

## MEMORANDUM

<b>TO:</b>	Sweeps Consultancy Ltd/Toko Farms Ltd	<b>Job No.:</b>	W000002
<b>ATTENTION:</b>	Emma Peters and Simon Davies	<b>Date:</b>	17 August 2023
<b>FROM:</b>	Zaaid Shah - Wai360 Engineering	<b>Pages</b>	3
<b>SUBJECT:</b>	RFI to Clutha District Council (CDC)	<b>Reference:</b>	MM-23-08-17_ZS.Docx
<b>SITE:</b>	Toko Mouth Residential Subdivision Development (TMRSD)	<b>Description:</b>	OWWFA & SWMP

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### 1. RFI Q1 & 2 - The Rationale for Stormwater Detention Tanks

Plastic tanks are widely used in New Zealand for stormwater detention and water storage. I agree plastic tank as an asset infrastructure has a limited life; however, all infrastructure goes through life cycle maintenance and depreciates in life and subsequently requires replacement. Thus, the proposed stormwater infrastructure for the site incorporates financial feasibility and shall be economical to construct and maintain over its useful life.

Initially, a feasibility study was completed for the communal detention pond storage for the site. Thus, the communal detention system was not feasible for the proposed development for the following reasons.

- The terrain does not allow for efficient conveyance of stormwater from lots into the communal detention pond proposed to be constructed in Lot 3 and part of Lot 2.
- The location of the communal detention pond was critical to ground stability due to its proximity to the cliff terrace.
- The stormwater reticulation network would have been uneconomical.
- Poor routine maintenance by the council due to the proximity of the site.
- High Maintenance cost to the council due to the proximity of the site.
- Will require frequent operation and maintenance, where individual lot owners are not responsible for any issues that may arise.

Further to the above, currently there is no portable town water supply. The residents of Toko Mouth are dependent on rainfall for their daily needs. Thus, having the detention tank system would allow for sustainable reuse of water by the future individual lot owners rather than the rainwater falling on the ground being directly discharged into the detention pond and subsequently conveyed and discharged into the ocean, i.e., unsustainable.

#### 1.1. Stormwater Management Plan

Section 5 of the Wai360 Engineering Onsite Wastewater Feasibility Assessment and Stormwater Management Plan (OWWFA & SWMP) report "*Ref: RP 22-05-06\_ZS\_W000002.Docx*" defines the stormwater water management plan in the following subsections in detail.

- 5.1 Stormwater Management Objectives
- 5.2 Stormwater Management Layout
- 5.3 Stormwater Management plan components in terms of collection, conveyance, detention, discharge and secondary overland flow path.

## 1.2. Detention Tank Drawing Sketch

Detention Tank system sketch drawings are appended as enclosures in this memo.

## 1.3. Operation and Maintenance Management Plan

The Operations and Maintenance Management Plan for the proposed subdivision is appended as enclosures in this memo.

## 2. Catchment Plan

The catchment plan is described in detail under section 4 of the OWWFA & SWMP report “*Ref: RP 22-05-06\_ZS\_W000002.Docx*”.

- Figure 2.0 is well described in the report about how the catchments are draining.
- Figure 4.0 and Figure 4.1 are the HEC-HMS hydrologic model simulation schematic and the HEC-HMS do not allow for drain features that can be added into the model.

According to Wai360 drawings a detailed catchment plan is further demonstrated as per “*Revision B Site Layout Stormwater Management Plan in Sheet C200*”.

## 3. Design Criteria

All design criteria required under section 4.3.5 of NZS 4404 were followed and are demonstrated in detail in the OWWFA & SWMP report “*Ref: RP 22-05-06\_ZS\_W000002.Docx*” under section 4.

## 4. Onsite Wastewater Feasibility Assessment (OWWFA)

### 4.1. Site and Soil Investigation

To determine the feasibility of the onsite wastewater dispersal, Wai360 performed a site and soil assessment and soil permeability measurements were performed on 24 October 2021 for the proposed TMRSD. Several test pits (TP1 – TP9) were excavated onsite as per “*Sheet C300 – Test-Pit Locations*” in Appendix A of OWWFA & SWMP report “*Ref: RP 22-05-06\_ZS\_W000002.Docx*”.

