dB(A)). Exceedances at these concerned NSRs are due to traffic noise from the existing Man Kam To Road. Besides, the mitigated noise impacts with Project in place would be less than that in prevailing scenario at Year 2016. Hence, it is anticipated that traffic noise impacts of the Project (with mitigation measures in place) would be less than that of without the Project. The predicted road traffic noise impacts are summarised in **Table 2.4**.

Table 2.4 Summary of predicted road traffic noise level (in dB(A))

Scenario	Normal day	Festive day	Criterion, L_{10} (1 hr)
	NSRs	NSRs	
Noise level (Unmitigated)	57 – 78	58 – 76	70
Noise level (Mitigated)	49 – 77	52 – 76	

2.4 Water Quality

2.4.1 Construction Phase

2.4.1.1 During construction phase, potential water quality impacts would arise from construction runoff, wash water from dust suppression sprays and wheel washing facilities, fuel and oil from maintenance of

construction machinery, etc. Control measures such as silt traps and oil interceptors will be implemented on site to control the potential surface runoff. Good site practice as stipulated in the Practice for Professional Persons on Construction Site Drainage, Environmental Protection Department, 1994 (ProPECC PN 1/94) should be followed. In addition, good practice at the barging point in Siu Lam, such as all barges fitted with tight bottom seals to prevent leakage of materials during transport, etc. should also be followed. Portable chemical toilets and sewage holding tanks should be provided for handling the construction sewage generated by the workforce. Regular water quality monitoring in the Conservation Area north of the Project, Nam Hang Stream and watercourse near San Uk Ling has been recommended.

- 2.4.1.2** With full implementation of the mitigation measures, adverse residual and cumulative impacts are not anticipated during the construction phase of the Project.

2.4.2 Operational Phase

- 2.4.2.1** During operational phase, the key water pollution source would be the sewage generated. The sewage from the development is mainly generated during festive periods (i.e. Ching Ming Festival and Chung Yeung Festival), the quantity is relatively small when compared to the Shek Wu Hui Sewage Treatment Works (SWHSTW) capacity. Hence, the SWHSTW has enough capacity to handle the sewage generated from the development.

- 2.4.2.2** For the drainage system, general control measures like silt traps and oil interceptors will be implemented to control the potential pollution from surface runoff.

- 2.4.2.3** Of particular concern is the wet woodland is located to the north-west of the columbarium. This wet woodland has been concluded to have high ecological value. The platform would occupy an area of about 4.0ha and there would be hydrological change, both groundwater and surface water, to the wet woodland downstream. For groundwater, the infiltration rate to the ground may be reduced and the hydrological flow of underground water may also be potentially interrupted by the foundation of the proposed platform. The amount of surface runoff may also increase from the additional paved area.

- 2.4.2.4** Hence, the current foundation design has been adjusted to use bored piles of about 0.6m in diameter and the spacing between each pile would be approximately 3.5 – 5m. As compared to other foundation designs such as (Diaphragm wall) D-wall or pipepiles, the proposed

small diameter bored pile system would allow a notional free area of about 87 – 91% for groundwater to pass through.

2.4.2.5 In addition, for the increase in surface runoff which may result in potential for soil erosion, energy dissipaters would be installed at the seasonally wet watercourses downstream, which comprises of a number of concrete steps to allow water velocity to decelerate.

2.4.2.6 With full implementation of the mitigation measures, no adverse residual and cumulative impacts are anticipated during the operational phase of the Project.

2.5 Waste Management

2.5.1 Construction Phase

2.5.1.1 Potential waste management implications from the generation of waste during the construction phase have been evaluated. Measures, including the opportunity for on-site sorting, reusing construction and demolition (C&D) materials etc., are devised in the construction methodology to minimise the surplus materials to be disposed. Recommendations have been made for implementation by the Contractor during the construction period to minimise waste generation and off-site disposal. The disposal quantities for C&D materials and their disposal methods have also been assessed.

2.5.1.2 A stockpile area will be located within the site during construction phase for temporary storage of inert C&D materials. The stockpile area is about 9,000m² at the platform +50mPD at middle portion of C&C facilities, and the approximate height of the stockpile would be about 1m.

2.5.1.3 All C&D materials arising from the construction would be sorted on-site to recover the inert C&D materials and reusable and recyclable materials prior to disposal off-site.

