Home Affairs Bureau
The Government of the Hong Kong Special Administrative Region

MOTT MACDONALD

Environmental Permit No. EP- 544/2017

Kai Tak Sports Park – Investigation

Environmental Team Leader Certification

Reference Document /Plan

~~Document~~/Plan to be Certified:	Stormwater Re-use Management Plan (Rev.7)
Date of Report:	May 2022
Date received by ETL:	23 May 2022

Reference EP Condition

Environmental Permit Condition: 2.21 and 2.22

If natural turf is used as the default playing surface at the Main Stadium or the Public Sports Ground, the Permit Holder shall, no later than one month before the commencement of construction of the Project or otherwise approved by the Director, deposit with the Director three hard copies and one electronic copy of Stormwater Re-use Management Plan(s) (the SRMP). The SRMP shall include details, implementation program, maintenance and management schedules of the required water quality mitigation measures for the Project.

If there are any change(s) to the water quality mitigation measures in the SRMP, the Permit Holder shall, no later than one month before the implementation of such change(s), deposit with the Director three hard copies and one electronic copy of an update to the SRMP (the Updated SRMP). The Updated SRMP shall show clearly the proposed change(s). Before submission to the Director, the SRMP or any Updated SRMP shall be certified by the ET Leader and verified by the IEC as conforming to the relevant information and recommendations on water quality mitigation measures contained in the approved EIA report (Register No. AEIAR-204/2017), or otherwise approved by the Director. All mitigation measures recommended in the SRMP or any Updated SRMP shall be fully implemented. The Permit Holder shall make available additional copies of the SRMP or any Updated SRMP to the Director upon his request.

ETL Certification

I hereby certify that the above reference plan complies with the above referenced condition of EP-544/2017.

Mr Sunny Chan
Environmental Team Leader Date: 25 May 2022

Environmental Permit No. EP-544/2017

Kai Tak Sports Park - Investigation

Independent Environmental Checker Verification

Reference Document/Plan

~~Document~~/Plan to be ~~Certified~~/ Verified:	Stormwater Re-use Management Plan
Date of Report:	May 2022 (Rev. 7)
Date received by IEC:	24 May 2022

Reference EP Condition

Environmental Permit Condition: 2.21 and 2.22

If natural turf is used as the default playing surface at the Main Stadium or the Public Sports Ground, the Permit Holder shall, no later than one month before the commencement of construction of the Project or otherwise approved by the Director, deposit with the Director three hard copies and one electronic copy of Stormwater Re-use Management Plan(s) (the SRMP). The SRMP shall include details, implementation program, maintenance and management schedules of the required water quality mitigation measures for the Project.

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IEC Verification

I hereby verify that the above referenced ~~document~~/plan complies with the above referenced condition of EP-544/2017.

Ms Mandy To

Independent Environmental Checker

Date: 25 May 2022

Our ref: 0500384_IEC Verification Cert_KTSP_SRMP_20220525.docx

Kai Tak Sports Park Ltd.

Design, Construction and Operation of the Kai Tak Sports Park

Stormwater Re-use Management Plan (Rev. 7)

20 May 2022

Job number 266006-70

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Contents

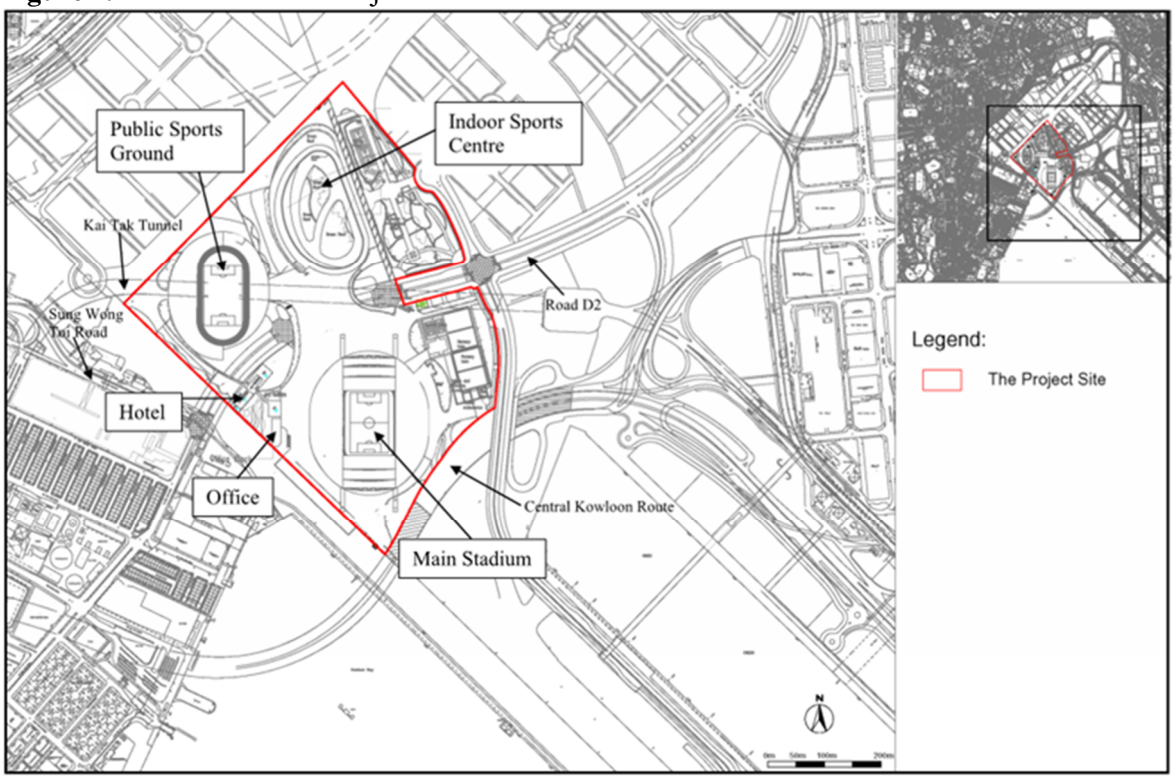
Appendices

1 Introduction

1.1 Background

1.1.1.1 The Environmental Permit (EP) (i.e. EP-544/2017) for the approved Environmental Impact Assessment (EIA) Report for Kai Tak Multi-purpose Sports Complex (former name of the Kai Tak Sports Park (KTSP)) was issued on 8 September 2017. The location of the Project is given in **Figure 1.1** (Extracted from EP-544/2017).

Figure 1.1: Location of the Project



1.1.1.2 Pursuant to Condition 2.21 of the EP, if natural turf is used as the default playing surface at the Main Stadium (MS) or the Public Sports Ground (PSG), the Permit Holder shall, no later than one month before the commencement of construction of the Project or otherwise approved by the Director, deposit with the Director three hard copies and one electronic copy of the Stormwater Re-use Management Plan (SRMP). The SRMP shall include details, implementation program, maintenance and management schedules of the required water quality mitigation measures for the Project.

1.1.1.3 If there are any change(s) to the water quality mitigation measures in the SRMP, the Permit Holder shall, no later than one month before the implementation of such change(s), deposit with the Director three hard copies and one electronic copy of an update to the SRMP (the Updated SRMP). The Updated SRMP shall show clearly the proposed change(s). Before submission to the Director, the SRMP or any Updated SRMP shall be certified by the ET Leader and verified by the IEC as conforming to the

relevant information and recommendations on water quality mitigation measures contained in the approved EIA report (Register No. AEIAR-204/2017), or otherwise approved by the Director. All mitigation measures recommended in the SRMP or any Updated SRMP shall be fully implemented. The Permit Holder shall make available additional copies of the SRMP or any Updated SRMP to the Director upon his request.

1.1.1.4 A turf bank will be located offsite in New Territories to harvest turf grass for the MS. The location of the turf bank is at DD104 Yuen Long with an area of around 1.85 ha. The site is owned by "Infinity View Limited". The land will be leased to a new entity being set up to provide turf and landscaping services to Hong Kong and the region with similar climate conditions. The company will use the site to carry out turf trials to assist KTSP in identifying the suitable turf system for the Precinct. The turf system will become a product of the company to be marketed to KTSP as well as other clients in the region. Other products of the company include horticulture and landscaping services. Considering that the details of the turf bank is under development, the requirements of the turf bank (e.g. use of fertiliser and pesticide, necessity of stormwater re-use system, etc.) will be discussed and agreed with EPD separately.

1.1.1.5 This SRMP focuses on the MS and PSG only

1.2 Objectives

1.2.1.1 The purpose of this SRMP is prepared to comply with Condition 2.21 of the EP. This SRMP contains details, implementation programme, maintenance and management schedules of the required water quality mitigation measures for the Project.

1.3 Scope

1.3.1.1 This SRMP is prepared to ensure that no adverse water quality impact is arising from the residual fertilisers and pesticides in the surface run-off from the turf. This Plan includes the following key elements:

- Healthy use of sports turf specific fertilisers and pesticides, and safe operation of the chemical recycling and disposal;
- Operation and maintenance of water storage/holding tanks;
- Frequency of testing and sampling, and appropriate testing parameters of the residual fertiliser and washable deposited pesticides;
- Action and Limit levels; and
- Emergency measures.

1.3.1.2 In order to encourage the professional use of sports turf fertilisers and pesticides, and safe operation of the chemical recycling and disposal, the SRMP is extended to control the application of fertiliser and pesticide with detailed operation control requirements of the intercepting system so that the

application of fertiliser and pesticide would be properly controlled and implemented in order to protect the Victoria Harbour Water Control Zone (WCZ). Time of application of fertiliser and pesticide is essential. Application of fertiliser and pesticide during or right before heavy rainfall is prohibited. In addition, use of more specific, systemic and biodegradable pesticide in low dosage is more preferred. All these may form part of the integrated fertiliser and pesticide management programme to minimize the potential water quality impact.

2 Application of Fertiliser

2.1 Selection of Fertiliser

2.1.1.1 Before the selection of fertilisers for turf harvesting, it is important to understand the rationale and best practice approach when selecting appropriate fertilisers and considering the potential environmental impacts in a wider horizon. The aim of fertiliser application on sports turf is quite different to that used in agricultural crops or grazing grassland. For the latter, biomass production is paramount and fertiliser inputs are selected to give optimum biomass production per kg of fertiliser applied. However, for turf on sports fields this is not necessarily the case. Indeed, excessive biomass production often has highly detrimental agronomic and playing quality effects. When managing turf, fertiliser inputs are optimised to produce healthy turf for the minimum possible input of nutrients.

2.1.1.2 Fertiliser selection will therefore be based on need, turfgrass nutrient demands, and product efficacy and in accordance with guidelines such as those set out in Lawson (2002), Duncan and Carrow (1999), McCarty and Miller (2002) and Carrow *et al*. (2001).

2.1.1.3 This project demands sports surfaces with a guaranteed performance from a contractual perspective. Turf products selected (including fertilisers) will therefore also need to have a guaranteed performance. Whether such products are organic or not is immaterial. The best turf products on the markets shall be selected and used responsibly within an integrated pest management (IPM) programme. Such an approach automatically implies minimising the demand for chemical application, use of non-chemical means where possible and applying products at manufacturer's recommendation rates. The turf trials will provide an opportunity to evaluate a range of turf products suited to the Hong Kong climate and turfgrass growing challenges.

2.1.1.4 The central tenets of fertiliser application guidance shall establish what levels of nutrients are available to the grass in the rootzone, plan nutrient inputs based on supplementing this existing reserve and on the growth and plant health objectives needed to sustain the playing surfaces. The requirements for nutrient inputs will vary according to:

- Species of turf;
- The current condition and health of the turf;
- The prevailing growing environment;
- Time of year;
- Age of the turf and level of root development; and
- Specific objectives of nutrient input.

2.1.1.5 The nature of fertilisers used in this project will be very different to those used in agricultural or horticultural situations. Firstly, the levels of nutrients contained in turf fertilisers have lower nitrogen and phosphorus contents than

those in agricultural fertilisers. This is to prevent excessive growth and to allow for more targeted and frequent fertiliser applications, thereby better meeting plant demands as they change dynamically during the season. On intensively managed turf, fertilisers tend to be applied in small quantities frequently during the growing season. This not only prevents flushes of growth, but also significantly reduces leaching or run-off risk, as there is a greater chance that turf, or the soil ecosystem will utilise the nutrient before it is flushed from the rootzone.

2.1.1.6 Leaching and wastage of soil nutrients shall be minimised by adopting a "good sustainable practice" nutrient management programme, coupled with judicious use of the irrigation systems.

2.1.1.7 When considering the risk of nutrient leaching, the solubility and form of fertiliser are important. Conventional/quick release fertilisers tend to be readily soluble to allow quick plant response, but if over-applied or over-irrigated could be at greater risk of leaching. Therefore, lighter but more frequent applications are often made, in comparison to applying the same level of nutrition in one or two applications per year. Slow release or controlled release formulations can be used to restrict the solubility/accessibility of nutrients to plants and the soil ecosystem to a certain extent. This is achieved either by producing soluble but complex molecules that take time to break down and release the nutrients, or coating quick release nutrients to restrict their solubility. Both approaches will produce a slower and more measured release of nutrients over a longer time-period, thereby reducing leaching risk. Finally, liquid products are very popular, as it is possible to apply frequent and very small doses of nutrient that are quickly taken up by the grass plant and utilised, thereby preventing excessive growth and minimising leaching losses, as most of the nutrients are quickly assimilated in the plant.

2.1.1.8 With reference to Section 6.11.5 of the approved EIA Report, in the case when natural turf is adopted, the operator shall consider using organic fertilisers. Organic-based fertilisers will be considered where they can be shown to have a guaranteed performance in terms of nutrient release and longevity during the turf trial. Their use is more likely to be appropriate at the turf bank where there may be long periods of time when the turf is not required to be in the MS. It may also be possible to use organic-based fertilisers on the PSG for the "background" supply of nutrients.

2.1.1.9 The fertiliser programme for all the turf surface of MS and PSG pitches shall therefore be based on a combination of applications of granular, controlled or slow release fertilisers supplemented by foliar feeding for presentational management and disease control. Additional small applications of conventional-release granular fertiliser will also be required as "back-up" for rapid promotion of growth at key times.

2.1.1.10 The further details of fertiliser selection and application are discussed in Section 3.3 of Grass Management Plan. A list of fertilisers to be potentially used for the Project and their application details extracted from Grass Management Plan are provided in **Appendix 2.1**.

2.2 Storage and Control

2.2.1.1 Storage and control of fertilisers shall be based on the following four main points:

- Stores shall be sited with care;
- Any spillage of fertiliser or water contaminated with fertiliser must be properly dealt with to avoid pollution;
- Stores shall be properly maintained and inspected, with records kept; and
- Emergency procedures must be in place and understood by all who may be involved.

2.2.1.2 An indoor area dedicated to fertiliser storage shall be used. The store room shall be separate from offices, surface water, neighbouring dwellings, and bodies of water; separate from pesticides; and protected from extreme heat and flooding. The storage area shall have an impermeable floor with secondary containment, away from plant material and high traffic areas.

2.2.1.3 The building or storage area shall be kept locked and clearly labelled as a fertiliser storage area. Labels on the windows and doors of the store room shall provide firefighters with information about fertilisers and other products present during an emergency response to a fire or a spill. Fire extinguishers shall be present and immediately accessible, as well as emergency contact information.

2.2.1.4 Following precautionary measures should be adopted when storing fertilisers:

- Pallets shall be used to keep large drums or bags off the floor. Shelves for smaller containers shall have a lip to keep the containers from sliding off easily. Steel shelves shall be used.
- Adequate spill clean-up materials for liquids (e.g. absorbent materials) and solids (e.g. shovel, dustpan, broom, and buckets) shall be available within the general area.
- There should be no food, drink, tobacco products, or livestock feed present in storage areas containing general greenhouse supplies.
- Fertiliser bags and boxes shall be opened with a utility knife (Stanley knife) or scissors; open containers shall be resealed and returned to storage where they shall be kept in a dry place.
- Fertilisers shall be stored in their original containers unless damaged; labels should be visible and legible; food or beverage containers shall never be used for storage.
- An inventory shall be actively updated as fertilisers are added or removed from storage; materials shall be dated when purchased and removed when outdated.

