

SUDS MANAGEMENT & MAINTENANCE PLAN



DOCUMENT CONTROL RECORD

Document Issue:

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A	08/02/24	First Issue	T.Brooker	C. Pendle
B	16/07/24	Swale maintenance added, updated to LLFA comments	T.Brooker	C. Pendle

References:

The SUDS manual – CIRIA C753 (2015) ISBN 9780-86017-760-9

National Planning Policy Framework (NPPF) – Communities and Local Government

Technical Guidance - Flood Risk & Coastal Change (March 2012)



1 Introduction

- 1.1 This document sets out the principles for the long-term management and maintenance of the proposed surface water Sustainable Drainage Systems (SuDS) installed at the residential development.
- 1.2 The purpose of this document is to set out the basis of the development SuDS Maintenance Plan and to ensure that the adopting management company is entrusted with a robust inspection and maintenance programme, ensuring the optimum operation of the surface water drainage network is continually maintained for the lifetime of the development and to prevent the increased risk of flooding both on and off-site in accordance with the National Planning Policy Framework (NPPF).
- 1.3 The activities listed in this document are generic to the relative SuDS types and represent the minimum maintenance and inspection requirements, however additional tasks or varied maintenance frequency may be instructed by the maintenance company as required. Specific maintenance needs of the SuDS elements should be monitored and maintenance schedules adjusted to suit requirements.
- 1.4 The installed SuDS system at this development are the initial responsibility of the developer. Following installation and after an initial period (TBC) of operation, all SuDS are to be transferred to an appointed Management Company. An agreement shall be set up by the developer, who shall confirm in writing to the principal planning Officer at LLFA when the maintenance agreement is completed and is operative.
- 1.5 The Management Company will then be responsible for maintaining the surface water system including all SuDS in perpetuity. All property owners should be advised that an annual management fee will need to be paid to the management company for this service.
- 1.6 All those responsible for maintenance should follow relevant Health and Safety legislation (Health and Safety at Work Regulations, 1999) for all activities listed within this report including lone working, if relevant) and risk assessments should always be undertaken.
- 1.7 Any contractor employed by the Management Company shall carry out periodic maintenance of all such SuDS in accordance with the schedules listed in this report. Inspection checks shall be carried out by a qualified and competent person, at the minimum intervals listed within the schedules and the appropriate work carried out.
- 1.8 This report is to be read in conjunction with the drainage strategy for the location of all SuDS elements present within the development. Reference should also be made to the detailed landscape proposals for the proposed treatment/maintenance regime for all landscape features. The operations contained within this plan shall (where feasible) be in conjunction with routine grounds maintenance operations to the surrounding landscape.

2 SuDS Layout & Design

- 2.1 The stormwater drainage strategy for the proposed development is to utilise a range of SuDS features to attenuate all surface water runoff from impermeable areas.
- 2.2 The proposed stormwater system may consist of the following SuDS components:
- Attenuation Tank (cellular polypropylene cells)
 - Attenuation Basins
 - Stormwater pipe work and road gullies
 - Flow control chambers
 - Outfall headwall
 - Vortex Separator
 - Swale
- 2.3 There are three categories of maintenance activities referred to in this report:
- **Regular maintenance** (including inspections and monitoring).
Consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter and debris removal, and inspections.
 - **Occasional maintenance**
Comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example).
 - **Remedial maintenance**
Comprises intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design.
Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.
- 2.4 It is also important that measures are taken to protect and ensure the continued operation of drainage features during the construction phase. All road gullies will be blocked until the site is complete. Mesh will be placed over the outfalls and swales to prevent construction silts from clogging up the drainage system and basins.

3 SUDS Management & Maintenance

3.1 Stormwater pipe work and road gullies

- 3.2 The key maintenance requirement for the upstream surface water drainage system includes the removal of sediments and debris from the system as required.
- 3.3 All stormwater pipework should be visually inspected a minimum of monthly for the first three months after installation and then a minimum of once a year. As road gullies are the first on the treatment train and susceptible to higher silt loadings, these will need to be inspected a minimum of monthly for the first three months after installation and then a minimum of every four months.
- 3.4 During this inspection identify any gully pots or pipes that require remedial maintenance such as removal of sediment, debris, leaves and litter as required. This involves the removal of all protective covers and grids and the cleaning out of channels or gully pots by hand or with suitable jetting equipment.
- 3.5 During the inspections the general operation and structural integrity of all components should be recorded and repaired as required.