2.5.1.4 It is estimated that a total of 894,000m³ of inert C&D materials would be generated from the Project. 412,200m³ of the generated inert C&D materials would be reused on-site and the remaining 481,800m³ would be reused in other concurrent projects.

2.5.2 Operational Phase

2.5.2.1 It is anticipated that only an insignificant amount of general refuse would be generated during the operational phase from the routine road cleaning activities along the roads network for the C&C facilities and Lin Ma Hang Road.

2.6 Land Contamination

- 2.6.1.1** A land contamination assessment has been conducted to examine the potential contaminative land uses within the area and their potential impacts to future use.
- 2.6.1.2** Based on the findings in desktop study and site survey, one potentially contaminated site (SRC-1) within the assessment area has been identified. According to the latest land resumption programme as advised by Engineer, only the western portion of SRC-1 with an area of approximate 1,200m² inside private lot would require land resumption for the road widening work at Sha Ling Road and utilities construction works nearby. For the portion of the site (about 620m²) which falls within government lot (to the southeast of SRC-1), only paved ground was observed and neither concrete and asphalt production nor open storage activities were observed during the site survey. In addition, review of historical aerial photos (since Year 1973) also revealed no sign of land contamination. As such, SI is considered not required for this strip of land and the necessity of SI should focus on the western portion of SRC-1 once the land is resumed and free for access.
- 2.6.1.3** Since approximate 92 % of the site (about 7,700m²) is located within a private land lot and it is currently under operation, it is recommended that re-appraisal should be carried out by the Project Proponent (PP) once the works area for the Project is confirmed and site access is available (e.g. after land resumption), in order to identify any hot spots for SI within the southeast and western portions of SRC-1. Should the findings of the re-appraisal identify signs of land contamination potential, the PP would need to prepare a Contamination Assessment Plan (CAP) presenting the findings of the re-appraisal and strategy of the recommended SI, if required, and submit to EPD for review and approval.
- 2.6.1.4** Following the submission of Contamination Assessment Plan (CAP), if required, a Contamination Assessment Report (CAR) needs to be prepared to present the findings and evaluate the level and extent of potential contamination. If land contamination is identified and remediation is required, a Remediation Action Plan (RAP) will be prepared to recommend specific remediation measures. Upon completion of the remediation works, if any, a Remediation Report (RR) that demonstrates the clean-up works are adequate would also be prepared. CAR, RAP and RR would be submitted to EPD for approval prior to commencement of any construction.

2.7 Ecology

2.7.1.1 Nine months survey has been carried out within 500m of the Project boundary including Sandy Ridge, Man Kam To Road, Sha Ling Road and Lin Ma Hang Road. The survey includes vegetation, terrestrial mammals, avifauna (birds, egret flight lines), herpetofauna, odonata, butterflies and aquatic fauna, and based on these surveys, habitat mapping is carried out.

2.7.1.2 Botanical species of conservation importance within the Assessment Area include *Aquilaria sinensis*, Bamboo Orchid and Toothed Habenaria. In addition, key faunal species of conservation concern recorded from within, or close to, the Project boundary include Two-striped Grass Frog, several grassland dependent butterflies and the endemic freshwater crab *Somaniathelphusa zanklon*.

2.7.1.3 The ecological baseline study has identified a number of habitats and species of conservation importance. Construction and operation of the Project will result in a range of ecological impacts. The key habitat losses are as follows:

- Permanent loss of 1.2ha of woodland (As discussed in **Section 1.6**, the affected woodland would be decreased from 2.0ha to 1.0ha through the optimization of platform and road network, the remaining 0.2ha is affected through Lin Ma Hang Road widening); and
- Permanent loss of 10.4ha of upland grassland.

2.7.1.4 Key mitigation measures are recommended as follows:

- Regarding grassland reinstatement, it is proposed that by collection of topsoil or turves from the development area and storing these appropriately during the construction phase, these can be established on the stabilising slopes once constructed, in order to provide species diversity and composition to adjacent habitats. Grassland reinstatement plan on the proposed cut-fill slope will be confirmed with Environmental Protection Department (EPD);
- Flora survey of conservation importance and transplantation plans for these species; and
- Specific measures to prevent indirect impacts to the ecology of the wetland system (seasonal watercourses, wet woodland, marsh and mitigation wetlands) to the north of the Project site will be developed at the detailed design stage in order to maintain hydrological function and good water quality.