- There shall be active mechanical temperature control and no direct sources of heat (sunny windows, steam pipes, furnaces, etc.). Adequate ventilation must be ensured.
- On no account shall spillages be hosed away or allowed to enter directly into surface drains or watercourses or to gradually wash into soil.
- Adequate road access for deliveries and use shall be provided.

2.3 Application, including dosages, frequency, residual quantities

2.3.1.1 The application of fertiliser in general shall be timed so that it brings a pitch to a peak condition for any major competition or event which may be notified to the Head of Turf Operations. In this respect, it is expected that the turf in turf bank shall be brought to peak condition before being harvested and laid in the MS. Fertiliser applications on turf laid within the MS shall be kept as minimal as possible.

2.3.1.2 Nutrient inputs shall be modified from month-to-month depending on soil test analysis and seasonal differences. As discussed in Grass Management Plan, the following annual nitrogen applications will be used as a guideline for different turfgrass species that may be used for this project:

Perennial ryegrass:	$\leqslant$ 250 kg/N/ha
Kentucky bluegrass:	$\leqslant$ 250 kg/N/ha
Zoysia:	$\leqslant$ 250 kg/N/ha
Paspalum:	$\leqslant$ 250 kg/N/ha
Bermudagrass:	$\leqslant$ 600 kg/N/ha

2.3.1.3 The above programme shall be devised to ensure a “little and often” approach providing a balance of NPK nutrients in the ratio of $4N:1P_2O_5:3K_2O$ or 9N:1P:6K and shall be dependent upon environmental conditions and the rate of turfgrass growth. For the first 12 months following initial turf establishment on the PSG pitch, fertiliser inputs are anticipated to be significantly higher than for a surface with an established mature turfgrass sward.

2.3.1.4 The above practice will ensure that there will be efficient turf nutrient uptake as well as no nutrient loading within the rootzone, thus minimising the potential for nutrient loss from the profile.

2.3.1.5 Applications of soil conditioners, wetting agents and fertilisers containing iron shall also be used as part of the routine maintenance applications as considered necessary by the Head of Turf Operations in order to maintain profile condition and health, and to present the pitches in optimal visual condition for matches and events.

2.3.1.6 Granular fertiliser shall be applied evenly using a rotary spreader and shall be washed in using a light irrigation application immediately after application. Furthermore, fertiliser shall not be applied when conditions are hot and sunny, but preferably early morning or late afternoon (ideally under overcast

conditions). The main risk of these products is runoff of granules into surface water, which can easily be mitigated by ensuring they are integrated into the turf canopy base, thereby rendering the granules immobile. As a further mitigation action, mowing shall be postponed by a minimum of two days from the date of fertilising to the date of mowing so that there is minimal pick up of fertiliser granules.

2.3.1.7 Foliar fertilisers shall be applied evenly using a motorised calibrated pedestrian sprayer with a 5 m wide boom.

2.3.1.8 Applications of fertiliser will be planned on a month-by-month basis, typically consisting of one application of controlled release granular fertiliser in one week and three weeks of foliar application in the intervening weeks. A nutrient budgeting spreadsheet shall be used for all calculations (see **Figure 2.1** for example).

Figure 2.1: Example of monthly fertiliser plan

Example fertiliser plan

Month	App. Code.	Fertiliser	App. Rate	Unit	Density (kg/L)	Nutrient											
						N	P_2O_5	K_2O	S	Ca	Mg	Fe	Mn	Zn	Cu	B	Si
Annual Nutrients (kg/ha)						**347**	**59**	**195**	**85**	**14**	**10**	**30**	**10**	**2**	**1**	**0**	**1**
Achieved ratio to N						1.0	0.1	0.6	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Target ratio to N						1.0	0.1	0.8	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	-
Jan	FL1	Foltech Cytozorb-S	20	L/ha	1.27	4		1			1	2	0	0			
	FL1	Foltec Nitroplast-S	20	L/ha	1.25	19	1	4				1	0	0	0		
	FL1	Foltech Fortify	10	L/ha	1.30	6				6		1	1				0
	FL2	Foltech Cytozorb-S	20	L/ha	1.27	4		1			1	2	0	0			
	FL2	Foltec Nitroplast-S	20	L/ha	1.25	19	1	4				1	0	0	0		
	FL2	Foltech Fortify	10	L/ha	1.30	6				6		1	1				0
	FG1	Andersons 20-2-16	200	kg/ha	1.00	18	18	5	7			2	0	0	0		
						49	16	10	14	2	0	5	1	0	0	0	0

2.3.1.9 During the grow-in period of each new turf surface, the fertiliser requirements are likely to be higher than those used on mature turf, for example 250-300 kg/N/ha/yr for the first year compared with 160-250 kg/N/ha/yr for subsequent years. On newly established areas, it shall be a standard practice to use only controlled-release fertilisers as these products reduce leaching risk under potentially high leaching conditions by only drip feeding the young grass plants over an extended period (typically 6-8 weeks).

2.3.1.10 All fertilisers applied shall be in uniform in composition, free flowing where relevant and suitable for application with approved equipment. Fertilisers shall be delivered to the site in their original packaging with legible intact labels shoring guaranteed nutrient analysis. Only mini-prill fertilisers shall be used in order to minimise granule pickup by mowers and potential run-off.

2.3.1.11 Fertilisers shall be sourced locally where available and shall be for specific use on turf surfaces.

2.3.1.12 Application of fertilisers during or right before heavy rainfall is prohibited. The "Envirosync system", based on meteorological data from Hong Kong Observatory and/or other international weather forecasting agents, will be adopted to predict heavy rainfall events in the next couple of days. Site personnel will base on prediction of Envirosync system to determine the favourable timeframe for application of fertilisers.

2.3.1.13 The details of application of fertilisers extracted from Grass Management Plan are provided in Appendix 2.1, subject to results of turf trial. The turf trial will evaluate a range of different fertiliser types, including liquid, granular, slow release, conventional release and organic for plant response under typical fertiliser application programmes for sports turf. The outcome from the evaluation will be to fine tune and customise the fertiliser programme to suit the specific conditions of this project particularly in terms of minimising fertiliser usage and leaching potential, and maximising turf response. The trial has been designed so that drainage water from individual plot areas can be isolated and sampled in order to assess the amount of residual fertiliser that may potentially enter the drainage system under specific fertiliser application regimes. In this way, a bespoke fertiliser programme will be able to be determined once the turf farm becomes operational.

2.3.1.14 In fact, the overall objective of this turf trial is to validate the transportable natural turf lay-and-play system proposed for use at the Kai Tak Sports Park. The detailed approach of the turf trial may involve in the below steps:

(1) Completing a desktop exercise using Sports Turf Research Institute (STRI)'s knowledge and previous experience combined with local knowledge and expertise for first selecting the most appropriate carpet hybrid turf reinforcement system(s) for evaluation in the trial

(2) Completing a consultation exercise with local expertise for selecting and sourcing the most appropriate turf species and varieties for evaluation in the trial

(3) Establishing a large scale, plot-based validation trial with three rounds of turf harvest and movement testing over a period of 21 months once the trial areas are fully established.

(4) Allowing for several periods of 'trial optimisation' during the entire period of the trial so that there is sufficient flexibility to improve or change treatments as the trial progresses

(5) Allowing for all turf combinations to be properly evaluated: pure warm season turf, pure cool

(6) Allowing for a small scale parallel cultivar trial to be carried out against which other warm season turf varieties can be benchmarked against the locally adapted 'Jockey Club' bermudagrass 419

There is no large scale site formation, except for site clearance and simple structure erection in the turf trial farm. It is anticipated that the construction phase impact (including dust, noise, water and waste) can be well controlled with good site management practices. During operational phase, potential environmental impact of the Turf Trial will include the storm water discharge. The discharge of effluent will be ensured to comply with Technical Memorandum Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters under Water Pollution Control Ordinance. Otherwise, water will be recycled and re-used on site. Hence, water quality impact is not anticipated.

2.4 Control and Monitoring of Application

2.4.1.1 Soil nutrient testing to 75 mm depth shall be carried out at 6 months and 12 months following establishment at the turf farm and PSG. On each sampling occasion, one sample from each turf facility shall be taken for testing by a recognised soil testing service provider. Two samples from the PSG will be collected for the soil test in a 12-months period. The Head of Turf Operations shall modify the nutrient programme of maintenance fertilising based on the results of the soil tests and from specialist advice given by the Turf Expert and reviewed by the Turf Specialist. Results of each soil test shall be recorded and stored for future reference. The organisation chart of the personnel is shown in Appendix 2.2.

2.4.1.2 Fertiliser requirements shall be planned and agreed with a "Fertiliser Advisers Certification and Training Scheme (FACTS) qualified" adviser who has completed training on turf nutrient planning. As a guideline for interpretation of soil test results using the base cation saturation ratio method (Carrow *et al.* 2001), the following nutrient and pH levels are recommended in order to enable planning of appropriate quantities of fertiliser application (excluding nitrogen for which there is no appropriate soil test):

Table 2.1: Guideline nutrient and pH levels

Characteristic	Target level
pH	5.8-7.2
% Potassium (K) (base saturation)	3-6
% Calcium (Ca) (base saturation)	35-75
% Magnesium (Mg) (base saturation)	5-15
% Sodium (Na) (base saturation)	0-5
Phosphorus (P) (µg/ml)	20-30
Cation-exchange capacity (CEC) (meq/100 g)	≥ 4
%Mg : %K	1-3 to 1
%Ca : %Mg	3-10 to 1

Note:
[1] Other methods of soil test interpretation may be used, for example the SLAN approach (sufficiency level of available nutrients).

2.4.1.3 All fertiliser applications shall be documented to record the following:

- location of applications;
- type of fertiliser applied;
- amount applied in kg per hectare;
- date of applications; and
- product applied.

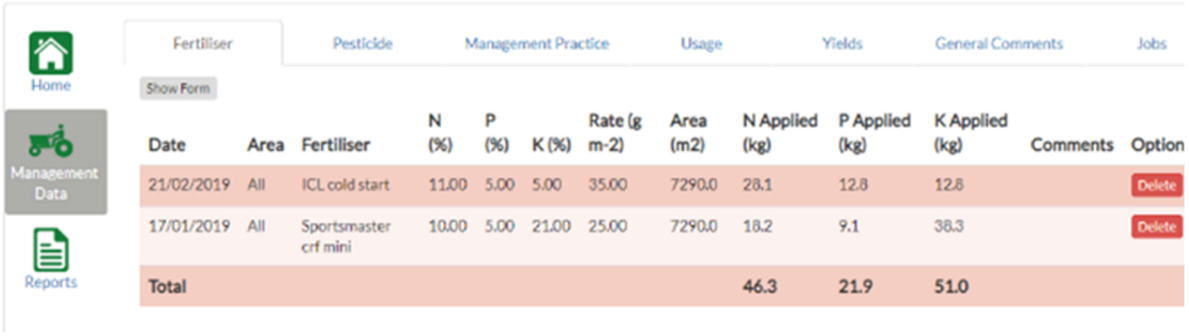
2.4.1.4 All fertiliser applications made will be recorded using STRI's bespoke TurfSync™ system. This system collates pitch management data (see

Figure 2.2). The TurfSync™ portal allows users to access historic and real-time pitch management information from any device anywhere in the world. The software allows users to monitor multiple pitches simultaneously to view agronomic trends, identify risks and solve problems before they arise. In addition, data can be inputted from multiple different sources.

2.4.1.5

The TurfSync™ portals design is functional and easy to navigate, allowing for easy data entry and view. As the site is completely mobile friendly users can log in and input data directly from their mobile device. The portal will be customised to suit the requirements of the KTSP site.

Figure 2.2: TurfSync showing fertiliser applications history



Date	Area	Fertiliser	N (%)	P (%)	K (%)	Rate (g m-2)	Area (m2)	N Applied (kg)	P Applied (kg)	K Applied (kg)	Comments	Option
21/02/2019	All	ICL cold start	11.00	5.00	5.00	35.00	7290.0	28.1	12.8	12.8		Delete
17/01/2019	All	Sportsmaster crf mini	10.00	5.00	21.00	25.00	7290.0	18.2	9.1	38.3		Delete
Total								**46.3**	**21.9**	**51.0**		

3 Application of Pesticides

3.1 Overview

3.1.1.1 Application of pesticides shall be undertaken strictly in accordance with manufacturer's recommendations and all health and safety requirements stipulated in the relevant legislation, standards and guidelines as follows:

- Pesticides Ordinance (Cap. 133);
- Registered pesticides list Part II, Pesticides Ordinance (Cap. 133);
- Code of Practice for the safe and efficient use of pesticides on sports turf (South China Turf Managers Association, May 2011);
- Code of Practice for the safe and proper use of pesticides in public areas (compiled by the Agriculture, Fisheries & Conservation Department, the Food and Environmental Hygiene Department, and the Leisure and Cultural Services Department, Sep 2014);
- A guide to labelling of pesticides (Agriculture, Fisheries & Conservation Department, Aug 2017);
- Safety guidelines for storage of pesticides (Agriculture, Fisheries & Conservation Department, March 2000); and

3.2 Selection of Pesticides

3.2.1.1 A full Integrated Pest Management (IPM) programme shall be implemented to limit the quantities of pesticides used in the management of the turf surfaces. IPM encourages the use of all available prevention and control methods to keep weeds, pests and diseases from reaching damaging levels. The goal is to produce a good turf and minimise the influence of pesticides on humans, the environment and the turf. IPM methods include:

- use of well adapted grasses;
- proper use of cultural practices such as watering, mowing, and fertilisation; and
- proper selection and use of pesticides when necessary.

3.2.1.2 Where possible, cultural controls and good turf husbandry shall be used to minimise pesticide use. Note that IPM is a systems approach that should form the foundation of any type of sound turf management plan. This holds true whether the materials being used are organic or not.

3.2.1.3 When any turfgrass problem occurs, the cause must first be correctly identified. If the cause is found to be a weed, disease or pest, non-chemical control methods should initially be considered (e.g. hand weeding). If these are not applicable, use of more specific, systemic and biodegradable pesticide in low dosage is more preferred. The safest (in terms of human exposure and

effects on the environment) effective chemicals should be considered. When making such decisions, it is recognised that not all chemicals registered in Hong Kong are necessarily recommended for use in turfgrass management. At all times, long term effects, as well as short term controls, shall be considered when selecting pesticides and chemicals which best fit into an IPM programme.

3.2.1.4 Once a chemical has been identified, formulation and concentration shall be selected to maximise effect against the target while minimising risk of affecting non-target organisms and the environment.

3.2.1.5 Early detection and prevention, or both, will minimise pest damage and disease incidence, saving time, effort and money. When chemical control is necessary, the proper pesticide shall be selected and applied when the disease or pest is most susceptible. Only pesticides registered in Hong Kong shall be used. The Director of Agriculture, Fisheries and Conservation (DAFC) maintains a register of pesticides which includes a list of the active ingredient(s), maximum concentration limit and permitted formulations of all registered pesticides.

3.2.1.6 For the plant growth regulators, the Head of Turf Operations shall manipulate the growth rate of the turf surfaces using growth regulators from the supplied list of products selected by the Turf Expert and approved by the Turf Specialist in the Pitch Management Manual in order to maximise the plant's photosynthetic capability and increase root growth. Growth regulation shall be carried out using plant growth regulators as registered by the Pesticides Ordinance (Cap. 133).

3.2.1.7 A list of potentially used pesticides, including fungicides, insecticides, herbicides, plant growth regulators, and their application details extracted from Grass Management Plan, are provided in **Appendix 3.1**.

