Shoreham Coastal Village Drainage Plan 2020

Project Team

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Report Summary

1. Introduction

Water Technology was commissioned by Mornington Peninsula Shire Council to undertake a drainage plan, following previous works by Council which recognised the need to resolve drainage issues across the catchment. The issues previously identified by Council and the community have been the focus of this study, with a preference for solutions to the problems to be practical, cost effective, environmentally sustainable and easily able to integrate opportunities for whole water cycle management. It is envisaged that this drainage plan will provide Council and the community with a future direction that overtime will address drainage issues faced in Shoreham.

Stage 1 of the project involved identifying existing issues and concerns, gaining key knowledge of the catchment, collation of existing data, and refining the scope of the project.

Stage 2 of the project is detailed in this report and includes the following:

- Identification of the hotspots from Stage 1
- Development of flood model
- Design storm events
- Analysis of drainage and erosion issues, and potential solutions
- Prioritisation of options
- Proof of concept selection
- Planning matters
- Recommendations

The recommendations act as a framework for the development of the drainage plan and were presented to the Council to seek feedback on the recommendations.

The subsequent Stage 3 of this project has incorporated feedback provided on the Stage 2 report with the development of a Drainage Plan presented to stakeholders including community representatives.

2. Background

The majority of Shoreham Coastal Village and all key hotspot areas identified in Stage 1 of the project lie within a small catchment area discharging to Western Port Bay. These areas have been highlighted as main focus areas, with any existing features and structures that may impact flooding and drainage. These areas of concern have been identified by Council and community. A key focus for the drainage strategy is to identify where integrated surface water management objectives can be implemented, improving not only flooding and drainage, but also delivering on other integrated management themes including water quality, water reuse opportunities, environmental and community values.

The catchment has 5 main drainage paths through Shoreham which all flow to Western Port Bay at various locations. The Shoreham catchment is very small and steep, with runoff occurring very quickly after intense rainfall. Some generic key concerns for the catchment identified from Stage 1 of the project are:

- Runoff from unsealed roads resulting in erosion and loss of road base (gravel)
- Maintenance of roadside drainage.
- Lack of formal kerb and channel drainage.
- Steepness of the catchment leading to high velocities and erosion potential
- Blockage of culverts from sediment (unsealed roads and roadside drains)
- Existing vegetation making engineering works difficult without impacting native vegetation.

Further analysis of the stormwater and erosion issues identified at key areas are also discussed in Section 6.

3. Identification of hotspots

Water Technology used the results of the catchment flood modelling along with stakeholder feedback from Council and the community from the engagement session, to identify hotspots. The hotspots were grouped into eight geographic areas. Table 3-1 gives a breakdown of the eight different hotspot areas with a brief description of the issues.

TABLE 3-1 FLOODING, DRAINAGE AND EROSION HOTSPOTS

Hotspot ID	Hotspot	Description
1	Marine Parade 1 and Campground	Runoff from Marine Parade onto properties on the low side of the road, then onto foreshore affecting the use of camp sites.
2	Marine Parade 2	Heavy runoff along Marine Parade scouring the road edge reducing the road width. Siltation issues affecting drain capacity.
3 **Though discussed separately, the prioritisation assessment considers it as one hotspot area.*	A) Prout Webb Road	Coastal erosion risk and stormwater flooding
	B) Cliff Road	Runoff along Cliff Road causing saturation of land and flooding along gullies.
4	Blake Street, Fisher Street and Foreshore	Sedimentation along Blake Street at northern end by the entrance to Buxton Reserve Issues of runoff along towards the bottom of Blake Street, entering Prout Webb Road. Runoff through the land area between Blake Street and those properties on Fisher Street, with pathway flowing down towards the Foreshore.
5	Sydney Road, May Street, Oxford Street, Cliff Road and Steen Avenue	Heavy runoff flowing down Sydney Road from Cliff Road, Steen Avenue and onto May Street properties. On May Street there is potential of undermining of a building structural integrity on property, and ineffective strip drain along the road in places. Flow path through gardens on Oxford Street.
6	Byrnes Road and Steen Avenue	Village common drainage issues – the verge on south side of Byrnes Road adjacent the common gets boggy, impacting roadside parking, and movement to path. Issue causes water to pool. Cases have reported blocked drains in the area of Byrnes Road and Steen Avenue. Issus along Steen Avenue due to topographic nature of the area
7	Buxton Reserve to Foreshore	Path at Lexington Avenue has been washed out on multiple occasions as a result of path not coping with flow. Road verge is too low causing some properties to flood from road runoff. Drainage issues and diverted drainage onto Nelson street causing flood issues.
8	Pine Grove, Myers Drive and Point Court	Inundation around Myers Drive, Pine Grove and Point Court. Due to blocked drains causing ponding and runoff bypassing the pits. Low road verge along Myers Drive. Some driveways in Pine Grove have no drainage crossovers, blocking roadside drainage.