2.7.1.5 Woodland enhancement of about 0.6ha northwest and west of the proposed columbarium to provide additional ecological linkages between existing fragments of woodlands and increase ecological function of the woodlands present.

2.8 Fisheries

2.8.1.1 The identified impacts on fisheries are expected to be low. However, the good site practices during the construction phase and operational phase to prevent water pollution has been recommended.

2.9 Landscape and Visual

2.9.1.1 The proposed development and associated works follow in principle the planning intentions from the Approved Man Kam To Outline Zoning Plan (No.S/NE-MKT/2) and Approved Fu Tei Au and Sha Ling Outline Zoning Plan (No.S/NE-FTA/14). The proposed work will not encroach onto any Amenity Area (A), Conservation Area (CA), and Country Park (CP).

2.9.1.2 Based on the broad-brush tree survey report, approximately 1,300 nos. of trees will be affected within the works area. Due to construction of the site formation and associated road widening works and footpath, it is unavoidably considered to remove the affected trees. Affected trees with high to medium amenity value and high to medium survival rate are proposed to be transplanted as far as possible. Trees surveyed within the proposed works boundary are primarily common species. There are no Leisure and Cultural Services Department (LCSD) Registered Old and Valuable Trees. Two mature trees and two rare species trees are found within the works area. For the two mature trees, one of them are unavoidably affected by the road works, and the other one will be retained. The two rare species trees will be relocated as far as possible and will be confirmed in technical feasibility assessments later.

2.9.1.3 There are two number of *Aquilaria sinensis* (土沉香), which listed under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586) are proposed to be relocated as far as possible and will be confirmed in technical feasibility assessments later. One number of mature *Bombax ceiba* (木棉) found within the works area and will unavoidably be affected by the proposed new road and viaduct section. As mentioned in **Section 1.6**, the alignment of the proposed road and viaduct had considered the constraints of land resumption, engineering technical feasibility, existing topography, etc., the site formation layout and road alignment are considered to be optimised.

2.9.1.4 As the principle of the project is to minimise the site formation works and the trees affected, limited land will be available for tree planting.

It is expected approximately 200 light standard sized trees will be planted as compensatory tree planting at proposed slope with gentler than 35 degree. Approximately 10 to 15 nos. of heavy standard compensatory trees and whips planting will be planted along Lin Ma Hang Road and approximately 130 nos. of heavy standard sized trees will be planted within Sandy Ridge. In addition, woodland mix species whips will be proposed along the hillsides for the woodland compensation. Any other off-site compensatory planting area will be further agreed with relevant government departments. The overall residual impact on trees is considered as acceptable with mitigation measures.

- 2.9.1.5** Some portion of shrubby grassland will be lost during construction, however, it can be compensated by the mitigation measures of slope greening.
- 2.9.1.6** Key mitigation measures such as tree planting and woodland compensation, greening treatment on slope and retaining wall, as well as silt traps on the design of road gullies for the natural stream(s) will be applied.
- 2.9.1.7** The proposed works will cause slight adverse landscape impact on the Hillside Woodland, Hillside Shrubby Grassland and Plantation within Sandy Ridge area. In fact, the compensatory whips planting will form as natural woodland during Year 10 operation phase, and grass planting will be proposed on proposed soil filled slope. It is considered that the overall residual landscape impact at Year 10 operation is acceptable with mitigation measures.
- 2.9.1.8** The proposed site formation work is far away from existing residential developments, it is considered that the proposed works will only cause small to negligible visual impact to most of the Visual Sensitive Receivers (VSRs). Only the VSRs located close to the Sha Ling Road upgrading road section will suffer more visual impact. Mitigation measures during construction phase include screening of construction works by hoardings/noise barriers in visually unobtrusive colours. It is considered that the residual visual impact at Year 10 operation is acceptable with mitigation measures.
- 2.9.1.9** The landscape and visual impact assessment has been conducted according to the criteria and guidelines for evaluating and assessing impacts as stated in Annex 10 and 18 of the TM-EIAO, it is considered that the identified residual impacts, taking account of both importance and degree of compliance, will be acceptable with mitigation measures.