3.3 Storage and Control

3.3.1.1 Pesticides shall be stored in compliance with relevant ordinances and regulations. In particular, requirements under the Pesticides Ordinance (Cap. 133) must be met. Chemicals should be kept in secure, well ventilated storage areas with adequate fire control and spillage containment facilities. Minimum requirements for the labelling and bottling of pesticides are stipulated in the Pesticides Regulations (Cap. 133A). These requirements are set out to safeguard the pesticide users, the general public and the environment. Warning statement "Store under lock and key" or equivalent must be on the label for all Part II pesticides. The storage of waste contaminated with pesticides should be controlled under the Waste Disposal (Chemical Waste) (General) Regulation (Cap 354C).

3.3.1.2 Following precautionary measures should be adopted when storing pesticides:

- Store away from food, drinks and feedstuffs, under lock and key;
- Always keep the pesticide in the tightly closed, original labelled container;

- Store in a cool, dry, well-ventilated place inaccessible to children and pets, under lock and key;
- Store away from direct sunlight or heat;
- Store away from other farm chemicals;
- Herbicides should be stored separately from other insecticides/fungicides;
- Do not reuse or refill the container for any other purpose;
- Relevant Material Safety Data Sheet (MSDS) of pesticides should be available for reference in case of emergency;
- Keep a record of all pesticide movements, an up-to-date inventory and a detailed job application record sheet;
- Do not store diluted pesticides; and
- Cloth, sand, empty containers and cleaning materials should be readily available for handling immediate spillage or leakage.

3.3.1.3 The Head of Turf Operations shall provide staff with adequate training, through either on-the-job training or safety training courses organised by appropriate educational institutes, to ensure that all pesticide users are equipped with relevant technical knowledge of pesticide application with a view to maintaining a quality standard of service. The training standard should meet the need of different job nature, so that pesticide users can understand the information and instructions and acquire sufficient technical knowledge to discharge their duties in a safe and proper manner. The training of pesticide users should focus on the properties of pesticides in their routine use and the potential hazards that the pesticides may pose.

3.3.1.4 The Head of Turf Operations shall develop emergency procedures (e.g. action plans) for dealing with pesticide personal contamination, spillage, poisoning and fire.

3.3.1.5 A responsible person at the appropriate level shall be appointed to receive pesticide deliveries and to ensure prompt transport to the established storage facility. The following precautionary measures should be implemented during transportation:

- Load and unload pesticides with care;
- Always keep pesticide apparatuses and containers in a stable position during transportation; and
- Avoid spilling and leaking of pesticides from containers or sprayers during transportation.

3.4 Application, including dosages, frequency, residual quantities

3.4.1.1 The Head of Turf Operations shall control disease, weed and pest attacks on the turf surfaces using pesticides from the supplied list of products selected by the Turf Expert and approved by the Turf Specialist in the Pitch Management Manual.

3.4.1.2 All chemical treatments to control diseases, weeds and pests shall be applied using products that are suitable for use on bermudagrass and perennial ryegrass or any such grass type that is selected by the Turf Expert as appropriate. Where possible, pest control will only be carried out on the PSG pitch and the turf bank. This is because the turf will only be located in the MS for relatively short period of time and often with the roof closed, thus reducing the likelihood of pest infection. Disease control may be carried out on the MS and PSG pitches as well as the turf bank turf.

3.4.1.3 The Head of Turf Operations shall undertake the necessary number of applications of any approved fungicide, herbicide or insecticide as is necessary to maintain the quality and health of the turf ensuring not to exceed product recommended dosage. However, all pesticides used must be registered under the Pesticides Ordinance (Cap.133). They should only be applied by trained persons in accordance with the label instructions.

3.4.1.4 Spraying pesticides should be suspended under the following circumstances:

- when treatment areas are wet from rain or dew;
- in a strong wind;
- if it is expected to rain in the next few hours; or
- under strong sunlight.

3.4.1.5 Prior to application, the Head of Turf Operations shall check the application area and its periphery to assess the potential hazards, which may affect humans and the environment, in particular adjacent leisure facilities.

3.4.1.6 Chinese-English bilingual warning notices (e.g. poison, no-entry, the name of active ingredients of the pesticide, pesticide registration number, date and time of application etc.) should be posted at conspicuous places before and after spraying.

3.4.1.7 When spraying, the pesticide applicators should not smoke, eat or drink. They should pay attention to the wind direction and do not face the wind when spraying. They should beware of spray drift and dust and do not inhale the mist. They should keep a bucket of water and soap handy when spraying. In case they get themselves sprayed, affected parts could be rinsed immediately.

3.4.1.8 The Head of Turf Operations shall ensure that the application operations are well-planned and arranged at times of low pedestrian flow, or if necessary, the application area may be temporarily closed for treatment purpose. If it is necessary to carry out treatments when the application area is with a high pedestrian flow (e.g. during weekends or public holidays), the affected parties

or on-site working staff should be informed in advance and provided with details of the operations for arrangement of appropriate precautionary measures. The application area shall also be clearly defined and isolated prior to operations to prevent public access.

3.4.1.9 The Head of Turf Operations shall provide appropriate protective clothing for pesticide applicators and ensure that it is worn when chemicals are being handled as recommended on the specific product label or Material Safety Data Sheet (MSDS). The Head of Turf Operations shall monitor the health of pesticide applicators and arrange proper care for them as and when necessary.

3.4.1.10 After handling or applying pesticides, the applicator/handler should wash themselves thoroughly with soap and water. Clothing after each pesticide application should be washed separately from other laundry.

3.4.1.11 The details of application of potentially used pesticides are provided in **Appendix 3.1**.

3.5 Control and Monitoring of Application

3.5.1.1 Records shall be kept on pesticide stocks, analytical data and pesticide use. The Head of Turf Operations shall also keep reference material such as copies of relevant ordinances, Material Safety Data Sheets and label information. The TurfSync™ system shall be used to log all relevant procurement information, including, but not necessarily limited to:

- type of pesticide;
- amount purchased;
- date purchased;
- name of supplier;
- date of arrival; and
- received by.

3.5.1.2 The TurfSync™ system shall be used to log all relevant application information, including, but not necessarily limited to:

- suitability and nature of product;
- method of application;
- timing of application;
- application rate;
- soil/climatic conditions before application;
- weather conditions following application;
- management prior to application; and

- management following application.

3.5.1.3 Spray equipment shall be fitted with shrouds to prevent drift beyond the pitch or turf areas (for example, into the stadium bowl).

3.5.1.4 In addition, the Head of Turf Operations shall monitor and assess for the likelihood of pest outbreaks on the turf surfaces by using insect traps and carrying out regular inspection of the profiles at the turf bank and PSG pitch and looking for signs of surface disturbance. This could potential reduce the amount of pesticides applied by control the pest outbreak at earlier stages. The Head of Turf Operations shall be capable of readily identifying the principal turfgrass pests and the stage(s) in their cycle when the pest is likely to affect the turf surfaces, including, but no necessarily limited to: mole crickets, armyworms, white grubs, greasy cutworms and sod webworms. The details of pest monitoring are discussed in Section 3.9.2 of the Grass Management Plan.

3.5.1.5 The Head of Turf Operations shall develop a programme of periodic sampling of stormwater to check for pesticide and nutrient residues. To this end, the "EnviroSync" system currently being developed by STRI, EPG Companies Inc. (EPG) and Kisters AG (Kisters) is expected to be available for this Project. This system is an intelligent sustainable water management system that provides reliable meteorological data and predictive weather data processing to help manage the use and release of stormwater. The EnvrioSync system measures and monitors various parameters including but not necessarily limited to:

- water level;
- rainfall actual and predicted;
- water outflow rate;
- water chemistry (e.g. electrical conductivity, pH and biological oxygen demand etc.); and
- soil electrical conductivity.

3.5.1.6 By using the EnviroSync system in conjunction with regular (eg. at least monthly) sampling and analysis of drainage water for fertiliser and pesticide residues, it is possible to confirm compliance with the requirement for "dosage of pesticides and fertilisers to be controlled to limit any residual dosage to less than 10%". Sampling and analysis details are summarised in Section 6.2.

3.6 Disposal Arrangement

3.6.1.1 Excessive storage of chemicals/pesticides are prohibited by wise purchase and careful planning when application of chemical for pest control is necessary. Only the amount of pesticides required for operational needs should be purchased. Stock inspection should be undertaken regularly to arrange the pesticide with the container opened or soon to be expired to be used first.

3.6.1.2 Should there be any expired or unwanted chemical/pesticide required disposal, the chemical/pesticide and/or its container shall be disposed of through a licensed waste collector in accordance with the Waste Disposal (Chemical Waste) (General) Regulations and the LCSD horticultural guidelines on use of turf management.

3.6.1.3 In addition, the following measures will be adopted for disposal of empty pesticides containers:

- Pesticide containers will be rinsed with water at least three times to remove all residues of pesticides, and then punctured or crushed (so that they cannot be reused) before being disposed of as standard municipal waste;
- Rinse water from cleaning pesticide containers shall be reused for pesticide applications (i.e. diluting pesticides) and shall not be discharged to storm or foul drains;
- Do not use any paper from empty containers for manufacturing recycled paper;
- Do not reuse empty containers for other purposes;
- Do not store any empty container that has not been cleaned for more than 90 days;
- Store pesticides that are no longer needed in their original containers pending disposal, and deal with such pesticides in accordance with the instructions set out on the label; and
- The Head of Turf Operations should be responsible for disposing of or dealing with empty containers or pesticides that are no longer needed.

4 The Stormwater Re-use System

4.1 Overview

4.1.1.1 As discussed in Section 3.3.2 and Section 3.8.2 of the Grass Management Plan, both fertilisers and pesticides will be applied to the natural turf at PSG, whilst only fertilisers will be applied to the natural turf at MS. Notwithstanding that both fertilisers and pesticides will be applied on a judicious basis and excessive application will be avoided, residual fertilisers and pesticides could still be carried away by the stormwater runoff discharged to adjacent water bodies, causing adverse water quality impact if the discharge is not properly intercepted.

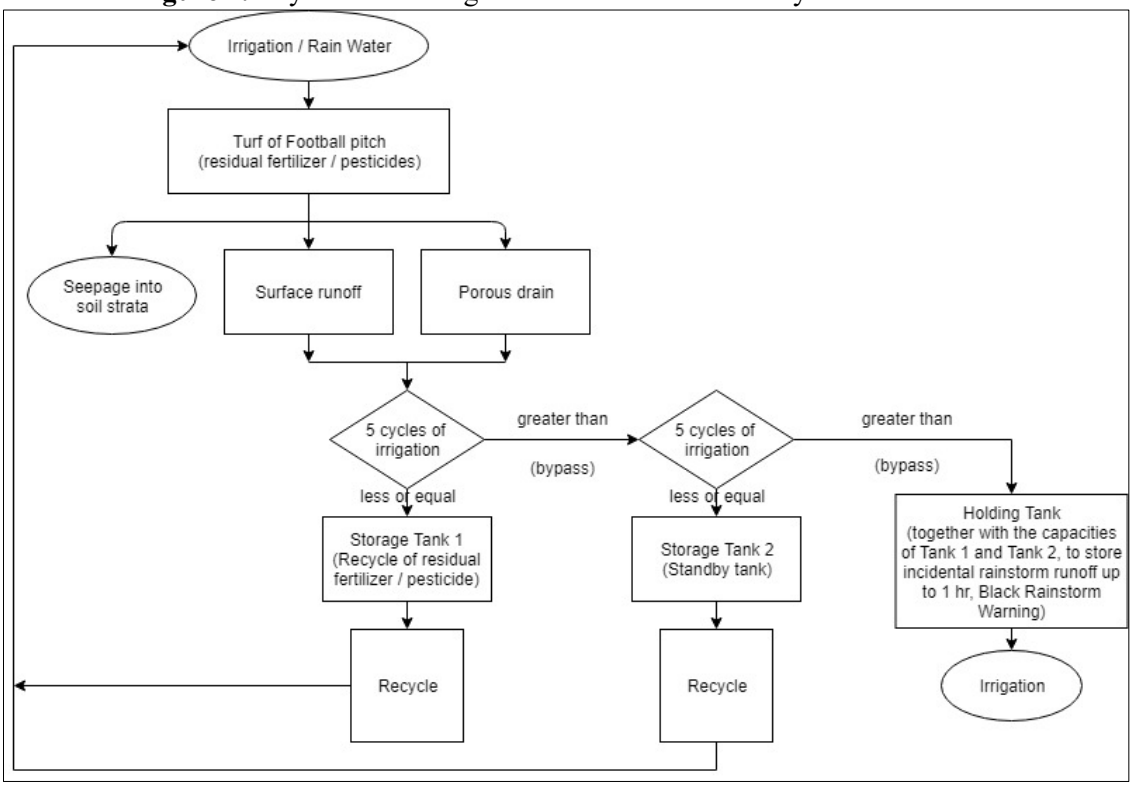
4.1.1.2 To minimise the potential water quality impact due to excessive use of pesticides and fertilisers on the turfs, the dosage of pesticides and fertilisers shall be controlled to limit any residual dosage to less than 10% of the total application.

4.1.1.3 In addition, to further contain the residual fertilisers and washable deposited pesticides, two sets of stormwater re-use systems are designed respectively for MS and PSG to intercept, convey, store and re-use stormwater to minimise the discharge of surface runoff with residual fertilisers and washable deposited pesticides. Due to the MS and PSG is geographical located apart and separated by Shing Kai Road, the tanks cannot be interconnected.

4.2 System Flow Diagram including Points of Control

4.2.1.1 The stormwater re-use system comprises three major components, namely: stormwater collection and conveyance; stormwater storage; and stormwater re-use. A system flow diagram of the proposed stormwater re-use system extracted from the approved EIA report is illustrated in **Figure 4.1**. Description of three major system components are provided in the following sections.

Figure 4.1:System flow diagram of stormwater re-use system



4.2.2 Stormwater Collection and Conveyance

4.2.2.1 Stormwater runoff containing washable deposited pesticides and residual fertilisers from the MS and PSG turf surfaces will be diverted to storage water tanks for irrigation. There will be two routes for runoff collection:

(i) Surface runoff collected by perimeter surface channels; and

(ii) Sub-surface runoff intercepted and collected by perforated sub-soil drainage systems (for PSG only).

When the turf is in position in the MS, there will be no perforated sub-soil drainage system in place because the pitch will only be temporary and there will only be perimeter channel drains in the concrete floor to collect any residual drainage water. In any case, it is highly unlikely that any significant drainage water will be collected off the MS pitch because the intention will be to keep the roof closed and avoid any rainfall falling on the pitch. Irrigation will also be kept to a minimum.

4.2.2.2 According to Drainage Services Department (DSD)'s Stormwater Drainage Manual, "flat" grassland on sandy soil has a typical runoff coefficient of 0.05 to 0.15. This means some 10% of precipitation, containing pesticides and fertilisers, will run off and be collected by the perimeter surface channels into the drainage system. The remaining 90% of water will infiltrate into the turf soil. The sub-surface runoff will be intercepted by impervious geotextile underneath the turf strata, and run into the sub-surface porous drains with a negligible portion infiltrating into the underneath soil strata.

4.2.3 Stormwater Storage

4.2.3.1 Both PSG and MS will be fabricated with three stormwater tanks on each side for water harvesting. The proposed drainage system will collect and convey the runoff into the stormwater tanks. The quantities of residual fertilisers and washable deposited pesticides are expected to be reduced following each cycle of irrigation or rainfall event. It is conservatively assumed that all residual fertilisers and pesticides will be rinsed away after 5 cycles of irrigation water, or equivalent rainwater. On this basis, stormwater tanks with sufficient storage capacity will be provided in both MS and PSG to fully contain stormwater with residual fertilisers and washable deposited pesticides.

4.2.3.2 Each set of stormwater re-use system comprise three stormwater tanks for storage:

(i) Tank 1 – Duty Tank;

It will be designed to provide storage volume sufficient to fully contain five cycles of irrigation water, or equivalent rainwater from the turf.

(ii) Tank 2 – Standby Tank; and

It is a "fail-safe" provision and will be sized to provide the same storage volume as Tank 1. It will be used when the volume of stormwater is in excessive of five irrigation cycles, e.g. during rainfall events, or when Tank 1 is out of operation for maintenance or repairing works. It will store any traces residual fertilisers and washable deposited pesticides that are not captured in Tank 1 as a fail-safe system.