Thus, the detailed site and soil investigations are described in Part B of the OWWFA & SWMP report “*Ref: RP 22-05-06\_ZS\_W000002.Docx*”.

However, the detailed design shall be performed by the designer during building consent. The location, size, etc. of the dispersal field and the collection, storage and conveyance systems shall then be designed based on the wastewater flow rate, volume and other parameters that are highly dependent on the number of people per dwelling.

### 4.2. Allocation of Dispersal Area

Based on the site and soil investigation the approximate minimum dispersal field size is demonstrated under section 3 of the “*OWWFA & SWMP report* “*Ref: RP 22-05-06\_ZS\_W000002.Docx*”.

The detailed design shall be performed by the designer during building consent. The location, size, etc. of the dispersal field and the collection, storage and conveyance systems shall then be designed based on the wastewater flow rate, volume and other parameters that are highly dependent on the number of people per dwelling

Please do not hesitate to contact the undersigned for any queries pertaining to the findings in this report.

Yours faithfully

**Wai360 Engineering Ltd**

Per:



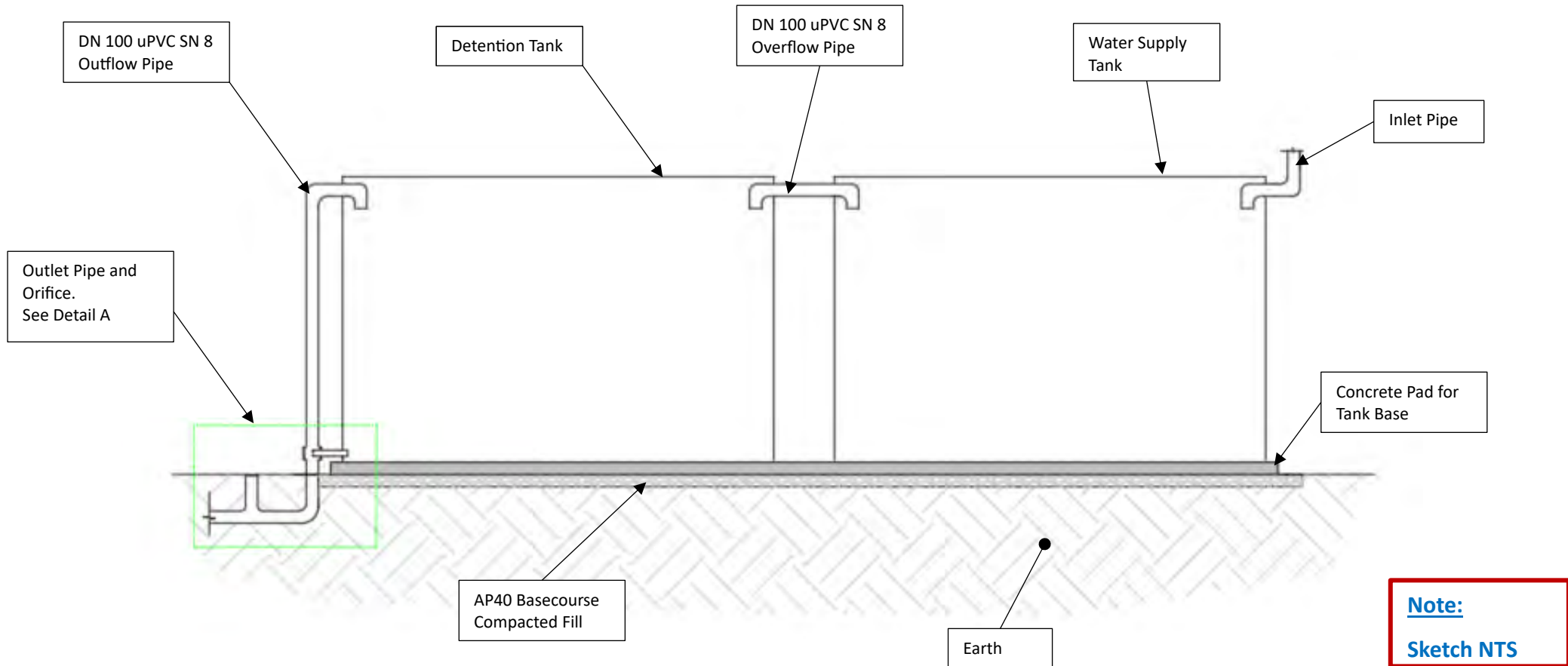
Zaaid Shah

Civil & Environmental Engineer

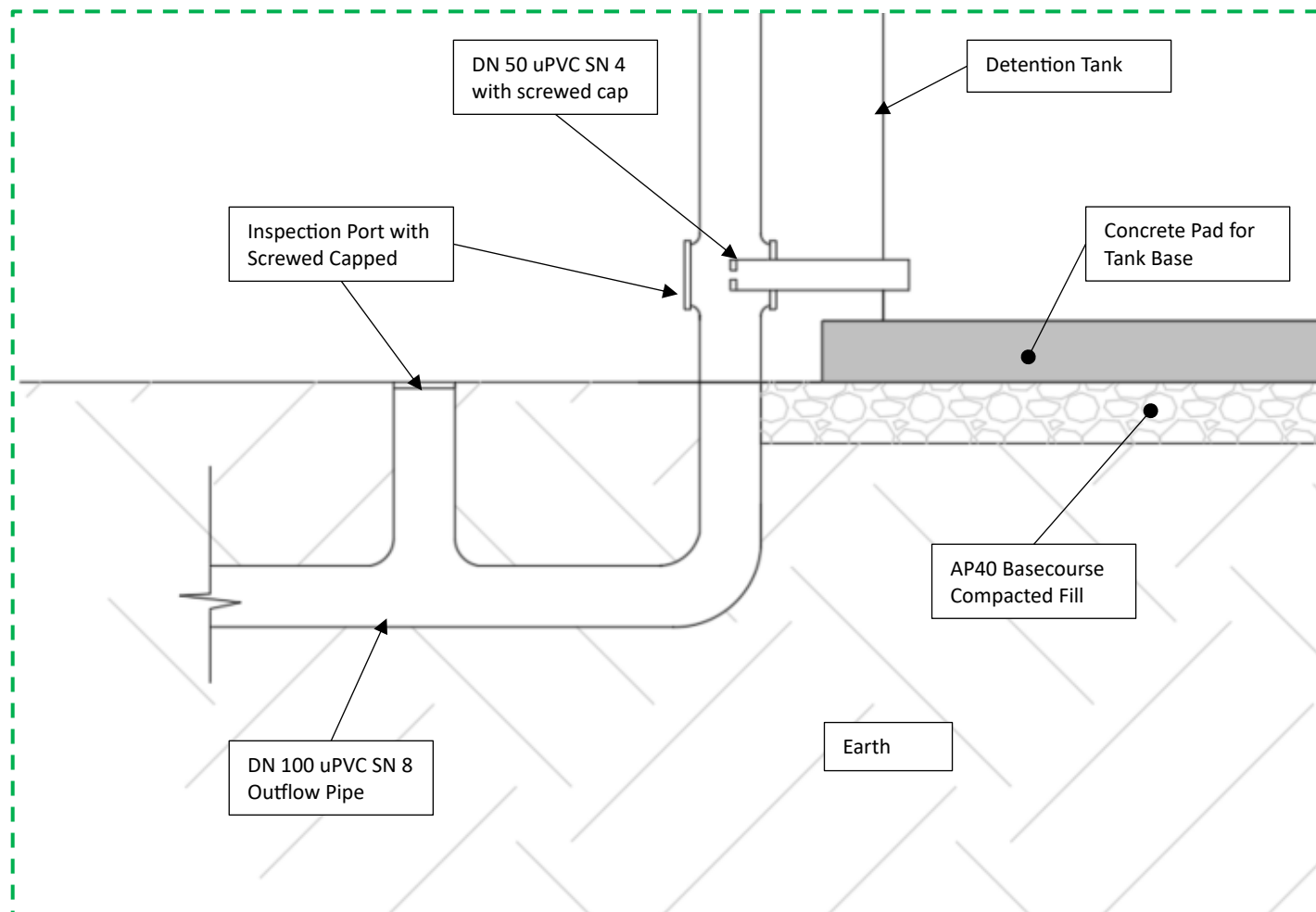
**Enclosures:**

- Detention Tank System Sketch
- Operations and Maintenance Management Plan – Stormwater Infrastructure

## Detention Tank – Typical Section View



## Detail Section A – Detention Tank Outlet Pipe and Orifice



**Note:**  
Sketch NTS