2.10 Cultural Heritage

2.10.1 Construction Phase

2.10.1.1 As discussed in **Section 1.6**, all clan graves within the original boundary of the platform would be avoided due to optimization of platform / road network.

2.10.1.2 In addition, one Graded Historic Building, 11 Historic Clan Graves and 7 Nil Grade Built Heritage items have been identified. With the implementation vibration monitoring, provision of buffer zone, protective covering, safe public access, etc, adverse impacts during are not anticipated. For archaeology, an Archaeological Watching Brief (AWB) Programme is recommended at the south eastern foot slopes of Sandy Ridge, where a cultural deposit without material findings was noticed.

2.10.1.3 Along Lin Ma Hang Road, it is recommended that the engineer inform the Antiquities and Monuments Office (AMO) if any antiquities or supposed antiquities are unearthed during the construction phase. No adverse impacts are expected to arise from the construction of the proposed C&C facilities at Sandy Ridge or the road widening at Lin Ma Hang Road.

2.10.2 Operational Phase

2.10.2.1 No adverse impacts are expected to arise from the operation of the proposed C&C facilities at Sandy Ridge or the road widening at Lin Ma Hang Road.

2.11 Environmental Monitoring and Audit

2.11.1.1 An environmental monitoring and audit programme will be implemented throughout the entire construction period to regularly monitor the environmental impacts on the neighbouring sensitive receivers. Any action required during the operational phase has also been recommended for implementation.

2.11.1.2 The EM&A programme would include site inspection / audit and monitoring for construction dust, odour, construction airborne noise, operation airborne noise, water quality and updating changes as necessary. Details of the recommended mitigation measures, monitoring procedures and locations are presented in a standalone EM&A Manual.