(iii) Tank 3 – Emergency Tank.

It is to cater for incidental heavy rainstorm. The total storage volume in all three tanks will be sufficient to hold stormwater runoff from a Black Rainstorm Warning rainstorm event (i.e. 70 mm/hour) for 1 hour. There is no discharge to the public storm drain system from all the stormwater tanks under normal operation situation. Emergency discharge is possible only if when all the three tanks are full.

4.2.3.3 Prior to the application of fertilisers/pesticides, the stormwater tanks need to be emptied by irrigation so that they will have adequate capacities to hold the residual fertilisers and washable deposited pesticides.

4.2.4 Stormwater Re-use

4.2.4.1 Stormwater stored and harvested in the three stormwater tanks will be re-used locally for irrigation of mainly the pitches and the water in the Tank 3 also for irrigation of the nearby landscape areas if in excessive. Pump sets will be installed in the stormwater tanks for emptying the tanks and distributing harvesting water for irrigation of turfs and landscaping areas. The use of harvested stormwater will take precedent to fresh water for irrigation. The water stored in Tank 1 and Tank 2 will be reused in the MS and PSG. As the run-off from the MS and PSG will be recollected and contained into the stormwater tank again. It will not have impact to the nearby sensitive receivers. The water in Tank 3 in which no significant residual pesticide and

fertiliser is expected, will be used for irrigation of turf at MS and PSG, and any excessive water could be considered for irrigation in the landscape area. Hence, adverse water quality impact on nearby water sensitive receivers is not anticipated.

4.3 Physical System, including Storage Tanks, Intercepting Facilities, etc

4.3.1 Stormwater Collection and Conveyance

4.3.1.1 Surface and sub-surface runoff from the turf surfaces in MS and PSG will be collected by the following drainage systems:

- Perimeter surface channels – around turf pitches of MS and PSG to collect surface runoff not infiltrated into the ground; and
- Perforated sub-soil drainage systems (for PSG only) – perforated lateral sub-soil drains at regular intervals underneath the turf surfaces.

4.3.1.2 The system comprises a layer of granular materials (drainage layer). Perforated lateral sub-surface drains for PSG are installed at regular interval beneath the drainage layer. They discharge to the solid collector drains into the drainage system.

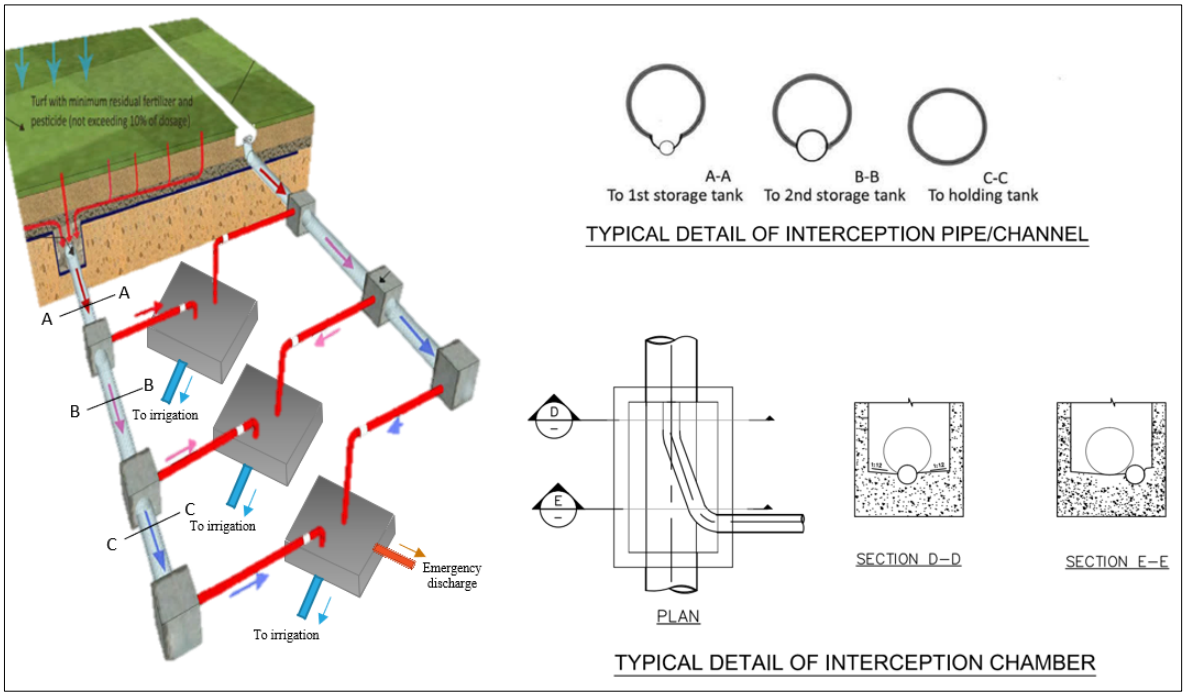
4.3.2 Stormwater Storage

4.3.2.1 The stormwater tanks will be located at strategic locations at MS and PSG based on the proposed drainage system design as shown in **Appendix 4.1**. These will be of reinforced concrete construction. Each tank will be designed to provide the minimum required storage volume as presented in **Appendix 4.2**.

4.3.2.2 It should be noted that the irrigation of the natural turf in the Main Stadium will never be in an extent that it drains water out of the base. Rainfall will not be allowed to fall on the pitch. The MS pitch will be a temporary pitch and the majority of its pesticide and nutrient management will be carried out at the turf farm and not when the turf is in situ in the Main Stadium. The possibility of the MS turf pitch filling the stormwater tanks with drainage or irrigation water is nearly zero.

4.3.2.3 The sequential flow of stormwater is under the control of gravity in the interception chambers. When the water level of the front tank reaches to a limited level, the stormwater will start flowing to the next tank. Schematic diagram of the stormwater re-use management system with interception chambers (extracted from the approved EIA report) is illustrated in **Figure 4.2**.

Figure 4.2: Schematic diagram of stormwater re-use system



4.3.2.4 Duty and standby submersible pumps will be installed in the stormwater tanks to extract water for irrigation. The submersible pumps will be designed to meet the irrigation water supply in terms of flows and pressure.

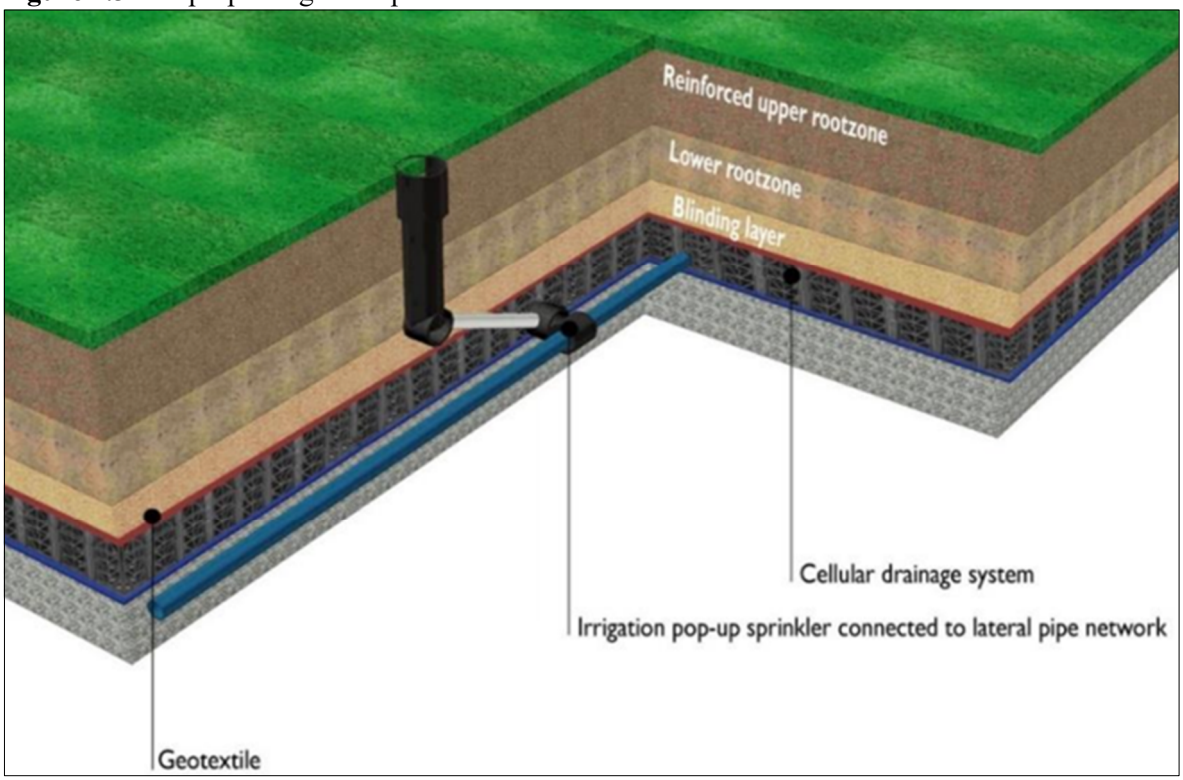
4.3.2.5 The stormwater tanks will be designed with necessary safety and maintenance provision to facilitate regular operation and maintenance activities, e.g. desilting.

4.3.3 Stormwater Re-use

4.3.3.1 The irrigation system fed by the submersible pumps in the stormwater tanks will be installed in the stormwater tanks for water extraction. The irrigation system will comprise pipelines, valves and fittings for either automatic or manual irrigation.

4.3.3.2 Typical details of "pop-up" irrigation sprinklers for turf surface are shown in in **Figure 4.3**. The re-use of harvested water is limited to the irrigation to the turf and landscape areas of the MS and PSG.

Figure 4.3: "Pop-up" irrigation sprinkler heads for turf surfaces



5 Operation and Maintenance

5.1 Turf Operation and Maintenance

5.1.1.1 The fertiliser and pesticide must be properly stored, handled, applied and disposed of as discussed in **Section 2**, **Section 3** and **Section 7**. In case of spillage, the emergency actions stated in **Section 7.2.1** should be followed.

5.1.1.2 The stormwater tanks should be emptied by irrigating to the turfs (or the nearby landscape areas if in excessive) before the application of fertiliser/pesticide.

5.1.1.3 The operation and maintenance details of turfs have been delineated in the Grass Management Plan.

5.2 Drainage Maintenance

5.2.1.1 Drainage system requires periodic maintenance such as desilting, rubbish removal and grass cutting to preserve their levels of performance.

5.2.1.2 If necessary, closed circuit television (CCTV) inspection can be used to assess both the internal services and structural conditions of perimeter drains, pipes, culverts and chambers.

5.2.1.3 In case of any drainage blockage, the operator should clear the drainage inside by using the high-pressure water pump.

5.3 Stormwater Tanks Maintenance

5.3.1.1 Desilting is required for the stormwater tanks to avoid accumulation of silts at their bottoms. It will be carried out to ensure the tanks can provide the required capacities. The desilting works will be typically conducted annually before the onset of wet seasons with the tank emptied and the period of no watering.

5.3.1.2 Mechanical ventilation will be provided to force ventilation of fresh air to the stormwater tank to ensure safe environment during the works. This can be provided by portable ventilation fans or equivalent during the desilting works. Confined space entry procedures are also required as discussed in **Section 7.2.6**.

5.3.1.3 If any activates anticipated to cause inflow to the stormwater tanks or adverse weather is anticipated, the desilting works will be called off and all equipment removed off-site.

5.3.1.4 Man-entry through access openings will be provided with access ladder(s). Temporary lighting system will be provided during the works.

5.3.1.5 Inspections should be undertaken regularly to ensure its structural integrity.

6 Monitoring and Control

6.1 Criteria of Monitoring and Control, including Parameters, Sampling and Testing

According to the "Technical Specifications on Grey Water Reuse and Rainwater Harvesting" (hereafter referred to as the Technical Specifications) issued by the Water Supplies Department, rainwater harvesting systems shall be operated in a way that ensures the treated effluent is fit for the purpose and presents no undue risk to health, and hence the water quality of the treated effluent shall meet the standards stipulated in Table 1-1 of the Technical Specifications.

The water taken from the stormwater tanks will be provided with water treatment system being designed in accordance with the Technical Specifications. The water from the stormwater tanks will be treated to meet the standards as stipulated in Table 1-1 of the Technical Specifications before being reused for irrigation. The water sampling and testing plan for the treated effluent will follow the guidelines provided in Section 7 and Table 7-1 of the Technical Specifications.

6.1.1.1 The main components of fertilizer are nitrogen and phosphorus. The monitoring will be established by measuring the suspended solids (SS), total inorganic nitrogen (TIN), total phosphorus (TP) and specified pesticides at designated monitoring locations in water bodies and stormwater tanks as specified in **Section 6.2.1**.

6.1.1.2 The water quality at water bodies will be monitored to ensure the compliance of relevant Water Quality Objectives (WQOs) in Victoria Harbour Water Control Zone (WCZ) under Water Pollution Control Ordinance (WPCO), whilst the monitoring at stormwater tanks serve as reference. In case that there is exceedance occurred in Victoria Harbour, it may be due to the following reasons: (1) Emergency discharge from the storage tank; (2) Discharge from the storm drains in the vicinity. The measurement at the stormwater tank 3 will provide an indication whether the exceedance occurred in Victoria Harbour is caused by the emergency discharge from the storage tank. In addition, it also provides indication on any fault on the stormwater re-use system or in the dosage of fertilizer or pesticide, which require further investigation. The monitoring programme will be implemented by the Contracted Party for at least one year after turf laying, and a review will be carried out before the end of the one-year for determining whether the monitoring programme be continued or revised. The measurements shall be taken at all designated monitoring stations on a monthly basis during the first one-year monitoring period. The water monitoring will cater for the tidal effects. At least one sampling at mid-flood tides and one sampling at mid-ebb tides will be conducted for monitoring locations in Victoria Harbour WCZ. The need to continue/enhance the monitoring programme will be reviewed by the Contracted Party at the end of the first one-year monitoring period.

6.1.1.3 The routine operation phase monitoring shall be temporarily suspending in the events of any emergency discharges. Marine water quality monitoring for Pesticides, SS, TIN and TP are recommended during and after the emergency discharge during the operational phase. In the event of emergency discharge, at least 5 continuous days of daily water monitoring shall be conducted at all designated monitoring stations as shown in **Table 6.2** after emergency discharge until the baseline water quality resumes and the normal operation is restored. The exact duration for daily monitoring shall depend on the turnaround time required by the laboratory. During each monitoring event, water samples shall be collected at both mid-flood tide and mid-ebb tide (i.e. twice a day). The monitoring programme for operational phase monitoring shall be conducted in the first year after the completion of the baseline monitoring. After the 1-year monitoring period, a review shall be conducted to determine whether such monitoring shall be continued.

6.1.1.4 The Contracted Party will review whether the monitoring programme need to be continued at the end of the first one-year monitoring period, subject to agreement with EPD. The frequency will be reviewed for subsequent monitoring, if any, subject to EPD's approval.

6.1.1.5 In case the Contracted Party wishes to change pesticides to be applied at the MS and PSG during the monitoring period, the Contracted Party will update the monitoring parameters, detection limits and analytical methods accordingly and also develop the new baseline data as necessary. The Contracted Party will seek approval from EPD before changing the monitoring parameters.

6.1.1.6 Replicate samples collected from each independent sampling event will be collected to ensure a robust statistically interpretable database. Analysis will be conducted by an accredited laboratory.

6.1.1.7 Other relevant data will be recorded, including monitoring locations / positions, time, water depths, tidal stages, weather conditions and any special phenomena.