Some of the hotspot areas have multiple issues. Figure 3-1 shows specific locations where flooding and erosion issues have been identified around Shoreham. The details of the flooding, drainage and erosion issues at each of the eight hotspots is discussed in detail in Section 5. A multi-criteria assessment was used to prioritise the hotspots.

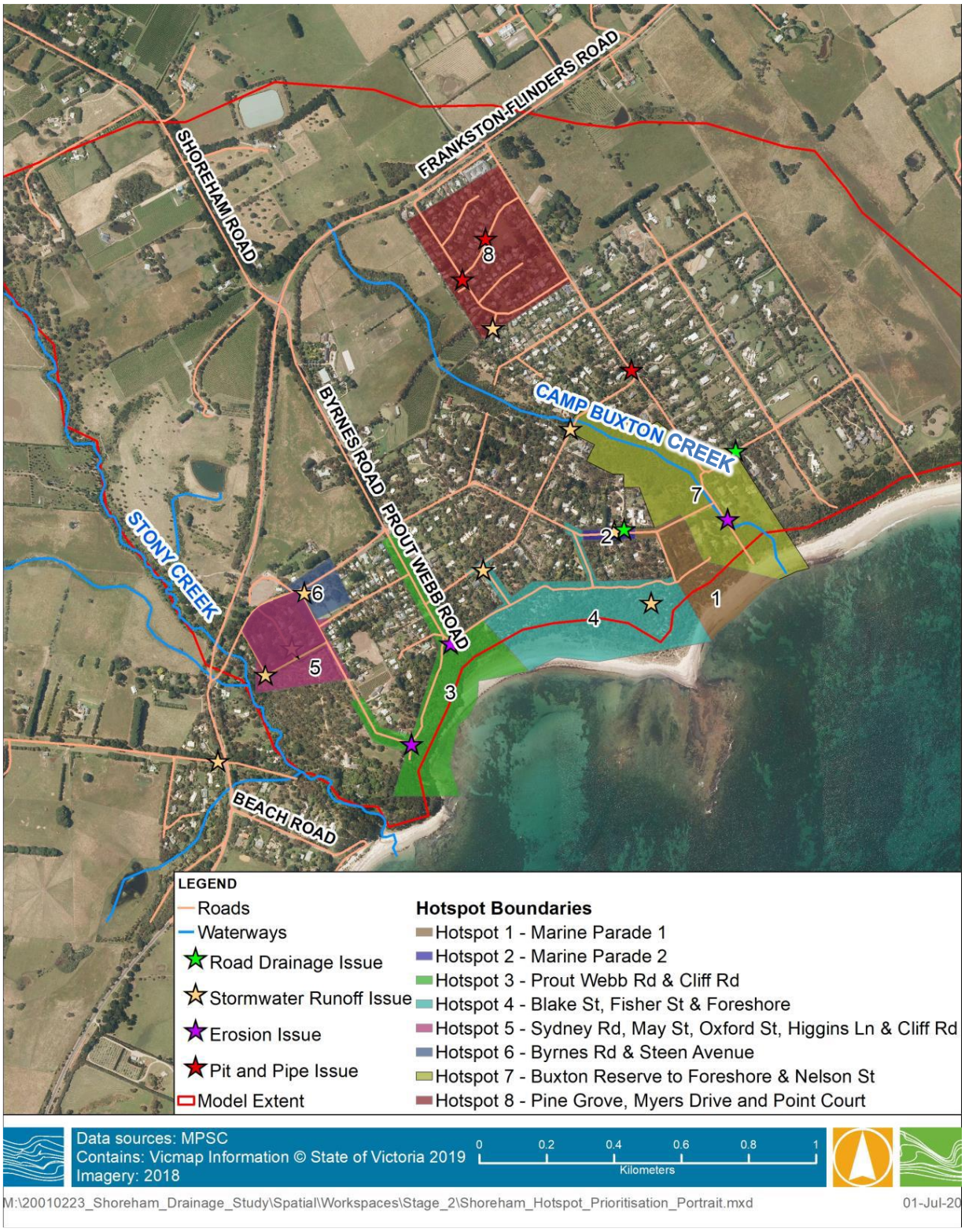

FIGURE 3-1 HOTSPOT LOCATIONS WITH KEY ISSUES

4. Development of flood model

A detailed hydraulic model was developed using TUFLOW software. The hydraulic model adopted a rain on grid approach. The hydraulic model used aerial laser survey (LiDAR) to represent the existing ground surface of the catchment, details of the existing council drainage infrastructure, and design rainfall data from the Bureau of Meteorology. Historic flood information and feedback from Council and community were used to validate the modelled flood behaviour.

FIGURE 5-1 1% AEP MAX DEPTH RESULTS

A detailed assessment of the flooding, drainage and erosion issues associated with the eight hotspot areas, using results of the flood model and from observed historic issues and site inspection are discussed in Section 5.