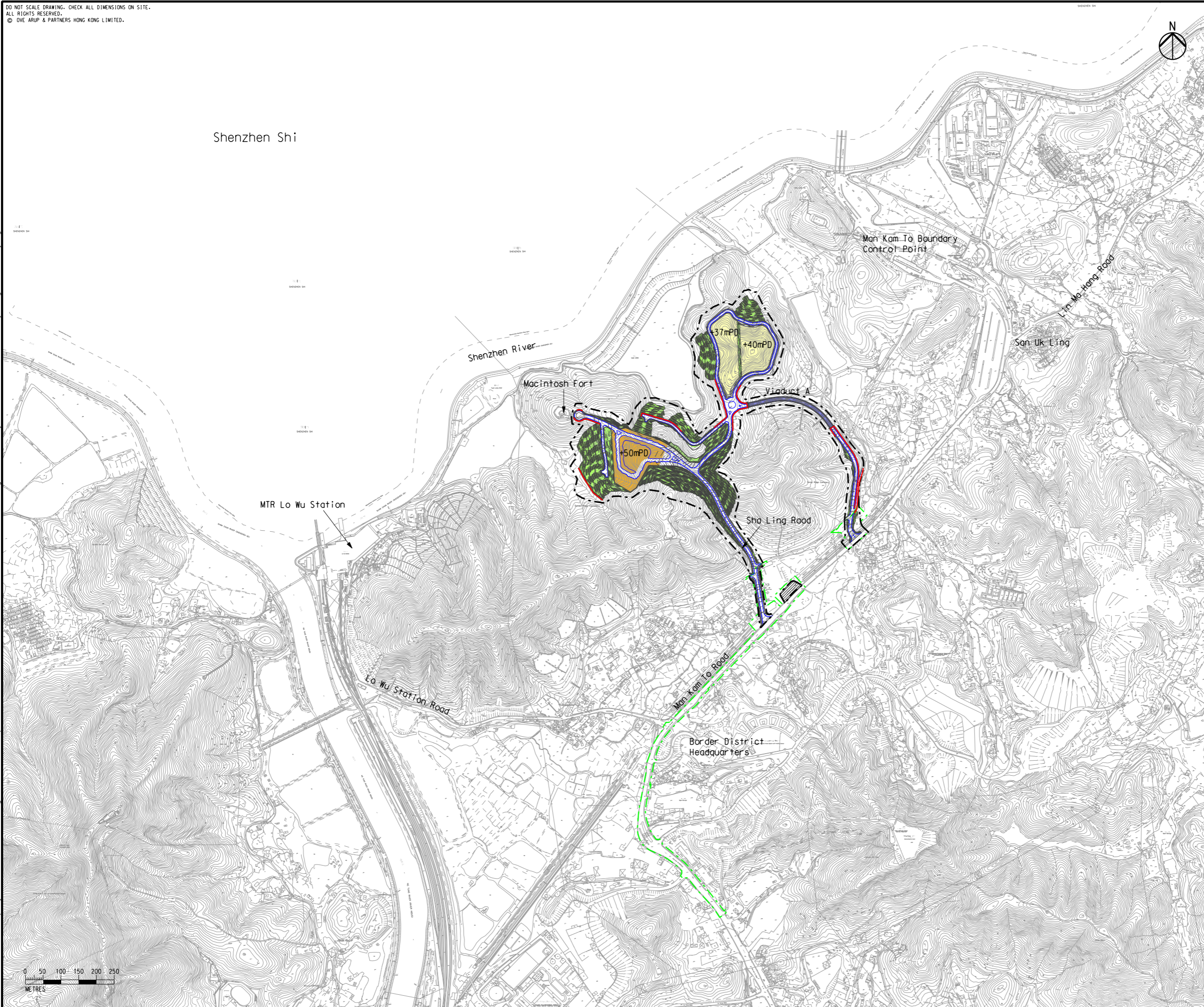
3 Conclusion

3.1.1.1 An EIA Report has been prepared to fulfil the requirements as specified in the EIA Study Brief No. ESB-271/2014 and the TM-EIAO. All the current design information has been incorporated in the EIA process. The aspects that have been considered in the EIA Report include:

- Alternative design and layout;
- Alternative construction methods and sequence of works;
- Air quality impact;
- Noise impact;
- Water Quality impact;
- Waste management implications;
- Land contamination impact;
- Impact on ecology;
- Impact on fisheries;
- Landscape and visual impact;
- Impact on cultural heritage; and
- EM&A requirements.

3.1.1.2 The mitigation measures and monitoring and auditing requirements are also proposed in the EIA report.

Shenzhen Shi



Legend

- Project Boundary
- Utilities Construction
- Proposed Access Road
- Proposed Viaduct
- Proposed Platform for Crematorium, Funeral Parlour and Visitor Service Centre
- Proposed Platforms for Columbarium
- Proposed Pick-up and Drop-off Point
- Proposed Cut / Fill Slope
- Retaining Wall

H	EIGHTH ISSUE	GL	02/16
G	SEVENTH ISSUE	GL	01/16
F	SIXTH ISSUE	GL	12/15
E	FIFTH ISSUE	GL	10/15
Rev	Description	By	Date

Consultant
ARUP

Contract No. and Title:
 Agreement No. CE 1/2013(CE)
 Site Formation and Associated Infrastructural Works for Development of Columbarium, Crematorium and Related Facilities at Sandy Ridge Cemetery - Design and Construction

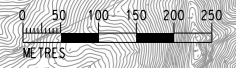
Drawing title
Project Location Plan at Sandy Ridge Cemetery

Drawing no. Figure 1.1		Rev. H	
Drawn GL	Date 02/16	Checked EL	Approved ST
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Legend

 Project Boundary

Printed by : 9/21/2015
 Filename : G:\env\project\231448\13 Drawing Deliverables\Reports\015 EIA\20150825 Revised Draft_v2\Ch 1\Intro\Figure 1.2 - Project Location Plan at Lin Ma Hang Road.dgn



Rev	Description	By	Date
B	SECOND ISSUE	GL	11/14
A	FIRST ISSUE	GL	07/14

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Contract No. and Title:
 Agreement No. CE 1/2013(CE)
 Site Formation and Associated
 Infrastructural Works for Development
 of Columbarium, Crematorium and
 Related Facilities at Sandy Ridge
 Cemetery - Design and Construction