6.1.2 Monitoring Equipment

Positioning Equipment

6.1.2.1 A hand-held or boat-fixed type digital Differential Global Positioning System (DGPS) with way point bearing indication and Radio Technical Commission for Maritime (RTCM) Type 16 error message "screen pop-up" facilities (for real-time auto-display of error messages and DGPS corrections from the Hong Kong Hydrographic Office), or other equipment instrument of similar accuracy, should be provided and used during marine water monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

Water Depth Detector

6.1.2.2 A portable, battery-operated echo sounder should be used for water depths determination at each designated monitoring station. The detector can either be hand-held or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

Water Sampling Equipment

6.1.2.3 Proper water samplers are required for monitoring. It should comprise a transparent PVC cylinder, with a capacity of not less than 2 litres, which can be effectively sealed with latex cups at both ends. The sampler should have a positive latching system to keep it open to prevent premature closure until released by a messenger when the sampler is at the selected water depth (for example, Kahlsico Water Sampler or an approved similar instrument).

Sample Containers and Storage

6.1.2.4 Water samples for SS, TIN and TP should be stored in high density polythene bottles with no preservative added, while those for herbicides, fungicides and insecticides should be stored in amber glass bottles with no preservative added, packed in ice (cooled to 4°C without being frozen) and shipment to the testing laboratory. The samples shall be delivered to the laboratory of collection and be analysed as soon as possible after collection.

6.1.3 Water Sampling

6.1.3.1 For marine water monitoring, where water depth is allowed, sampling should be conducted at three water depths which are 1m below water surface, mid-depth, and 1m above the sea bed. If the sampling water depth is less than 6m, the mid-depth may be omitted. If the water depth is less than 3m, only the mid-depth may be monitored. For water monitoring inside tank, sample shall be taken in the mid-depth.

6.1.4 Laboratory Measurement / Analysis

6.1.4.1 Sufficient water samples shall be collected at the monitoring stations for carrying out the laboratory measurement and analysis. The analytical method and reporting limit are presented in **Table 6.1**.

Table 6.1: Laboratory analysis for water quality monitoring

Parameters	Analytical Method	Reporting Limit
Suspended Solid (SS)	APHA 2540-D	0.5 mg/L
Total Inorganic Nitrogen (TIN)	APHA 4500-NH_3:G APHA 4500-NO_3^-:I	0.02 mg/L
Total Phosphorus (TP)	APHA 4500-P:J	0.01 mg/L
Specified Pesticides [1]	Varies	Varies

Note:

[1] Analytical methods and reporting limits of pesticides (including fungicides, insecticides and herbicides) depend on the products to be used for the turf. Potential pesticides to be used are listed in Appendix 3.1. The analytical methods and reporting limits for each pesticide will be provided when such information is confirmed. LCMS Standard Methods or USEPA Methods will be referenced when considering the analytical methods for laboratory analysis.

6.1.5 Quality Control and Quality Assurance

6.1.5.1 At least 3 replicate samples from each independent sampling event are required for SS, TIN, TP, specified pesticides measurement which shall be carried out in a HOKLAS or an international accredited laboratory.

6.1.5.2 The laboratory determination work, including specific pesticides shall start within 24 hours after the collection of water samples. Remaining samples after analysis shall be kept by the laboratory for 3 months if any repeat analysis is required.

6.2 Locations and Frequency of Sampling and Testing

6.2.1 Monitoring Locations

6.2.1.1 Water quality will be carried out at selected locations in Victoria Harbour WCZ and the stormwater tanks. WM1 and WM2 in Victoria Harbour WCZ serve for compliance checking whilst WM3 and WM4 at the stormwater tanks serve as controls. The proposed water quality monitoring locations are shown in **Figure 6.1** and listed in **Table 6.2**. For any change of the proposed monitoring locations, the Contracted Party shall seek EPD's approval.

Figure 6.1: Water quality monitoring locations

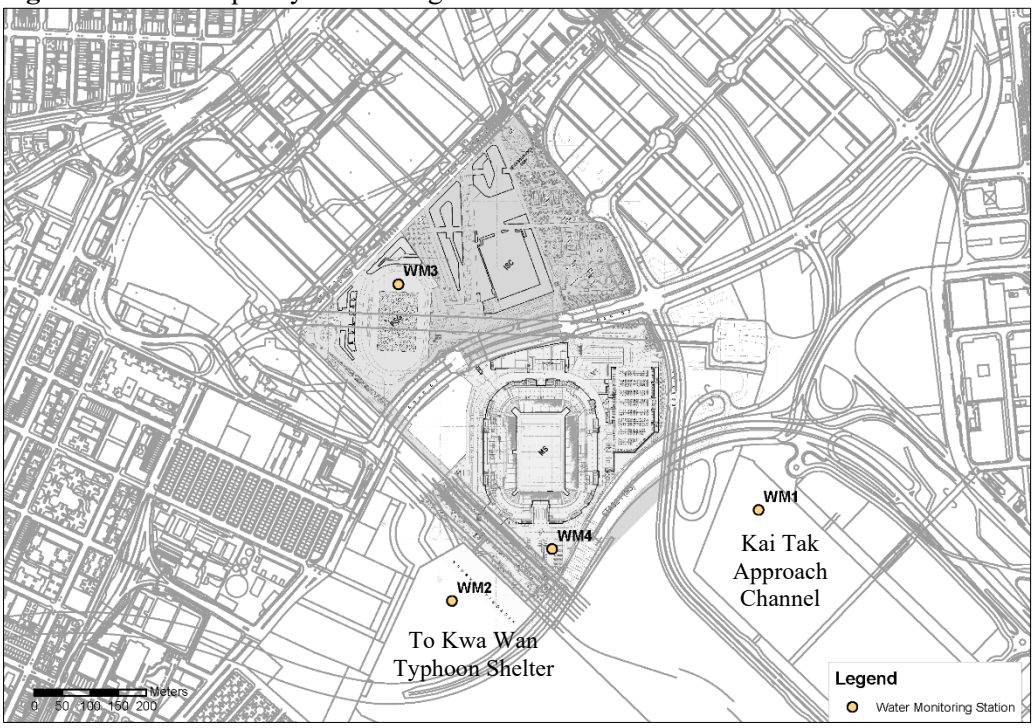


Table 6.2: Proposed water quality monitoring locations

Monitoring Station ID	Description	Easting	Northing
WM1	Kai Tak Approach Channel	838766	820251
WM2	To Kwa Wan Typhoon Shelter	838223	820089
WM3[1]	Tank 3 of stormwater tank (PSG)	-	-
WM4[1]	Tank 3 of stormwater tank (MS)	-	-

Note [1] : Tank 3 is to cater for the incidental heavy rain. There will not be sufficient volume of water to be collected for laboratory testing during normal case. In case collected water is not sufficient, no laboratory test will be done in Tank 3. A remark will be included to indicate this situation.

6.2.2 Baseline Monitoring Details

6.2.2.1 Baseline conditions for water quality monitoring stations WM1 and WM2 shall be established and agreed with EPD prior the monitoring work. The baseline conditions shall include the water quality monitoring parameters specified in **Section 6.1**. The proposed water quality monitoring schedule will be submitted to EPD by the Contracted Party at least 2 weeks before the first day of the monitoring month. The baseline monitoring shall be conducted for at least 4 weeks prior to the turf laying works with a frequency of 3 days in a week, at mid-flood and mid-ebb tides. The interval between two sets of monitoring shall not be less than 36 hours. EPD will be notified immediately for any changes in schedule. Given the tight of programme, annual monitoring may not be feasible. In order to cater for the seasonal variation, EPD's long term marine water quality monitoring data at VT11 and VT4 can be referred to supplement the baseline dataset where appropriate. The seasonal pattern of HK Water can be divided into dry season (Oct to Mar) and wet season (Apr to Sept). In order to have better long term seasonal trend for the determination of the action and limit level, the previous 3 - 5 years of EPD marine water quality monitoring data (subject to the agreement with EPD) at VT11 and VT4, together with the measured baseline data, before the turf laying works shall be collected and divided into dry season (Oct to Mar) and wet season (Apr to Sept). Based on the divided data series in dry and wet seasons, the 95^{th} / 99^{th} percentile levels at the dry and wet seasons can be determined.

6.2.2.2 There should be neither construction work nor fertilisers/pesticides application in the vicinity of the monitoring stations during the baseline monitoring. The baseline data will be used to establish the Action and Limit levels, which will be discussed in **Section 6.3**.

6.2.2.3 **Table 6.3** summarises the baseline water quality monitoring programme.

Table 6.3: Proposed baseline water quality monitoring programme

Item	Baseline Monitoring
Monitoring Period	At least 4 weeks prior to the turf laying works
Monitoring Frequency	3 days in a week (each monitoring consists of samplings at mid-flood tide and samplings in mid-ebb tides, and at 3 water depths if situation allowed)
Monitoring Locations	WM1 and WM2 in **Table 6.2**
Monitoring Parameters[1]	Suspended solids (SS), total inorganic nitrogen (TIN), total phosphorus (TP), specified pesticides
Intervals between 2 Sets of Monitoring	Not less than 36 hours

Notes:
[1] Any change in monitoring parameters to be agreed with EPD, based on the Grass Management Plan to be approved by EPD (Refer to Clauses 2.13 to 2.15 of EP-544/2017

6.2.3 Impact Monitoring Details

6.2.3.1 The impact monitoring shall be conducted for at least one year. The Contracted Party will review if the monitoring programme would need to be continued or revised before the end of the 1-year monitoring period, subject to agreement with EPD. The purpose of impact monitoring is to ensure the implementation of the recommended mitigation measures, provide effective control of any malpractices, and provide continuous improvements to the environmental conditions. The proposed water quality monitoring schedule shall be submitted to EPD by the Contracted Party at least 2 weeks before the first day of the monitoring month.

6.2.3.2 **Table 6.4** summarises the proposed water quality monitoring programme for impact monitoring.

Table 6.4: Proposed water quality monitoring programme for impact monitoring

Item	Impact Monitoring during Operation Phase
Monitoring Period	One year after turf laying, and thereafter to be further agreed with EPD
Monitoring Frequency	Monthly (for marine water monitoring stations, each monitoring consists of samplings at mid-flood tide and samplings in mid-ebb tides for marine water monitoring stations, and at 3 water depth if situation allowed). At least 5 continuations days of daily water monitoring shall be conducted at all designed monitoring stations after each event of emergency discharge or pesticide spillage)
Monitoring Locations	All stations in **Table 6.2**
Monitoring Parameters[1]	Suspended solids (SS), total inorganic nitrogen (TIN), total phosphorus (TP), specified pesticides[2]
Intervals between 2 Sets of Monitoring	N/A

Notes:
[1] Any change in monitoring parameters to be agreed with EPD, based on the Grass Management Plan to be approved by EPD (Refer to Clauses 2.13 to 2.15 of EP-544/2017)
[2] Whenever there is any change in the selected pesticides afterwards, this table should be updated accordingly subject to agreement with EPD.

6.3 Action and Limit Levels

6.3.1.1 The action and limit levels for water quality at water monitoring stations are defined in **Table 6.5**.

Table 6.5: Action and limit levels for water quality

Parameters [1]	Action Level	Limit Level
SS in mg/L	WM1 & WM2: 95 percentile of baseline data (data at WM3& WM4 for reference purpose)	WM1 & WM2: 99 percentile of baseline data (data at WM3 & WM4 for reference purpose)
TIN in mg/L	WMl & WM2: 95 percentile of baseline data (data at WM3& WM4 for reference purpose)	WMl & WM2: 99 percentile of baseline data (data at WM3& WM4 for reference purpose)
TP in mg/L	WM1 & WM2: 95 percentile of baseline data (data at WM3& WM4 for reference purpose)	WMl & WM2: 99 percentile of baseline data (data at WM3 & WM4 for reference purpose)
Specified Pesticides [2]	WM1 & WM2: Level of detection limit WM3 & WM4: Level of detection limit	WM1 & WM2 : Level of detection limit WM3 & WM4 : Level of detection limit

Notes:
[1] "Depth-averaged" is calculated by taking the arithmetic means of readings of all three depths.
[2] Whenever there is any change in the selected pesticides afterwards, new baseline data should be developed and this table should be updated accordingly subject to agreement with EPD.

6.3.1.2

Should monitoring results of the water quality parameters at any designated monitoring station exceed the action and limit level, the proposed actions to be taken are summarized in **Table 6.6**:

Table 6.6 Event and Action Plan for water quality

Event	Action			
	ET	IEC	SOR	Contractor
Action level exceedance for one sampling day	1. Repeat measurement on next day of exceedance. 2. Inform IEC, Contractor and SOR; 3. Check monitoring data, all plant, equipment and Contractor's working methods; and	1. Discuss with ET, SOR and Contractor on the implemented mitigation measures; 2. Review proposals on remedial measures submitted by Contractor and advise the SOR	1. Discuss with IEC, ET and Contractor on the implemented mitigation measures; 2. Make agreement on the remedial measures to be implemented; 3. Supervise the implementation of agreed remedial measures.	1. Identify source(s) of impact; 2. Inform the SOR and confirm notification of the non-compliance in writing; 3. Rectify unacceptable practice; 4.Check all plant and equipment; 5. Consider changes of working methods; 6. Discuss with SOR, ET and IEC and

Event	Action			
	ET	IEC	SOR	Contractor
	4. Discuss remedial measures with IEC and Contractor and SOR.	accordingly; and 3. Review and advise the ET and SOR on the effectiveness of the implemented mitigation measures.		propose remedial measures to IEC and SOR; and 7. Implement the agreed mitigation measures.
Action level exceedance for more than one consecutive sampling days	1. Repeat measurement on next day of exceedance to confirm findings; 2. Inform IEC, contractor and SOR; 3. Check monitoring data, all plant, equipment and Contractor's working methods; 4. Discuss remedial measures with IEC, contractor and SOR 5. Ensure remedial measures are implemented	1. Discuss with ET, Contractor and SOR on the implemented mitigation measures; 2. Review the proposed remedial measures submitted by Contractor and advise the SOR accordingly; and 3. Review and advise the ET and SOR on the effectiveness of the implemented mitigation measures.	1. Discuss with ET, IEC and Contractor on the implemented mitigation measures; 2. Make agreement on the remedial measures to be implemented ; and 3. Discuss with ET, IEC and Contractor on the effectiveness of the implemented remedial measures. 4. Supervise the implementation of agreed remedial measures	1. Identify source(s) of impact; 2. Inform the SOR and confirm notification of the non-compliance in writing; 3. Rectify unacceptable practice; 4. Check all plant and equipment and consider changes of working methods; 5. Discuss with ET, IEC and SOR and submit proposal of remedial measures to SOR and IEC within 3 working days of notification; and 6. Implement the agreed mitigation measures.
Limit level exceedance for one sampling day	1. Repeat measurement on next day of exceedance to confirm findings; 2. Inform IEC, contractor and SOR; 3. Rectify unacceptable practice;	1. Discuss with ET, Contractor and SOR on the implemented mitigation measures; 2. Review the proposed remedial measures submitted by Contractor and	1. Discuss with ET, IEC and Contractor on the implemented remedial measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the remedial	1. Identify source(s) of impact; 2. Inform the SOR and confirm notification of the non-compliance in writing; 3. Rectify unacceptable practice; 4. Check all plant and equipment and

Event	Action			
	ET	IEC	SOR	Contractor
	4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Consider changes of working methods; 6. Discuss mitigation measures with IEC, SOR and Contractor; and 7. Ensure the agreed remedial measures are implemented	advise the SOR accordingly; and 3. Review and advise the ET and SOR on the effectiveness of the implemented mitigation measures.	measures to be implemented; and 4. Discuss with ET, IEC and Contractor on the effectiveness of the implemented remedial measures.	consider changes of working methods; 5. Discuss with ET, IEC and SOR and submit proposal of additional mitigation measures to SOR and IEC within 3 working days of notification; and 6. Implement the agreed remedial measures.
Limit level exceedance for more than one consecutive sampling days	1. Inform IEC, contractor and SOR; 2. Check monitoring data, all plant, equipment and Contractor's working methods; 3. Discuss mitigation measures with IEC, SOR and Contractor; and 4. Ensure mitigation measures are implemented; and 5. Increase the monitoring frequency to daily until no exceedance of Limit Level for two consecutive days	1. Discuss with ET, Contractor and SOR on the implemented mitigation measures; 2. Review the proposed remedial measures submitted by Contractor and advise the SOR accordingly; and 3. Review and advise the ET and SOR on the effectiveness of the implemented mitigation measures.	1. Discuss with ET, IEC and Contractor on the implemented remedial measures; 2. Request Contractor to critically review the working methods; 3. Make agreement on the remedial measures to be implemented; 4. Discuss with ET and IEC on the effectiveness of the implemented mitigation measures; and 5. Consider and instruct, if necessary, the Contractor to reduce or to stop all or part of the pesticide/fertilizer dosage until no	1. Identify source(s) of impact; 2. Inform the SOR and confirm notification of the non-compliance in writing; 3. Rectify unacceptable practice; 4. Check all plant and equipment and consider changes of working methods; 5. Discuss with ET, IEC and SOR and submit proposal of additional mitigation measures to SOR and IEC within 3 working days of notification; 6. Implement the agreed remedial measures; and 7. As directed by the SOR, to reduce or to stop all or part of the pesticide/fertilizer

Event	Action			
	ET	IEC	SOR	Contractor
			exceedance of Limit level.	dosage until no exceedance of Limit level.