3.6 Flow Control Chamber

- 3.7 The key maintenance requirement for the flow control chambers will be the inspection of the units for blockages of the vortex flow control unit and silt removal from the sump of the chamber.
- 3.8 The hydraulic vortex flow control unit has no moving parts and is self-activating, requiring minimal maintenance. After initial installation, it is recommended that the unit be inspected monthly for three months.
- 3.9 Thereafter the manhole chamber and control device should be inspected at least every six months to verify the condition and operation of the unit and check for blockages within the inlet of the chamber and of the flow control device. During these inspections, accumulated silts should be removed and the sump cleaned out using a conventional sump vacuum cleaner. Flow Controls are fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.

3.10 Cellular Attenuation Tanks

- 3.11 The key maintenance requirement for the cellular attenuation tank will be the visual inspection of the internal units via built-in access chambers and an integral maintenance tunnel for the removal of sediment and jetting as required. A visual inspection of the impermeable geomembrane that envelopes the structure should also be carried out to check for structural integrity.
- 3.12 The attenuation tank is to be constructed from SDS GEOLight cellular units that allow internal CCTV and jetting access to the perforated pipe distribution channel for inspection and maintenance.
A catchpit chamber is to be installed immediately upstream of the attenuation tank to reduce the amount of silt entering the tank and it will generally only be necessary to ensure that the upstream catchpits / silt traps are free from debris such as leaves or sediment.
- 3.13 It is recommended that the attenuation tank system be inspected no less frequently than at monthly intervals for the first 3 months and thereafter at 6 monthly intervals. In addition, it is suggested that the installation is inspected immediately following the first storm event, whenever this should occur post-installation.
- 3.14 It should also be noted that more regular inspections may be required should the catchpit(s) fill more frequently and/or if the initial inspections reveal that maintenance/cleaning will be required more regularly than at six-month intervals.
- 3.15 Flushing of the system can be achieved using a jetting system with a 150 bar pump pressure (ie. approximately 80 bar at the nozzle) at a discharge flow of 300 l/min. The jet nozzle should be introduced to the system via the Inspection manhole and the integral inspection/maintenance tunnel.
- 3.16 Any silt & debris should be flushed to the inspection or catchpit manhole and removed in accordance with the Management Company policy for waste management.

Cellular Systems - Operation and Maintenance Requirements

Maintenance schedule	Required action	Recommended Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually, or as required
Remedial actions	Repair/rehabilitation of inlets, outlet , overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms

3.17 Outfall Headwalls

- 3.18 Outfall headwalls should be visually inspected a minimum of monthly for the first three months after installation and then a minimum of once a year. Accumulated sediments, debris and any overgrown vegetative material should be removed from the culvert and margins of the outlet headwalls as necessary.
- 3.19 During the inspections the general operation, and structural condition of the headwall and any erosion of banks or scour control features should be identified and rehabilitated as required.

3.20 Existing Watercourse

- 3.21 However the existing ordinary watercourse should be visually inspected at least twice a year and any physical obstructions such as accumulated sediments at the outfall headwall, large rocks, rubble, fallen trees and branches and other waste materials (litter, grass cuttings etc) removed so that water can flow freely.

3.22 Attenuation Basins

Key Maintenance Requirements:

- Litter/trash removal
- Inlet/outlet headwall inspection and cleaning
- Vegetation management
- Sediment monitoring and removal when required

- 3.23 Regular inspection and maintenance is important for the effective operation of the attenuation basin. The basin will be subject to a routine monitoring and maintenance schedule as part of the general site management. This will be carried out at intervals detailed below, and shall comprise the following operations:

Collection and removal of all litter/large debris from the attenuation pond, inlets, outflows, and water margins once a month.

Monthly inspection of the attenuation ponds to check the following, and repair as necessary:

1. Any failure in the operation of the inlet and outlet headwalls unless adopted by others in which case they will be notified of any observed defect.
2. Any damage or erosion to the perimeter edges and slopes of the attenuation ponds.

- 3.24 The attenuation basin will be sown with two grassland seed mixes to create a simple mosaic of grassland habitat. The floor of the basin will be seeded with a wet meadow mix (WF2), whilst the banks will be seeded with a standard wildflower meadow mix (WF1) as detailed on the landscape proposals drawings.