# TOKO FARMS LIMITED


## Toko Mouth Residential Subdivision Development

O&M Management Plan  
Stormwater Infrastructure



**Toko Farms Limited**  
**Toko Mouth Residential Subdivision Development (TMRSD)**  
**O&M Management Plan**  
**Stormwater Infrastructure**  
**August 2023**

**Prepared By**  
**Wai360 Engineering Ltd**

<b>Work Description</b>	<b>Personnel</b>	<b>Signature</b>
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**Project Information**

Project Number: W000002  
Date: 17 August 2023  
Reference Number: *Ref: O&M 23-08-17\_ZS\_W000002.Docx*

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- 6 Monthly Inspection and Surveillance Checklist
- Stormwater Infrastructure



## 1. Introduction

### 1.1 Scope

This “Stormwater Asset Operations and Maintenance Management Plan” (O&M Plan) sets out the stormwater and flood management asset surveillance, operations, and maintenance requirements for the proposed residential subdivision development at Coombe Hay Lane, Toko Mouth.

The stormwater infrastructure includes the stormwater collector network of pipes that delivers stormwater to a stormwater detention tank and subsequently the detention tank discharges into the swale drain which later flows into the outfall (the ocean).

### 1.2 Locality

The TMRSD site will be developed in 18 individual residential lots with private access ways via Toko Mouth Domain Rd and Coast Rd. Figure 1.0 below presents the site lot layout for the proposed TMRSD development by Surveyor “Craig Horne”.