Note:

- ET – Environmental Team
- IEC – Independent Environmental Checker
- SOR – Supervising Officer's Representative
- Each step of actions required shall be implemented within 1 working days unless otherwise specified or agreed with EPD.

7 Mitigation and Emergency Actions

7.1 Mitigation Measures for Stormwater Re-use System

7.1.1 Design and Construction Phase

7.1.1.1 The mitigation measures for design and construction phase include:

Table 7.1: Mitigation measures for Stormwater Re-use Management System in design and construction phase

EM&A Log	Mitigation Measures	Implementation Agent	Implementation Programme	Maintenance and Management Parties	Maintenance and Management Schedule
WQ1	Practices outlined in ProPECC PN 1/94 Construction Site Drainage should be adopted.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ2	Install perimeter channels in the works areas to intercept runoff from boundary prior to the commencement of any earthwork	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ3	To prevent storm runoff from washing across exposed soil surfaces, intercepting channels should be provided.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ4	Drainage channels are required to convey site runoff to sand/silt traps and oil interceptors. Provision of regular cleaning and maintenance to ensure the normal operation of these facilities throughout the construction period.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ5	Any practical options for the diversion and realignment of drainage should comply with both engineering and environmental requirements	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ6	Minimum distances of 100 m should be maintained between the discharge points of construction site runoff and the existing WSD saltwater intake and EMSD cooling water intake.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ8	The runoff and wastewater generated from the works areas should be treated so that it satisfies all the standards listed in the TM-DSS.	Contractor	Q2/2019 – Q1/2023	Contractor	As required

EM&A Log	Mitigation Measures	Implementation Agent	Implementation Programme	Maintenance and Management Parties	Maintenance and Management Schedule
WQ9	Reuse and recycling of the treated effluent from construction site runoff.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ10	Weekly site audit should be carried out to check the implementation status of the recommended water quality impact mitigation measures throughout construction period.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ11	The construction programme should be properly planned to minimise soil excavation, if any, in rainy seasons.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ12	Any exposed soil surfaces should be properly protected to minimise dust emission.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ13	In areas where a large amount of exposed soils exist, earth bunds or sand bags should be provided.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ14	Exposed stockpiles should be covered with tarpaulin or impervious sheets at all times.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ15	The stockpiles of materials should be placed at locations away from any stream courses so as to avoid releasing materials into the water bodies.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ16	Final surfaces of earthworks should be compacted and protected by permanent work.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ17	Haul roads should be paved with concrete and the temporary access roads protected using crushed stone or gravel, wherever practicable.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ18	Wheel washing facilities should be provided at all site exits to ensure that earth, mud and debris would not be carried out of the works areas by vehicles.	Contractor	Q2/2019 – Q1/2023	Contractor	As required

EM&A Log	Mitigation Measures	Implementation Agent	Implementation Programme	Maintenance and Management Parties	Maintenance and Management Schedule
WQ19	Good site practices should be adopted to keep the site dry and tidy, such as clean the rubbish and litter on the construction sites.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ20	Adequate temporary site drainage and pumping should be provided, if necessary.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ21	Provide sufficient temporary toilets in the works areas. The toilet facilities should be more than 30 m from any watercourse. A licensed waste collector should be deployed to clean the temporary toilets on a regular basis.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ22	Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the nearby environment during the construction phase of the Project.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ23	Contractor must register as a chemical waste producer if chemical wastes would be produced from the construction activities. The Waste Disposal Ordinance (Cap 354) and its subsidiary regulations in particular the Waste Disposal (Chemical Waste) (General) Regulation should be observed and complied with for control of chemical wastes.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ24	Any service shop and maintenance facilities should be located on hard standings within a bunded area, and sumps and oil interceptors should be provided. Maintenance of vehicles and equipment involving activities with potential for leakage and spillage should only be undertaken within the areas appropriately equipped to control these discharges.	Contractor	Q2/2019 – Q1/2023	Contractor	As required

EM&A Log	Mitigation Measures	Implementation Agent	Implementation Programme	Maintenance and Management Parties	Maintenance and Management Schedule
WQ25	Clean the construction sites on a regular basis.	Contractor	Q2/2019 – Q1/2023	Contractor	As required
WQ26	Oil interceptor in car parking area shall be designed and constructed according to Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers, APP-46 (PNAP 124)	Contractor and Designer	Q2/2019 – Q1/2023	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
Others	Construct a suitable, approved and certified chemical store capable of storing all required quantities of chemicals in a safe way. The store should be constructed to local industry guidelines, in a suitable location, with the relevant local authorities including the fire services approval. The store as a minimum should be bunded to allow containment of at least 110% of the overall capacity of the store (or in line with local industry guidelines), should be sufficiently fire-proofed, not be located close to any drainage inlets/outlets.	Contractor and Designer	Q2/2019 – Q1/2023	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement

EM&A Log	Mitigation Measures	Implementation Agent	Implementation Programme	Maintenance and Management Parties	Maintenance and Management Schedule
Others	A designated wash down area for all turf equipment shall be constructed with a suitable fully enclosed wastewater system. The pad shall be an area of hard standing with bunded edges and shall drain to a single discharge point which shall then connect to the wastewater unit so it can be treated. In addition, the wash down area and wastewater system shall be designed to allow for washing down of chemical/pesticide application equipment. It is critical that the wastewater system is designed to treat these types of materials.	Contractor and Designer	Q2/2019 – Q1/2023	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
Others	The runoff from natural turf shall be diverted to a network of surface channels, underground pipes, interception chamber, interception tanks and holding tank.	Designer	Q2/2019 – Q1/2023	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement

7.1.2 Operational Phase

7.1.2.1 The mitigation measures for operational phase include:

Table 7.2: Mitigation measures for Stormwater Re-use Management System in operation phase

EM&A Log	Mitigation Measures	Implementation Agent	Implementation Programme	Maintenance and Management Parties	Maintenance and Management Schedule
WQ26	Oil interceptor in car parking area shall be designed and constructed according to Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers, APP-46 (PNAP 124)	Contractor and Designer	Q2/2019 – Q1/2023	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
WQ27	The chemicals/fuels to be stored on site will be limited to small essential quantities at any one time. Any chemicals that may be carried away by water shall be contained in specific containers and cabinets under shelter and protected from weather. Any liquid chemical or fuel shall be contained in hard standing bunded area. The operator shall ensure that only staff trained in the use and handling the specific chemicals for specific tasks are allowed to handle the relevant chemicals.	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
WQ28	Good practice should be adopted to clean the rubbish and litter on the sites so as to prevent rubbish and litter from spreading from the site area. It is recommended to clean the Project Site on a regular basis. Management guidelines shall be provided to the management team practically to separate and remove solids from discharging stormwater system.	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
WQ29	For use of artificial turf, subject to design and operation considerations, practically no mitigation measures are required. The duration of the natural turf on the pitch should be minimized in case of using	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage

EM&A Log	Mitigation Measures	Implementation Agent	Implementation Programme	Maintenance and Management Parties	Maintenance and Management Schedule
	occasional natural turf during major events and no pesticides and fertilizers should be used during the period under normal circumstances. Intercept the surface water from the turf that may contain residual fertilizers and pesticides for reuse or treatment if usage of fertilizers and pesticides is needed.				under ER requirement
WQ30	The future management of the KTSP should follow Pesticides Ordinance (Cap 133), Pesticides Regulations (Cap 133A), A Guide to Labeling of Pesticides, and Safety Guidelines for Storage of Pesticides issued by AFCD and the LCSD horticultural guidelines on use of turf management and consult AFCD on pesticides used.	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
Others	All pesticide containers and packaging shall be disposed of in an environmentally friendly way in line with local industry standards. Containers should be triple rinsed with rinsing sprayed back onto the target area ensuring not to exceed the product dose rate prior to recycling or disposal by a certified and licensed waste disposal contractor. Where this is not a possibility of rinsing, it should be sprayed out onto an approved bio-bed or placed back into a suitable sealable container properly labelled and disposed of by a licensed waste disposal contractor.	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
WQ31	Application of pesticides will be confined to the approved list and the dosage as well as the frequency and intensity should be well-justified according to the manufacturers' instructions and genuine operational needs.	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage

EM&A Log	Mitigation Measures	Implementation Agent	Implementation Programme	Maintenance and Management Parties	Maintenance and Management Schedule
WQ32	The dosage of the pesticides/ fertiliser shall be controlled to limit the residual dosage to less than 10%.	Operator	Operation	Operator	under ER requirement
WQ33	Provision of two sequential storage tanks to contain surface water with residual fertilisers and pesticides and third holding tank for incidental rainstorm	Designer	Q2/2019 – Q1/2023	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
WQ34	A Stormwater Re-use Management Plan is recommended for the operator including: 1) Healthy use of fertilizers and pesticides, and safe operation of the chemical disposal. 2) Operation and maintenance of water storage/holding tanks. 3) Frequency of testing and sampling, and appropriate testing parameters. 4) Alert levels and action limit levels. 5) Emergency measures.	Designer	Q2/2019 – Q1/2023	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
Others	Implement a full Integrated Pest Management (IPM) programme to reduce the application quantities of pesticides and chemicals for the pitch.	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
Others	Use of pesticides forms an integral part of turf maintenance; however, pesticides are not commonly applied on a regular basis but normally in reaction to certain climatic and ground conditions or as a result of a pest, disease, or weed being identified.	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
Others	The site personnel should be properly trained in the identification of symptoms of turf disease, pest and weeds, so that the minimum dosage of pesticides could be used.	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
Others	Use of the Envirosync system to determine fertiliser application and avoid	Designer	Operation	Operator	Refer to the O & M Manual to be

EM&A Log	Mitigation Measures	Implementation Agent	Implementation Programme	Maintenance and Management Parties	Maintenance and Management Schedule
	applications during or right before heavy rainfall				developed in the later stage under ER requirement
Others	Mowing shall be postponed by a minimum of two days from the date of fertilising to minimise pick up of fertiliser granules	Designer	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
Others	Fertilisers are normally applied to encourage growth and recovery of the grass plants and ultimately produce a healthy grass sward. The site personnel should be trained in the use of fertilisers to help reduce over or under applications of fertilisers. It is important that the quantity of nutrient loss is minimized to prevent any adverse water quality impact.	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
WQ35	The storage and holding tanks shall be emptied prior to application of fertilizers and pesticides. In general, the intercepted surface water must be recycled by irrigation into the football pitch.	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
WQ36	Encourage recycling of stormwater for irrigation and flushing	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
WQ37	Cleansing detergents shall not be used for washing the spectator seats.	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
Others	Augment supply of the harvested stormwater for irrigation before resorting to fresh water	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage

EM&A Log	Mitigation Measures	Implementation Agent	Implementation Programme	Maintenance and Management Parties	Maintenance and Management Schedule
					under ER requirement
Others	In order to reduce the quantities of chemicals stored it is recommended to maintain minimum stocking levels, carrying out regular stock checks, while maintaining adequate stock levels to allow for immediate applications of certain chemicals if required.	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
Others	Detailed records of all chemicals stored should be kept and updated on a continual basis. It is recommended that a minimum of two copies of records are kept and updated with one located close to the store.	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
Others	Regular inspection of the drainage system and stormwater tank's structure and integrity	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement
Others	Provision of desilting of the stormwater tanks (typically conducted annually before the onset of the wet season).	Operator	Operation	Operator	Refer to the O & M Manual to be developed in the later stage under ER requirement

7.2 Emergency Actions

7.2.1 Pesticide Spillage or Leakage

7.2.1.1 The following precautionary measures should be undertaken to handle the potential chemical spillage of pesticides:

- protective gear such as overalls, aprons, rubber gloves, safety boots, goggles, mouth masks with canisters and industrial cleansers for human use should be readily available;
- to provide effective protection for the workers, choose the appropriate personal protective equipment with reference to the information provided by the manufacturers and suppliers. The workers should also know the correct

way of using and maintaining the equipment. Cracked or damaged equipment should be replaced;

- the pesticides should be stored separately from the personal protective equipment and other articles to avoid contamination;
- Wash the personal protective equipment immediately after use. Working clothes should be washed every day with soap or washing powder and separately from ordinary clothing; and
- tools such as empty open head drums, large heavy-duty plastic bags, brooms, shovels, rubber wipers and adequate absorbent materials should be available for handling leakages or spillages.

7.2.1.2 In case of occurrence of spillage or leakage, the following emergency measures should be undertaken as soon as possible:

- the spill or leak should be covered and contained with double the volume of inert absorbent such as sand, sawdust or soil;
- after the spilt pesticides have been absorbed, sweep or shovel up the absorbent thoroughly;
- put all contaminated debris in sealed and marked containers or large heavy-duty plastic bags;
- clean the contaminated area with detergents; and
- in case of occurrence of spillage of pesticide, water quality monitoring programme similar to that for the event of emergency discharge as described in Section 6.1.1.3 should be carried out.

7.2.1.3 Far from being a substitute for medical treatment, first aid is given to a poisoned person to relieve the symptoms while he/she is awaiting medical treatment. Seek medical assistance as soon as possible in case of bodily contamination with pesticides or suspected pesticide poisoning. Do not spend too much time giving first aid on your own. The general first aid measures should be implemented:

- prevent further exposure to a pesticide. In case of skin contact, wash thoroughly the skin, hair and nails with clean water. If a person who has swallowed a pesticide remains conscious and the airway is kept unobstructed, vomiting must be induced subject to relevant instructions (please refer to those set out below);
- keep the pesticide containers and any leftover inside; give to the doctor any labels that are legible as well as names of relevant chemicals; and
- when handling a pesticide poisoning arising from skin contact, first-aiders must put on protective gloves and clothing if there is a risk of exposure to pesticides.

7.2.2 Fire and Explosion Control for Pesticides

7.2.2.1 Many pesticides need to be diluted with such inflammable liquids as petrol or kerosene, so they carry the risk of fire or explosion. Compressed aerosol pesticides in canned form also contain inflammable liquids and have the same kind of risk.

- Pesticides should not be stored under strong sunlight or high temperature;
- Smoking and the use of naked flame should be prohibited in the storage area and the place where pesticides are being applied;
- Never spray pesticides onto places where the temperature is high, a flame is burning, or an electrical appliance is operating;
- Be always equipped with suitable fire-extinguishers; and
- Keep the means of escape clear and know the route well.

7.2.3 Fertiliser Spillage

7.2.3.1 In general, spillage of solid fertiliser is not a great concern to the environment. It can be easily cleaned up by prompt and immediate physical methods, such as sweeping up dry, solid spills. The collected dry spillage will be re-use on the turf.

7.2.3.2 However, spillage of liquid fertiliser is difficult to be cleaned up. The strategy is to recover as much of the spill as possible and reuse it as it was intended. The most common method is to remove contaminated soil and re-apply it to fields. In addition, the site personnel should also check with the supplier/manufacturer to follow their instruction for spill removal.