3.25 **Ground preparation**

The basin should be constructed of predominantly low fertility subsoil, with only a thin upper layer of topsoil to be left after ground modelling to take up imperfections in the soil surface. Final surface to be harrowed / fully cultivated to break up large soil clods.

The basin area should then be continually cultivated for a period of several weeks to remove unwanted surface vegetation and weeds prior to meadow seeding. No herbicide is to be used due to the sensitive location of the basin construction. The ground should be cultivated to form a medium tilth and basin to be seeded at the recommended sowing rate, followed by light rolling (if necessary) throughout the meadow area.

3.26 **Landscape Maintenance (Year 1)**

In the first year, meadow areas should be managed more intensively to prevent the intrusion of invasive ground flora and allow a diverse sward to develop. The first cut should occur when the grass reaches approximately 100mm, down to 50mm, followed by subsequent cuts every 4-6 weeks down to 50mm throughout the first growing season.

- 3.27 Meadow areas should be monitored to assess the growth of any invasive species and grassland areas should be hand-weeded or spot-swiped for any perennial weeds such as docks, nettles and ragwort.

3.28 Landscape Maintenance (Year 2 onwards)

Meadow areas will be maintained with bi-annual cuts in May / June and after seed has dropped in late September. Meadow grassland should be cut to a height of approximately 100mm. All arising should be allowed to lay in-situ for 24 hours before being removed from the site in order to allow any wildlife using the basin to disperse. No fertiliser should be added to the grassland at any time and an annual monitoring visit to the grassland should be conducted to inform management that may be required.

3.29 An annual check carried out by a suitably qualified person, to assess the condition and operation of the attenuation basin inlet and outflow, and the accumulation of silt/sediment.

3.30 A record of maintenance visits and remedial operations shall be maintained.

3.31 The above operations shall (where feasible) be in conjunction with routine grounds maintenance operations to the surrounding landscape.

Basin Operation and Maintenance Requirements

Maintenance schedule	Required action	Frequency
Regular maintenance	Litter, debris and trash removal.	Monthly.
	Grass cutting – for landscaped areas and access routes.	Monthly (during growing season), or as required.
	Grass cutting – meadow grass in and around basin.	Half yearly (spring – before nesting season, and autumn).
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required).
Occasional maintenance	Re-seed areas of poor vegetation growth.	Annually, or as required.
	Prune and trim trees and remove cuttings.	As required.
	Remove sediment from pre-treatment system when 50% full.	As required.
Remedial actions	Repair of erosion or other damage by re-seeding or re-turfing.	As required.
	Realignment of rip-rap.	As required.
	Repair/rehabilitation of inlets, outlets and overflows.	As required.
	Rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates.	As required.
	Re-level uneven surfaces and reinstate design levels.	As required.
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly.
	Inspect banksides, structures, pipework, etc for evidence of physical damage.	Monthly.
	Inspect inlets and pre-treatment systems for silt accumulation. Establish appropriate silt removal frequencies.	Half yearly.
	Inspect infiltration surfaces for compaction and ponding.	Monthly.

3.32 Desilting of Attenuation Basins

In addition to routine items, SuDS maintenance will be carried out which may include desilting the attenuation ponds, usually on a 10-15 year cycle depending on the ongoing silt level checking.

This can be an intrusive operation when carried out within housing areas and prior to any planned desilting or dredging, consultation will be undertaken with the local authority and the Environment Agency.

- 3.33 Before any desilting operations are carried out, residents and members of the public in the general area will be informed and those in the immediate vicinity will be notified in writing well in advance of commencement of works.
- 3.34 The desilting work will be carried out under the supervision of consulting engineers and to a pre-agreed method statement. Such a method statement should be submitted in writing to the local authority and agreed in advance of the commencement of the works.
- 3.35 Prior to desilting works commencing, a suitably qualified ecologist shall be appointed to undertake an assessment of the ecological interest within the pond and its margins. In the event that the attenuation ponds develop particular ecological interest, then careful consideration will be given to the timing of this operation.