**Figure 1.0: Proposed Lot Layout Plan**

### 1.3 Function of Stormwater Infrastructure

#### 1.3.1 Roof Collector System and Detention Tank

Initially, the stormwater collection system would collect and discharge the stormwater into the single or multiple Reuse Water Tank(s) - approximately larger than 21 000 litres in capacity for reuse of water for domestic purposes. As a result of Reuse Water Tanks reaching the maximum level, it would subsequently overflow and discharge into Detention Tank System. Thus, the purpose of the Detention Tank System is to control the post-development flows at the pre-development rate.

Thus, the relative level (RL) for the Reuse Water Tank discharging into the Detention Tank must be the same or greater than the high-level inlet of the Detention Tank System.

A **21 000** Litres Aqua Tank or similar tank system is proposed for TMRSD for each lot to control the post-development flows at a pre-development level. The Detention Tank System is fitted with orifice control that will restrict the post-development flow rate to be less than the peak pre-development flow rate from each lot.

The Detention Tank size is upgraded to 21 000 litres to achieve a factor of safety in design and management for the pre and post-development stormwater runoff conditions to mitigate any adverse effects on the downstream environment.

Also, the stormwater management plan entails all the relevant parameters for climate change effects to mitigate any adverse effects on the downstream environment.

### 1.3.2 Swale Collector System

The swale collector system located along the carriageway would collect the stormwater discharge from the detention tank from each lot and subsequently convey it to the outfall (the ocean).