7.2.4 Incidental Heavy Rain

7.2.4.1 As discussed in Section 6.7.15 and Figure 6-7-1 of the approved EIA report, any residual fertilisers and washable deposited pesticides will be rinsed away through five cycles of watering, or equivalent raining. The first stormwater tank will provide adequate capacity to intercept most of the residual fertilisers and washable deposited pesticides from five cycles of watering or equivalent raining. In addition, a second tank is appended as a fail-safe system to intercept, if any, traces of residual fertilisers and washable deposited pesticides. The harvest water in the first and second tanks will only be re-used for subsequent irrigation and will not be directly discharged.

7.2.4.2 For incidental heavy rainfall events, the third stormwater tank with the same capacity is provided to withstand the rainfall intensity of a Black Rainstorm Warning, i.e. 70 mm/hr, for one hour (incorporating all three tanks). When all three stormwater tanks are full, there will be an emergency discharge to the external public drainage system for the excessive water. Under such circumstances (i.e. after the third storage tank is full) residual soluble fertilizers and pesticides should be completely washed away already.

7.2.4.3 Additional precautionary measures will be implemented to further reduce the adverse water quality impact. As discussed in Section 3.5, EnviroSync system will be adopted to predict whether there will be a heavy rainstorm event during the next couple of days. Application of fertiliser and pesticide will be suspended to avoid those chemicals rinsed away due to heavy rainstorm event.

7.2.5 System Failures

7.2.5.1 Major potential system failures comprise power failure and failure of pump to extract stormwater in the tanks for irrigation.

7.2.5.2 The collection of storm runoff from the pitches to the stormwater tanks solely relies on gravity and does not require the use of electricity intrinsically. Electricity will only be consumed when the harvested rainwater is extracted from the stormwater tanks back to the pitches for irrigation. In this regard, any power or pump failure will cut off the regressive supply of harvested rainwater from the tanks, which therefore could not be emptied for the application of fertiliser/pesticide. As an emergency measure, scheduled application of fertiliser/pesticide should be suspended until the recovery of power and pumps, and the stormwater tanks could be emptied.

7.2.5.3 Similar problems will be encountered for pump failures. Application of fertiliser/pesticide should only be performed when the pumps have been repaired/replaced.

7.2.5.4 For precaution, regular inspection and maintenance will be provided for the power installations and pumps. Desilting will be undertaken in the stormwater tanks to avoid the blockage of pumps and pipes for backward supply of harvested water for irrigation.

7.2.6 Working in Confined Spaces

7.2.6.1 Stormwater tanks, manholes, chambers etc. are confined spaces to which their sizes are large enough to permit access. Personnel entering the confined spaces should be subject to entry safety procedures as stipulated in the Factory and Industrial Undertakings (F&IU) (Confined Spaces) Regulation.

7.2.6.2 The personnel need to check if the work can be done another way so that entry to or work in confined spaces is avoided. Better work-planning or a different approach can reduce the need for confined space working.

7.2.6.3 If entry to a confined space is unavoidable, a safe system for working inside the space should be developed.

7.2.6.4 A “competent person” should be appointed to carry out a risk assessment of the conditions and the work and activities to be conducted in the confined space, and identify the necessary safety precautions to be taken according to the findings to avoid posing hazards to workers. The “competent person” should make recommendations on safety precautions to be taken having regard to the nature of the confined space, the associated risk and the work involved.

7.2.6.5 The following precautionary measures should be implemented when any personnel are working in the confined spaces:

- Only the certified workers who have sufficient experience in the type of work to be carried out should be appointed for the work.
- Disconnect and properly lock off the power supply of all the machinery and equipment that could cause hazards in a confined space; blank off pipelines and service pipes with contents that could cause hazards; take effective steps to prevent an ingress or in-rush to the confined space of hazardous gas, vapour, dust, fume or free flowing solid and liquid.
- A confined space should be adequately purged before the entry of workers to ensure that no sludge or other deposits will give off hazardous gas, vapour, dust or fume during the course of work. If steam cleaning is used, sufficient time should be allowed for cooling to ensure that it is safe to work in the confined space.
- Increase the number of openings and therefore improve ventilation. Mechanical ventilation may be necessary to ensure an adequate supply of fresh air. Do not use oxygen to freshen the air inside the confined space as this will greatly increase the risk of fire or explosion. Adequate supply of fresh air is of particular importance if compressed gas or burning equipment is used inside the confined space because of the dangers from build-up of engine exhaust.
- This is necessary in order to check that the air is free from both toxic and flammable gases, and that there is no deficiency in oxygen and the air is fit to breathe. Testing should be carried out by a competent person using a suitable gas detector which is correctly calibrated. Where the risk assessment indicates that conditions may change in the course of work, or as a further precaution, continuous air monitoring as advised by the competent person is required.
- Non-sparking tools and specially protected lighting are essential where flammable or potentially explosive atmospheres are likely. In certain confined spaces (e.g. inside metal tanks), suitable precautions to prevent electric shock include the use of extra low voltage equipment (voltage not exceeding 50 volts alternating current or 120 volts direct current whether between conductors or to earth) and, where necessary, residual current devices.
- Where the use of “approved breathing apparatus” is recommended in a risk assessment report, or entry into a confined space for underground pipework is required, it is required to ensure that any person entering or remaining in the confined space is properly wearing an approved breathing apparatus of a type that gives appropriate protection given the nature of the confined space; and is wearing a suitable safety harness connected to a lifeline that is strong enough to enable him to be pulled out, and that the free end is held by a person staying outside the confined space who has sufficient physical strength to be capable of pulling the worker out of the confined space in an emergency. That person must remain in situ throughout the course of work.

- A safety certificate should be obtained from safety officer to ensure that all the safety precautions are in place and a formal check has been undertaken before workers are allowed to enter or work in the confined space. The certificate specifies the period during which workers may remain safely in the confined space. The risk assessment report and the safety certificate must be displayed in a conspicuous position at the entrance to the confined space.
- When work is being carried out in a confined space, another person should be assigned to station outside the confined space to maintain communication with the worker inside. Sufficient number of rescue personnel should also be made available outside the confined space. These persons need to be properly trained in rescues, physically fit and readily available to carry out rescue tasks, and capable of using any rescue equipment provided, e.g. breathing apparatus, reviving apparatus, lifelines and firefighting equipment. They should also be adequately protected against any harm.

7.2.6.6 Even in case of emergency, the standby person should not enter the confined space. He should remain stationed outside the confined space and summon assistance of the rescue team and public emergency services (i.e. the Police and the Fire Services). He should stay outside the confined space and brief the rescue personnel of the relevant circumstances of the incident upon their arrival.

8 Reporting

8.1 General

8.1.1.1 The results and findings of all monitoring work required in this plan shall be reported in the Monthly Water Quality Monitoring Report prepared by the Contracted Party. The monitoring reports shall be prepared and submitted to EPD within 14 days of the end of each reporting month. Copies of each monitoring report shall be submitted to the following parties: the Environmental Team (ET), the Independent Environmental Checker (IEC), the Supervising Officer's Representative (SOR), Home Affairs Bureau (HAB) and EPD. Before the submission of the first report, the Contracted Party will liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.

8.1.1.2 The Contracted Party should prepare and submit a Baseline Water Quality Monitoring Report within one month after the last day of baseline monitoring. Whenever there is any change in the selected pesticides afterwards, new baseline data should be developed and hence the Baseline Water Quality Monitoring Report should be updated accordingly subject to agreement with EPD. Copies of the Baseline Water Quality Report should be submitted to the ET, IEC, SOR, HAB and EPD. The Contracted Party will liaise with the parties on the required number of copies.

8.1.1.3 The Contracted Party shall review the locations of monitoring stations and parameters on as needed basis to cater for any changes in the surrounding environment, the nature of works in progress and the applied types of fertilisers and pesticides.

8.2 Baseline Water Quality Monitoring Report

8.2.1.1 The Baseline Water Quality Monitoring Report shall include at least the following:

- brief project background information;
- drawing showing the locations of the baseline water quality monitoring stations;
- monitoring results (in both hard and diskette copies) together with the following information;
    - monitoring methodology;
    - name of laboratory and types of equipment used and calibration details;
    - parameters monitored;
    - monitoring date and time; and
    - quality assurance (QA) / quality control (QC) results and detection limits;
- details of influencing factors, including:

- major activities, if any, being carried out on the site and the vicinity of the monitoring locations during the monitoring period;
- weather conditions during the period; and
- any other factors which might affect monitoring results;

- determination of the Action and Limit levels for each monitoring parameter and statistical analysis of the baseline data; and
- comments, recommendations and conclusions.

8.3 Monthly Water Quality Monitoring Report

8.3.1.1 The Monthly Water Quality Monitoring Report shall include at least the following:

- brief project background information;
- drawing showing the locations of the water quality monitoring stations;
- brief summary of monitoring requirements, including all monitoring parameters and their Action and Limit levels;
- monitoring results (in both hard and diskette copies) together with the following information;
  - monitoring methodology;
  - name of laboratory and types of equipment used and calibration details;
  - parameters monitored;
  - monitoring date and time; and
  - QA/QC results and detection limits;
- details of influencing factors, including:
  - major activities, if any, being carried out on the site and the vicinity of the monitoring locations during the monitoring period;
  - the fertiliser and/or pesticide used on MS/PSG pitch and the application dates;
  - weather conditions during the period; and
  - any other factors which might affect monitoring results;
- comments, recommendations and conclusions;
- report on, if any, exceedance of Action and Limit levels;
- review of the reasons and working procedures for, if any, exceedance; and
- description of the action taken in the event of exceedance and the corresponding follow-up actions.

8.4 Data Keeping

8.4.1.1 No site-based documents (such as monitoring field records, laboratory analysis records etc.) are required to be included in the Baseline/Monthly Water Quality Monitoring Reports. However, any such document shall be well kept by the corresponding parties and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. Monitoring data shall also be recorded on diskettes or other approved media, and the software copy must be available upon request. Data format shall be agreed with EPD. All documents and data shall be kept for at least one year following the completion of the monitoring.

References

Carrow, R.N., Waddinton, D.V. and Rieke, P.E. 2001. Turfgrass Soil Fertility and Chemical Problems: Assessment and Management. John Wiley & Sons, Inc., New Jersey, USA, 400 pp.

Duncan, R.R. and Carrow, R.N. 1999. Seashore Paspalum: The Environmental Turfgrass. John Wiley & Sons, Inc., New Jersey, USA, 2810 pp.

Lawson, D.M. 2002. Fertilisers for Turf (second edition). The Sports Turf Research Institute, Bingley, UK, 45 pp.

McCarty, L.B. and Miller, G. 2002. Managing Bermudagrass Turf: Selection, Construction, Cultural Practices, and Pest Management Strategies. Ann Arbor Press, Michigan, USA, 221 pp.

Appendix 2.1

List of Potentially Used Fertilisers

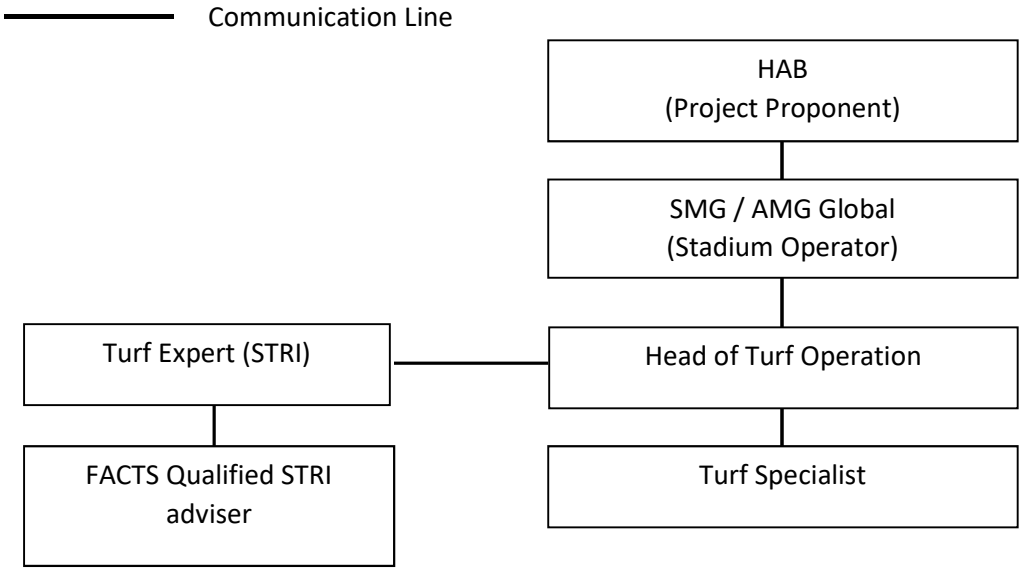
Product name	Granular/liquid	Controlled release	Readily available	Description	NPK	Rate per hectare	Typical number of applications per year	Product label	MSDS	Fact sheet	GHS signal word	Package size
General turf maintenance												
Nutri DG	Greens Grade Granular		Yes	Mag-tec™, 24% Mg	0+0+12	100-200 kg	4	Yes	Yes	Yes	Warning	25 kg
Nutri DG	Greens Grade Granular		Yes	Kal-tec®9.2% Ca, 2.0% Mg, 1.5% Mn	0+0+13	250-400 kg	4	Yes	Yes	Yes	Warning	25 kg
Nutri DG	Greens Grade Granular		Yes	3.0% Mn, 4.0% Mg, Bio-enhanced with Amvital™	0+0+25	150-300 kg	6	Yes	Yes	Yes	Warning	20 kg
Nutri DG	Greens Grade Granular	Yes		65% MUtech®, 0.3% Fe, 6.0% Mn	9+0+18	150-300 kg	2	Yes	Yes	No	Warning	20 kg
Nutri DG	Greens Grade Granular	Yes		50% MUtech®, 0.3% Fe, 0.5% Mn, 0.5% Mg	10+5+20	150-300 kg	2	Yes	Yes	Yes	Warning	20 kg
Nutri DG	Greens Grade Granular	Yes		50% MUtech®, 0.3% Fe, 0.5% Mn	12+24+8	150-300 kg	4	Yes	Yes	Yes	Warning	20 kg
Nutri DG	Greens Grade Granular	Yes		100% MUtech®	13+0+26	150-300 kg	2	Yes	Yes	Yes	Warning	20 kg
Nutri DG	Greens Grade Granular	Yes		60% MUtech®, 0.3% Fe, 0.14% Mn	18+9+18	150-300 kg	6	Yes	Yes	Yes	Warning	20 kg
Sustane	Organic Granular	Yes		Organic compost base and trace minerals	15+3+9	330 kg	4	Yes	Yes	Yes	Warning	22 kg
Sustane	Organic Granular	Yes		Organic compost base and mycorrhizal fungi	4+4+4	1250 kg	1	Yes	Yes	Yes	Warning	22 kg
Gypsum & lime												
DG Soil Enhancers	Sports Field Granular		Yes	Dispersible limestone, 30% Ca, 4% Mg, SGN 100	DG Lime	100-400 kg	4	Yes	Yes	Yes	Warning	25 kg
DG Soil Enhancers	Sports Field Granular		Yes	Dispersible gypsum, 21% Ca, SGN 100	DG Gypsum	250-500 kg	2	Yes	Yes	Yes	Warning	25 kg
Sea plant + amino acid based nutrients												
Fortify	Liquid		Yes	6% N, 6%Ca, 0.5%Fe, 0.5%Mg, 0.3%Si	6+0+0	10-20 L	8	Yes	Yes	Yes	Warning	9.45 L
Cytozorb-S	Liquid		Yes	0.53%Mg, 2.00%Fe, 0.25%Mn, 0.20%Mn	4+0+1	10-20 L	8	Yes	Yes	Yes	Warning	9.45 L
Tur-Gade	Liquid		Yes	0.50%Fe, 0.45%Mn	0+0+18	10 -22 L	12	Yes	Yes	Yes	Warning	9.45 L
Chlorofast-S	Liquid		Yes	2%Mg, 5%Mn	6+0+0	10-26 L	6	Yes	Yes	Yes	Warning	9.45 L
Nitroplast-S	Liquid		Yes	0.50%Fe, 0.18%Mn, 0.10%Zn, 0.10%Cu	19+1+4	10-38 L	12	Yes	Yes	Yes	Warning	9.45 L
NusioN	Liquid		Yes	No Trace	29+2+3	6-64 L	18	Yes	Yes	Yes	Warning	9.45 L
Minors	Liquid		Yes	1.50%Mg, 3.50%Fe, 0.75%Mn, 0.20%B	0+0+0	5-10 L	6	Yes	Yes	Yes	Warning	9.45 L
Ultramate LQ	Liquid		Yes	Humic acid 12%	0+0+0	9.4-14 L	18	Yes	Yes	Yes	Warning	9.45 L

Appendix 2.2

Organisation Chart for
Turf Management

Appendix 2.2

Organisation Chart for Turf Management



(1) The Head of Turf Operations

The Head of Turf Operations refers to the turf manager in charge of the maintenance and operation of the turf farm, public sports ground and main stadium sports turf areas. This position will be appointed by the stadium operators (SMG/ASM Global).