Drawing title
**Project Location Plan
 at Lin Ma Hang Road**

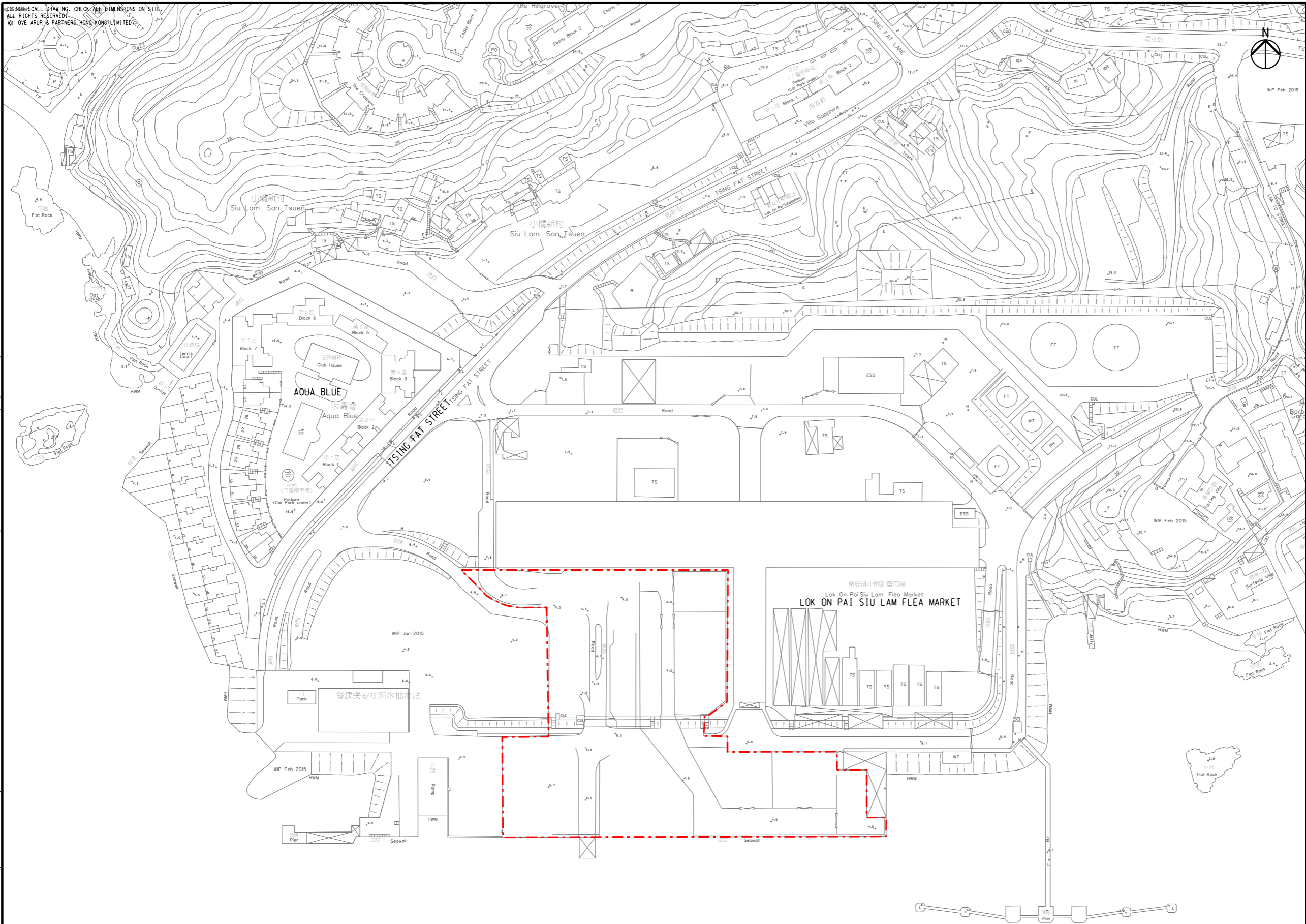
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Drawn GL	Date 11/14	Checked EL	Approved ST
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BARGING POINT AREA

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A	FIRST ISSUE	GL	09/15

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Site Formation and Associated
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Related Facilities at Sandy Ridge
Cemetery - Design and Construction

Drawing title
Location of Barging Point

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Scale 1:2000 @A3		Status PRELIMINARY	