## 1.4 Stormwater Maintenance

All Lot owners are responsible for the maintenance of all stormwater infrastructure onsite at the TMRSD site.

## 2.0 Site Stormwater Maintenance & Surveillance (OMS) Plan

### 2.1 OMS Objectives

The primary purpose of the OMS manual is as follows:

Provide a procedure to identify any conditions that could adversely affect the collector system and flood levels in the Detention Tank.

Ensure Detention Tank capacity and functional requirements are maintained to protect adjacent properties and property downstream of the site.

### 2.2 Inspections, Operation and Maintenance

Routine 6 monthly inspections, surveillance and planned maintenance activities will be completed for the following;

- Roof Collector – gutters and pipes.
- Detention Tank – including the inlet and outlet.
- Swale Collector.

Routine maintenance would include the following.

- Inspection and cleaning of roof collector pipes for leaves and debris.
- Inspection of Detention Tank inlet and outlet system.
- Removal of sedimentation from the Detention Tank.
- Frequent inspection of pipework and fitting of the Detention Tank to endure they remain fully operational.
- Frequent inspection and removal of any overgrown vegetation and accumulation of sediments in the swale collector system.

## 2.3 Operational Risks and Mitigation Plan

**Table 1.0: Operational Risks Mitigation Strategy for Stormwater Infrastructure**

Item No	Risk	Effect	Mitigation Strategy	Comment
1	Erosion, sedimentation and debris accumulation. <ul style="list-style-type: none"> <li>▪ Detention Tank</li> <li>▪ Roof Collector System</li> <li>▪ Swale Collector System</li> </ul>	<ul style="list-style-type: none"> <li>▪ Debris built in the Roof Collector System would cause rainwater overflow.</li> <li>▪ Debris and sedimentation buildup would reduce the Detention Tank storage capacity.</li> <li>▪ Overgrow vegetation and sedimentation built up in the swale would cause collection and conveyance capacity of the Swale Collector System.</li> </ul>	<ul style="list-style-type: none"> <li>▪ 6 monthly inspections to remove debris, vegetation and sediments from the Detention Tank, Roof and Swale Collector System.</li> <li>▪ Inspections to remove debris, vegetation and sediments from the d Detention Tank, Roof and Swale Collector System after the storm.</li> </ul>	
2	Extreme Natural Hazard Event. <ul style="list-style-type: none"> <li>▪ Seismic event</li> <li>▪ Major flood events.</li> </ul>	<p><b>Detention Tank</b></p> <ul style="list-style-type: none"> <li>▪ The seismic event would cause structural tank failure, pipe, and fitting damage.</li> </ul> <p><b>Roof Collector System</b></p> <ul style="list-style-type: none"> <li>▪ The seismic event would cause pipe and fitting damage.</li> </ul> <p><b>Swale Collector System</b></p> <ul style="list-style-type: none"> <li>▪ The seismic event would cause slips and ground settlement, thus, blockages of drainage.</li> </ul>	<p>Immediate surveillance checks following natural hazard events would include:</p> <ul style="list-style-type: none"> <li>▪ Check the Detention Tank structure for cracks and damage.</li> <li>▪ Check for erosion, ground settlement and blockages for Detention Tank and the Swale Collector System.</li> <li>▪ Check for pipework and fittings for cracks and damage for Detention Tank and Roof Collector System.</li> <li>▪ If there are signs of settlement or dislocation of the Detention Tank floor a geotechnical inspection will be required.</li> </ul>	If there is doubt about the condition or functionality following routine inspections of the works then people with the appropriate relevant skill and qualifications should be employed to provide engineering advice.
3	Corrosion, Wear and tear	check metallic components for corrosion and abrasion.	6 monthly inspections for any corrosive and abrasions on the fixtures and fittings.	

## 2.4 Surveillance and Monitoring Plan

### 2.4.1 Surveillance and Monitoring Activities Plan

The Surveillance and Monitoring activities plan includes the following.