3.36 Vortex Separator

Downstream Defender (by Hydro International) or Similar

Maintenance at a Glance

Activity	Frequency
Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most cleanouts it is not necessary to remove the entire volume of liquid in the vessel. Only removing the first few inches of oils/floatables and the sediment storage volume is required.	

- 3.37 Vortex separators protect the environment by removing a wide range of pollutants, sediments, oil and floatables from stormwater runoff. The units are self-activating, have no moving parts, no external power requirement and are fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. They allow for easy and safe access for inspection/monitoring and clean-out procedures. Entry into the unit or removal of the internal components is not necessary for maintenance, thus safety concerns related to confined-space entry are avoided. Periodic removal of captured pollutants is essential to the continuous, long-term functioning of the unit.

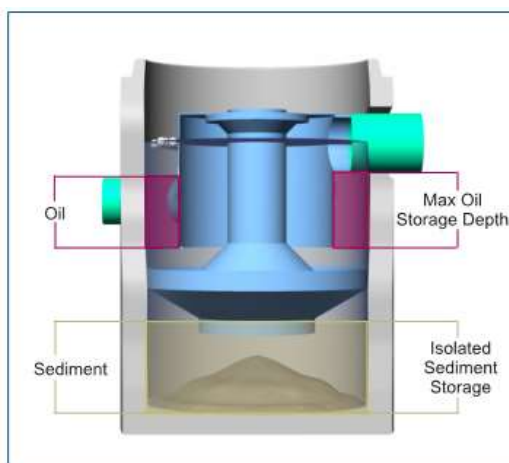


Fig.1 Pollutant storage volumes of the Downstream Defender®.

Table 1. Downstream Defender® Pollutant Storage Capacities and Max. Cleanout Depths.

Unit Diameter	Total Oil Storage	Oil Clean-out Depth	Total Sediment Storage	Sediment Clean-out Depth	Max. Liquid Volume Removed
(feet)	(gallons)	(inches)	(gallons)	(inches)	(gallons)
4	70	<16	141	<18	384
6	216	<23	424	<24	1,239
8	540	<33	939	<30	2,884
10	1,050	<42	1,757	<36	5,546
12	1,770	<49	2,970	<42	9,460

NOTES

1. Refer to Downstream Defender® Clean-out Detail (Fig. 1) for measurement of depths.
2. Oil accumulation is typically less than sediment, however, removal of oil and sediment during the same service is recommended.
3. Remove floatables first, then remove sediment storage volume.
4. Sediment removal is not required unless sediment depths exceed 75% of maximum clean-out depths stated in Table 1.

- 3.38 The separator allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located at the top of the manhole. Maintenance events do not require entry into the unit nor do they require the internal components to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

3.39 Determining the Maintenance Schedule

The frequency of cleanout is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log to establish a routine maintenance schedule. The vactor procedure, including both sediment and oil/floatables removal, typically takes less than 30 minutes and removes a combined water/oil volume of about 2000 litres.

3.40 Inspection Procedures

Inspection is a simple process that does not involve entry into the unit. Maintenance teams should be familiar with the unit and its components before inspection.

3.41 Scheduling

It is important to inspect the unit every six months during the first year of operation to determine the site-specific rate of pollutant accumulation:

- Typically, inspection may be conducted during any season of the year.
- Sediment removal is not required unless sediment depths exceed 75% of the maximum clean-out depths stated in Table 1.

3.42 Recommended Equipment

Safety Equipment and Personal Protective Equipment (traffic cones, work gloves, etc.)

- Crowbar or other tool to remove grate or lid
- Pole with skimmer or net.
- Sediment probe.
- Trash bag for removed floatables.
- Maintenance Log.

3.43 Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the unit as stipulated by local ordinances. Safety equipment should notify passing pedestrians and road traffic that work is being done.
2. Remove the lid(s) to the unit.
3. Without entering the unit, look down into the chamber to inspect the inside and make note of any irregularities.
4. Without entering the unit, use the pole with the skimmer net to remove floatables and loose debris from the outer annulus of the chamber.
5. Using a sediment probe measure the depth of sediment that has collected in the sump of the unit.
6. On the Maintenance Log, record the date, unit location, the estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also, note any apparent irregularities such as damaged components or blockages.
7. Securely replace the grate or lid.
8. Take down safety equipment.
9. Notify Hydro International of any irregularities noted during the inspection.

3.44 Floatables and Sediment Cleanout

Floatables cleanout is typically done in conjunction with sediment removal.