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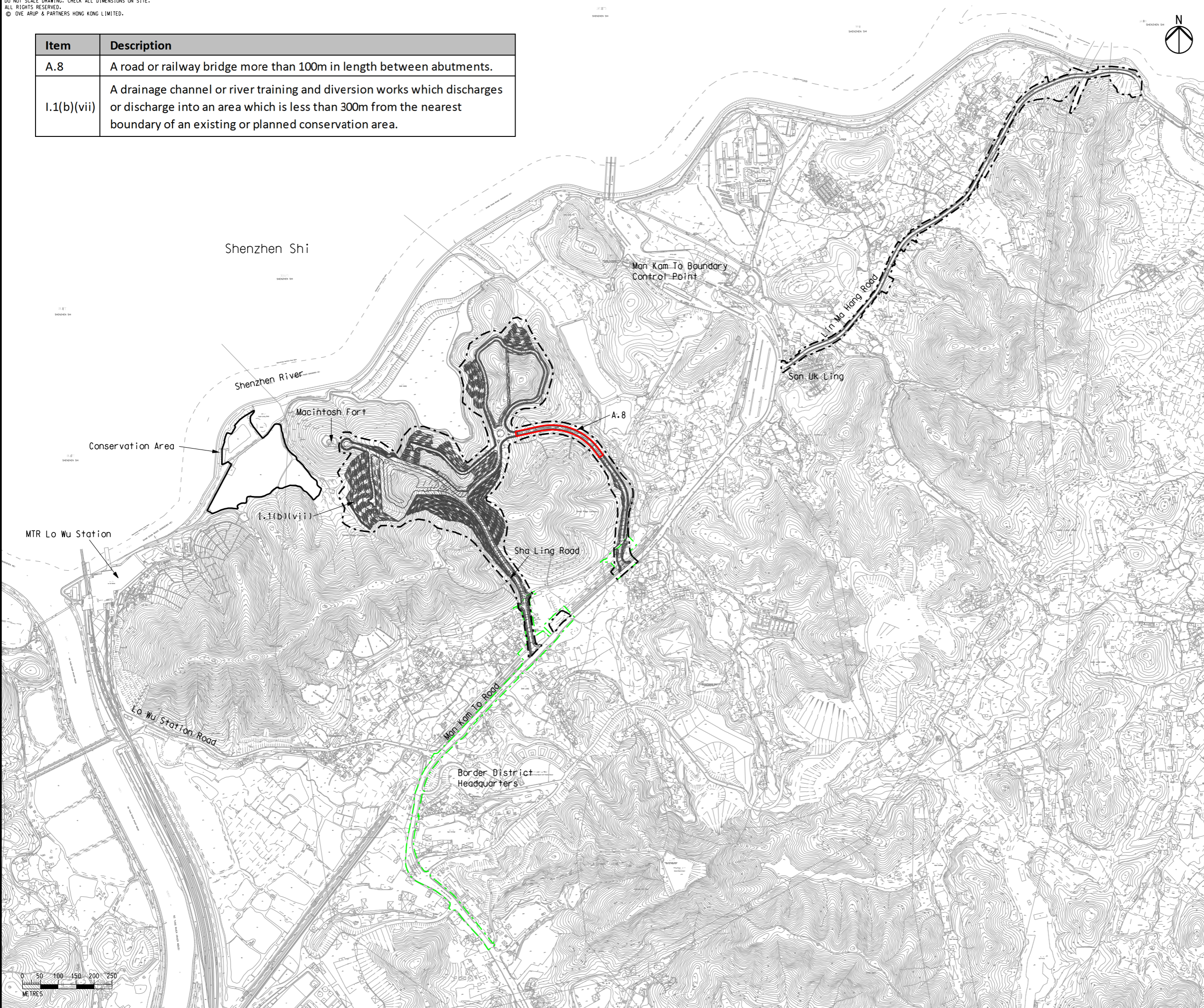
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Item	Description
A.8	A road or railway bridge more than 100m in length between abutments.
I.1(b)(vii)	A drainage channel or river training and diversion works which discharges or discharge into an area which is less than 300m from the nearest boundary of an existing or planned conservation area.

Legend

-  Project Boundary
-  Utilities Construction



G	SEVENTH ISSUE	GL	02/16
F	SIXTH ISSUE	GL	01/16
E	FIFTH ISSUE	GL	12/15
D	FOURTH ISSUE	GL	10/15
Rev	Description	By	Date

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Contract No. and Title:
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 of Columbarium, Crematorium and
 Related Facilities at Sandy Ridge
 Cemetery - Design and Construction

Drawing title
**Locations of
 Designated Projects**

Drawing no. Figure 1.4		Rev. G	
Drawn GL	Date 02/16	Checked EL	Approved ST
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