1. Frequent routine inspection and monitoring of all the operational functionality and management of operational risks for all the stormwater infrastructure.
2. Surveillance and reporting of functionality and status of the stormwater infrastructure flowing storms and seismic events.
3. Stormwater infrastructure operations, monitoring and reviews.

### 2.4.2 Surveillance and Monitoring Schedule

The surveillance and monitoring schedule for the Detention Tank, Roof and Swale Collector System is presented in Table 2.0 below.

**Table 2.0: Surveillance and Monitoring Schedule**

Activity No.	Frequency / Report Type	Purpose	Resource Required	Outcomes
1	<b>6 Monthly Surveillance Record</b> <ul style="list-style-type: none"> <li>▪ Detention Tank</li> <li>▪ Roof Collector System</li> <li>▪ Swale Collector System</li> </ul>	a. Surveillance and reporting including maintenance checks. a. Minor “on the spot” maintenance such as clearing inlet & outlet. b. Identify any issues relating to the corrosion, degradation, sedimentation, erosion, seismic and vegetation risks in Table 2.0. c. Immediate inspection of the Detention System after seismic or extreme rainfall events.	Council Inspector Build Or A trained person with experience in monitoring civil works.	Complete the 6 Monthly Surveillance Task Sheet (See Appendix A) that includes: <ol style="list-style-type: none"> <li>1. Report on the success of any maintenance work carried out.</li> <li>2. Report on any current maintenance work activities.</li> </ol>
2	<b>Annual Maintenance Plan</b> <ul style="list-style-type: none"> <li>▪ Detention Tank</li> <li>▪ Roof Collector System</li> <li>▪ Swale Collector System</li> </ul>	a. Review the surveillance reports for the previous 12 months. b. Prepare the next annual forward maintenance work plan for the next financial year and update the forward 5-year funding plan.	Council Inspector Build Or A trained person with experience in monitoring civil works.	<ol style="list-style-type: none"> <li>1. Prepare the next annual monitoring and maintenance activity plan – funding programme and work plan.</li> <li>2. Update the OMS Manual as required.</li> </ol>

## **APPENDIX A**

- 6 Monthly Inspection and Surveillance Checklist
  - Stormwater Infrastructure

6 Monthly Surveillance Checklist Stormwater System Components For TMRSD	
<b>Lot Owner Details</b>	<b>Inspector Details</b>
<b>Name:</b> Click or tap here to enter text.	<b>Contractor/Owner:</b>
<b>Email:</b>	<b>Reviewed by:</b>
<b>Signature:</b>	<b>Signature:</b>
<b>Visit Date:</b>	<b>Review Date:</b>

Surveillance	Tick Answer	Comment <i>(Action proposed)</i>
<b>Detention Tank</b>		
1. Inlet Pipe in working order	Yes <input type="checkbox"/> No <input type="checkbox"/>	
2. Outlet Pipe working order	Yes <input type="checkbox"/> No <input type="checkbox"/>	
3. Sedimentation in the Detention Tank	Yes <input type="checkbox"/> No <input type="checkbox"/>	
4. Corrosion in the fixtures and fittings	Yes <input type="checkbox"/> No <input type="checkbox"/>	
5. Detention Tank structure damage e.g., cracks and base	Yes <input type="checkbox"/> No <input type="checkbox"/>	
<b>Roof Collector System</b>		
1. Gutters and pipes working order	Yes <input type="checkbox"/> No <input type="checkbox"/>	

Surveillance	Tick Answer	Comment ( Action proposed)
<b>Swale Collector System (one form for all Lots)</b>		
1. Swale sedimentation	Yes <input type="checkbox"/> No <input type="checkbox"/>	
2. Swale overgrown vegetation	Yes <input type="checkbox"/> No <input type="checkbox"/>	
3. Swale culverts blocked	Yes <input type="checkbox"/> No <input type="checkbox"/>	
4. Mudtanks (if any) blocked	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Planned maintenance work completed satisfactorily?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Other matters by exception:	Yes <input type="checkbox"/> No <input type="checkbox"/>	