(2) The Turf Expert

STRI has been appointed as the Turf Expert and is responsible for all consultancy matters relating to the sports turf surfaces for this project. The Turf Specialist will be appointed by the Contracted Party (KTSP Ltd), with the approval by HAB (appointment yet to be confirmed).

(3) The Turf Specialist

The Turf Specialist is responsible for auditing the turf trial findings produced by the Turf Expert and monitoring of the performance of the Pitch Surface System to ensure that the system is fit for purpose.

(4) FACTS qualified STRI adviser

FACTS qualification is an internationally-recognised UK qualification and is the qualification that UK sports turf consultants need to possess to advise on fertilizer recommendations in the UK. The fertilizer advice given by the Turf Expert will be based on recommendations compiled by a FACTS qualified STRI adviser.

Appendix 3.1

List of Potentially Used Pesticides

Funigcides	Product name	Active ingredient	Type	Registration number	Company	Concentration	Recommended application rate	Typical number of applications per year	Product label available	MSDS available	Fact sheet available	GHS signal word	Application rates available	Package size
	Fore Rainshield	Mancozeb	Suspention concentrate	2P127	Amgrow	480 g/L	390 ml/100 m2	6	Yes	Yes	Yes	Caution	Yes	10 L
	Heritage Maxx	Azoxystrobin	Dispersible concentrate	2P287	Syngenta	95 g/L	60 ml/100 m2	3	Yes	Yes	Yes	Caution	Yes	1 L
	Banol	Propamocarb hydrochloride	Soluble concentrate	2P161	Bayer	600 g/L	55 ml/100 m2	3	Yes	Yes	Yes	Caution	Yes	1 L
	Captan	Captan	Wettable powder	2P37	Adama	800 g/kg	125 g/100 m2	3	Yes	Yes	no	Danger	Yes	10 kg
	Daconil WeatherStik	Chlorothalonil	Suspension concentrate	2P47	Syngenta	720 g/L	160 ml/100 m2	6	Yes	Yes	Yes	Caution	Yes	10 L
	Chipco Signature	fosetyl-aluminium	Water-dispersible granule	2P110	Bayer	800 g/kg	125 g/100 m2	3	Yes	Yes	Yes	Danger	Yes	2.25 kg
	Chipco GT	Iprodione	Suspension concentrate	2P119	Bayer	340 g/L	200 ml/100 m2	6	Yes	Yes	Yes	Caution	Yes	2.5, 5, 10 L
	Banner Maxx	Propiconazole	Emulsifiable concentrate	2P206	Syngenta	156 g/L	30 ml/100 m2	4	Yes	Yes	Yes	Caution	Yes	3 L
	Triumph	Metalaxyl-M	Soluble concentrate	2P314	Adama	240 g/L	25 ml/100 m2	3	Yes	Yes	Yes	Caution	Yes	1 L
Insecticides	Product name	Active ingredient	Type	Registration number	Company	Concentration			Product label supplied	MSDS supplied	Fact Sheet	GHS signal word	Application rates supplied	Package size
	Acelepryn	CHLORANTRANILIPROLE	Suspension concentrate	2P327	Syngenta	200 g/L	10 ml/100 m2	2	Yes	Yes	Yes	Warning	Yes	750 ml
	Agador	ABAMECTIN	Suspension concentrate	2P226	Syngenta	20 g/L	15 ml/100 m2	2	Yes	Yes	Yes	Danger	Yes	1, 5, 10 L
	Meridian	THIAMETHOXAM	Water-dispersible granule	2P313	Syngenta	250 g/kg	10 g/100 m2	2	Yes	Yes	Yes	Warning	Yes	1 kg
	Compel	BIFENTHRIN	Emulsifiable concentrate	2P240	Amgrow	100 g/L	30 ml/100 m2	2	Yes	Yes	Yes	Warning	Yes	5 L
	Pride	IMIDACLOPRID	Suspension concentrate	2P256	Amgrow	200 g/L	25 ml/100 m2	1	Yes	Yes	Yes	Warning	Yes	1 L
Herbicides	Product name	Active ingredient	Type	Registration number	Company	Concentration			Product label supplied	MSDS supplied	Fact sheet	GHS signal word	Application rates supplied	Package size
	Barricade	PRODIAMINE	Water-dispersive granule	2P312	Syngenta	65 g/kg	6.3 g/100 m2	1	Yes	Yes	Yes	Caution	Yes	8.16 kg
	Monument	Trifloxysulfuron-sodium	Water-dispersive granule	2P308	Syngenta	75 g/kg	2.5 g/100 m2	3	Yes	Yes	Yes	Caution	Yes	25 g
	Drive XL	QUINCLORAC	Wettable powder	2P173	BASF	180 g/L	46 ml/100 m2	2	Yes	Yes	Yes	Warning	Yes	5, 10, 20 L
	Monopoly	MSMA	Soluble concentrate	2P124	Amgrow	720 g/L	33 ml/100 m2	4	Yes	Yes	Yes	Danger	Yes	10 L
	Ronstar	OXADIAZON	Granular	2P141	Bayer	20 g/kg	2 kg/100 m2	1	Yes	Yes	Yes	Poison	Yes	15 kg
Plant growth regulators	Product name	Active ingredient	Type	Registration number	Company	Concentration			Product label supplied	MSDS supplied	Fact sheet	GHS signal word	Application rates supplied	Package size
	Primo Maxx	TRINEXAPAC-ETHYL	Emulsifiable concentrate	2P222	Syngenta	120 g/L	10 ml/100 m2	8	Yes	Yes	Yes	Caution	Yes	5 L

Appendix 4.1

Locations of Stormwater Tanks

MATCH LINE

FOR CONTINUATION SEE DWG. NO. KTSPL-ST-M-05-01-0001

NOTES:

1. FOR GENERAL NOTES AND LEGEND REFER TO DRAWING NO. KTSPL-ST-M-05-01-9014.
2. FOR MANHOLE SCHEDULE, REFER TO DRAWING NO. KTSPL-ST-M-05-01-9001.

Stormwater reuse tank at Main Stadium:
(3-Chambers)
Provide total 855m3 storage volume
Max water Level = +1.500mPD
Water Depth= 2.5m
internal chamber size= 11.5m x10m

600Ø pipe for emergency discharge

STORMWATER REUSE TANK
10000
11500

500Ø
500Ø

catchpit

400UC (1:150)
400ø COLLECTOR DRAIN
C/L M.C.
1:500
CONC. FLOOR WITH SPORTS SURFACE OVERLAY FOR TYPICAL DRAINAGE SECTION REFER TO DRAWING NO. KTSPL-ST-M-05-01-9013.
1
01/901.3
IL 5.800

300_UC (MC)
CP9.9
RWO
150ø DOWN PIT TO CATCHPIT CP9.9

MATCH LINE
FOR CONTINUATION SEE DWG. NO. KTSPL-ST-M-05-01-0004

838350 E
838450 E
838550 E
838650 E
820075 N
820175 N
820275 N
820375 N
820475 N
820575 N

FILE REF :
DO NOT SCALE DRAWING. CHECK ALL MEASUREMENT ON SITE.

REFERENCE MAP

EMPLOYER :
HOME AFFAIRS BUREAU
The Government of The Hong Kong Special Administrative Region

CONTRACTED PARTY :
KAITAK SPORTS PARK LIMITED
啟德體育園有限公司

FIRST TIER SUB-CONTRACTOR - DESIGN AND BUILD :
HIPHING ENGINEERING CO LTD

FIRST TIER SUB-CONTRACTOR - OPERATE :
SMG

LEAD CONSULTANT (DESIGN STAGE) / ARCHITECTURAL DESIGNER :
POPULOUS

LEAD CONSULTANT (CONSTRUCTION STAGE) / ARCHITECTURAL DESIGNER / AUTHORIZED PERSON :
SKA

ENGINEERING DESIGNER :
ARUP

LANDSCAPE DESIGNER / REGISTERED LANDSCAPE ARCHITECT :
ADI

TURF EXPERT :
STRI

SPORTS DEVELOPMENT / COMMERCIAL SALES CONSULTANT :
Lagardère SPORTS

AIP / DDA CONSENT
( ) Consent is given without conditions
( ) Consent is given with conditions
( ) Consent is not granted.

For and on behalf of Supervising Officer

For the SOR
Date :

CONTRACTED PARTY :

Simon Lee
General Manager
Kai Tak Sports Park Limited
Date :

STRUCTURAL DESIGN CHECKER:

MAN Kin Chang
MSC, BEng, CEng
MIStructE MHKIE RPE
REGISTERED STRUCTURAL ENGINEER
Meinhardt (C&S) Ltd
Date :

STRUCTURAL DESIGNER :

CHOI CHI KEUNG TONY
CEng MIStructE MHKIE RPE
REGISTERED STRUCTURAL ENGINEER
Ove Arup & Partners Hong Kong Ltd
Date :

REV	DESCRIPTION	DATE
A0	1st AIP SUBMISSION	02.05.2019

PROJECT

DESIGN, CONSTRUCTION AND OPERATION OF THE KAI TAK SPORTS PARK
CONTRACT NO. HAB/KTSP/01
PROGRAMME NO. 3272RS

SHEET TITLE

DRAINAGE LAYOUT PLAN - LEVEL 00

(SHEET 3 OF 4)

COORDINATED	REVIEWED
CC	TC
SCALE @ A0	APPROVED
1:500	PT
DRAWING NUMBER	REVISION
KTSPL-ST-M-05-01-0003	A0

Plot by : King-Chak Lo
Plot Time : 16/5/2019 7:30 PM

DWG Name : J:\j66000\Arup\Civil\KTSPL-ST-M-05-01-0003.dwg

MATCH LINE
FOR CONTINUATION SEE DWG. NO. KTSPL-ST-M-05-01-0001

MATCH LINE
FOR CONTINUATION SEE DWG. NO. KTSPL-ST-M-05-01-0004

NOTES:

1. FOR GENERAL NOTES AND LEGEND REFER TO DRAWING NO. KTSPL-ST-M-05-01-0001.

Stormwater reuse tank at PSG:
(3-Chambers)
Provide total 795m3 storage volume
Max Water Level = +3.650mPD
Water Depth= 2.65m
internal chamber size= 10m x10m

Catchpit IL = 3.80mPD

inlet IL = 3.700mPD
water level=3.650mPD

600Ø emergency discharge

EXISTING STORMWATER MANHOLE (SDP2)
CL 6.056
IL 0.557

EXISTING 4x1830ø STORM DRAIN PIPES TO BE REMOVED / DEMOLISHED AFTER COMMISSIONING OF CEDD STAGE 5A BOX CULVERTS B4 & B5

EXISTING STORMWATER MANHOLE (SDP3)
CL 6.280
IL 0.500

EXISTING STORMWATER MANHOLE (SDP4)
CL 5.800
IL 0.556

EXISTING BOX CULVERT B4
ONE CELL 5000(W)x4000(H)

BOX CULVERT B3
3000x3000

Box Culvert B5 3000x3000

Box Culvert B4 5000x4000

Box Culvert B4

NATURAL TURF PITCH WITH CELLULAR DRAINAGE SYSTEM

ROAD GULLIES ON SUPPORTED SLAB

WIP Oct 2014

WIP Dec 2014

REV	DESCRIPTION	DATE
-	Tender Submission	10.08.2018

PROJECT

DESIGN, CONSTRUCTION AND OPERATION OF THE KAI TAK SPORTS PARK
CONTRACT NO. HAB/KTSP/01
PROGRAMME NO. 3272RS

SHEET TITLE

DRAINAGE LAYOUT PLAN - LEVEL 00

(SHEET 2 OF 4)

PROJECT NUMBER 257897	REVIEWED TC
COORDINATED NB	APPROVED PT
SCALE 1:500	NORTH POINT W 90.00 DEG
DRAWING NUMBER KTSPL-ST-M-05-01-0002	REVISION -

ORIGINAL SHEET SIZE A0 - 1189 x 841mm

DWG Name: - J:\257897\ARUP\CAM\KTSPL-ST-M-05-01-0002.dwg

Appendix 4.2

Estimation of Volumes of Stormwater Tanks

Estimation of Volumes of Stormwater Tanks

1. Control

1.1 The dosage of fertilizer and pesticides shall be controlled to limit the residual fertilizer and washable deposited pesticides to less than 10 % of the dosage.

1.2 The water use is about 40.5 m^3 for each watering during wet season.

2. Assumptions

2.1 In each watering of 40.5m^3, the football pitch will take up more than 75% of the water due to evaporation and transpiration. Maximum 25% water will be collected through surface runoff or porous drain into the first water tank.

2.2 The residual fertilizers and washable deposited pesticides will be rinsed for recycling after five cycles of irrigation or equivalent.

3. Tank Volume Estimation in **Main Stadium**

3.1 Tank 1

3.1.1. There will always be about 10 m^3 of irrigation water in the tank, i.e.

25% collected x 40.5 m^3 = 10 m^3

3.1.2. Capacity for five cycles of irrigation water

5x40.5m^3	=	202.5 m^3
Total volume		212.5 m^3
Say		285.0 m^3

3.2 Tank 2

3.2.1 Since it is a fail-safe standby tank, volume same as Tank 1 = 285 m^3.

3.3 Total capacity to cater for Black Rainstorm Warning (70 mm for 1 hour).

As the seepage effect is not significant, all surface runoff from Black Rainstorm will be considered and will be collected by the storage tanks finally. (i.e c=1.0) There will be about 11,800 m^2 turf area in Main stadium.

Total capacity = 1 x 0.07 m x 11,800 m^2 + 10 m^3 = 836 m^3.

Say 855 m^3

3.4 Tank 3

Volume of Tank 3

= Total storage capacity — Tank 1 — Tank 2

= 855 m^3 — 285 m^3— 285 m^3

= 285 m^3, say 285 m^3

4. Tank Volume Estimation in **PSG**

4.1 Tank 1

3.1.3. There will always be about 10 m^3 of irrigation water in the tank, i.e.

25% collected x 40.5 m^3 = 10 m^3

3.1.4. Capacity for five cycles of irrigation water

5 x 40.5m^3	= 202.5 m^3
Total volume	212.5 m^3
Say	265.0 m^3

4.2 Tank 2

4.2.1 Since it is a fail-safe standby tank, volume same as Tank 1 = 265 m^3.

4.3 Total capacity to cater for Black Rainstorm Warning (70 mm for 1 hour).

As the seepage effect is not significant, all surface runoff from Black Rainstorm will be considered and will be collected by the storage tanks finally. (i.e c=1.0)

There will be about 7,800m^2 turf area in PSG and 3,400 m^2 in running track area will also be considered in the storage tanks capacity (the surface runoff of running track will also be collected to the same drainage system.)

Total capacity = 1 x 0.07 m x 11,200 m^2 + 10 m^3 = 794 m^3

Say 795m^3

4.4 Tank 3

Volume of Tank 3

= Total storage capacity — Tank 1 — Tank 2

= 795 m^3 — 265 m^3— 265 m^3

= 265 m^3