A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Floatables and loose debris can also be netted with a skimmer and pole.

The access port located at the top of the manhole provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump.

3.45 Scheduling

- Floatables and sump cleanout are typically conducted once a year during any season.
- If sediment depths are greater than 75% of the maximum cleanout depths stated in Table 1, sediment removal is required.
- Floatables and sump cleanout should occur as soon as possible following a spill in the contributing drainage area.

3.46 Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crowbar or other tool to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe.
- Vactor truck (150mm flexible hose recommended)

1. Set up any necessary safety equipment around the access port or grate of the unit as stipulated by local ordinances. Safety equipment should notify passing pedestrians and road traffic that work is being done.
2. Remove the lid(s) to the unit.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.

4. Using the Floatables Port for access, remove oil and floatables stored on the surface of the water with the vactor hose or the skimmer net.
5. Using a sediment probe measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log.
6. Once all floatables have been removed, drop the vactor hose to the base of the sump via the Central Access Port. Vactor out the sediment and gross debris off the sump floor.
7. Retract the vactor hose from the vessel.
8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also, note any apparent irregularities such as damaged components or blockages.
9. Securely replace the grate or lid.

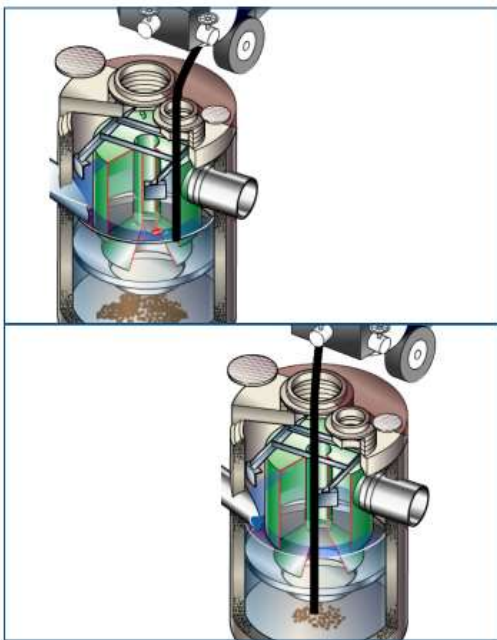


Fig.9 Floatables and sediment are removed with a vactor hose

3.47 For further detailed inspection and maintenance information and procedures refer to the manufacturer's document 'Downstream Defender Operating and Maintenance Manual'.

3.48 To order replacement parts contact Hydro International on:

██████████ (Monday to Friday 9.00 am to 5.30 pm)

██████████

████████████████████

3.49 Highway and Driveway Gullies

- 3.50 General gully maintenance involves the removal of dead leaves, soil and litter from the gratings and sediments from the sump within the gully pot or channel. This involves the removal of all protective covers and grids and the cleaning out of channels or gully pots by hand or with suitable jetting equipment. During the first year of operation, each gully and channel should be inspected every 4 months, and every year thereafter for structural integrity and cleaned out as required.
- 3.51 During construction, road gullies will be capped and headwalls netted to ensure construction silts and debris does not enter the drainage system. Maintenance will comprise the removal of large debris and litter by hand picker and sucking out the sediment/oil contents of any drainage feature into a tanker.

3.52 Swale

- 3.53 The swale will require regular maintenance to ensure continuing operation to design performance standards. Maintenance of swales is relatively straightforward for landscape contractors, and typically there should only be a small amount of extra work required for a swale over and above what is necessary for standard public open space.
- 3.54 Litter and debris removal should be undertaken as part of general landscape maintenance for the site and before any other SuDS management task.
- 3.55 The major maintenance requirement for dry swales is mowing. Mowing should ideally retain grass lengths of 75–150mm across the main “treatment” surface, to assist in filtering pollutants and retaining sediments and to reduce the risk of flattening during runoff events. Grass clippings should be disposed of either off-site or outside the area of the swale, to remove nutrients and pollutants.

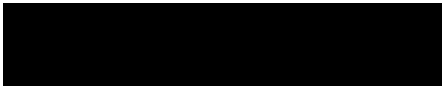
Swale Operation and Maintenance Requirements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeded	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

4 Contact Information

For further information on the management and maintenance of SuDS on the development please contact:

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