5. Analysis of flooding, drainage and erosion issues

5.1. Hotspot 1: Marine Parade 1

FIGURE 6-1 HOTSPOT 1 - ISSUES AND CATEGORISED SOLUTION

5.2. Hotspot 2: Marine Parade 2

FIGURE 6-4 HOTSPOT 2 - ISSUES AND CATEGORISED SOLUTION

5.3. Hotspot 3: Prout Webb Road (A) and Cliff Road (B)

FIGURE 6-8 HOTSPOT 3(A AND B) - ISSUES AND CATEGORISED SOLUTION

5.4. Hotspot 4: Blake Street, Fisher Street and Foreshore

FIGURE 6-11 HOTSPOT 4 - ISSUES AND CATEGORISED SOLUTION

5.5. Hotspot 5: Sydney Road, May Street, Oxford Street, Higgins Lane and Cliff Road

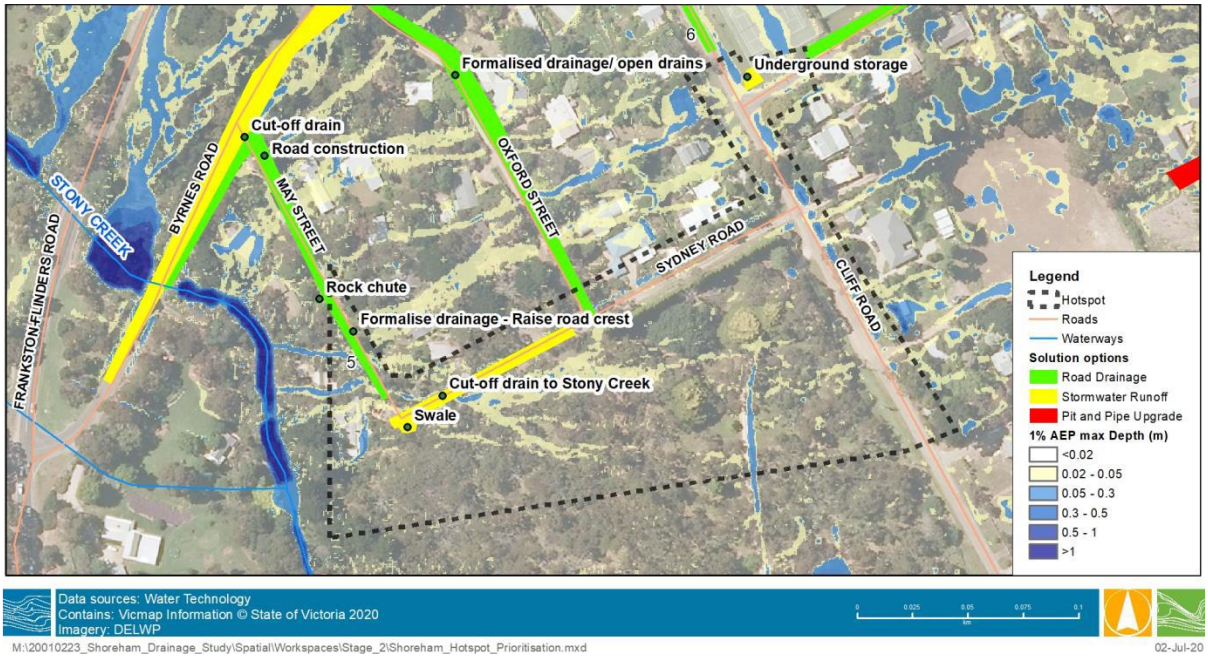

FIGURE 6-13 HOTSPOT 5 - ISSUES AND CATEGORISED SOLUTION

5.6. Hotspot 6: Byrnes Road and Steen Avenue

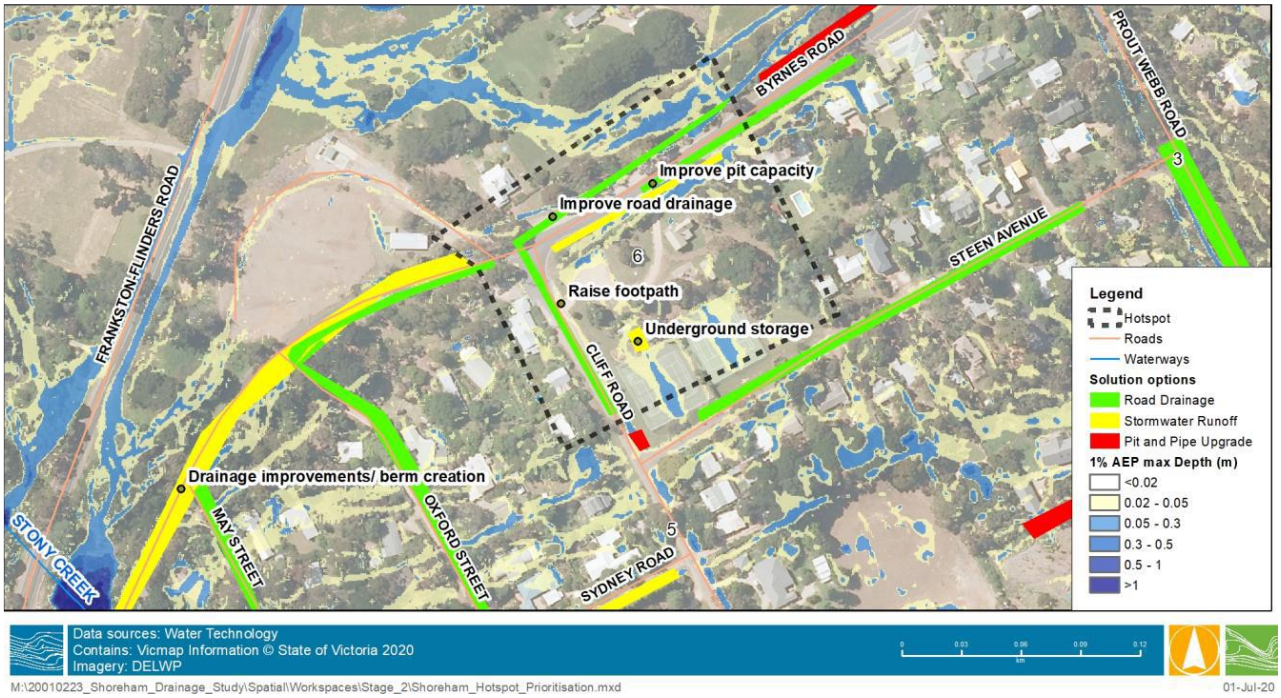

FIGURE 6-14 HOTSPOT 6 - ISSUES AND CATEGORISED SOLUTION

5.7. Hotspot 7: Buxton Reserve to Foreshore and Nelson Street

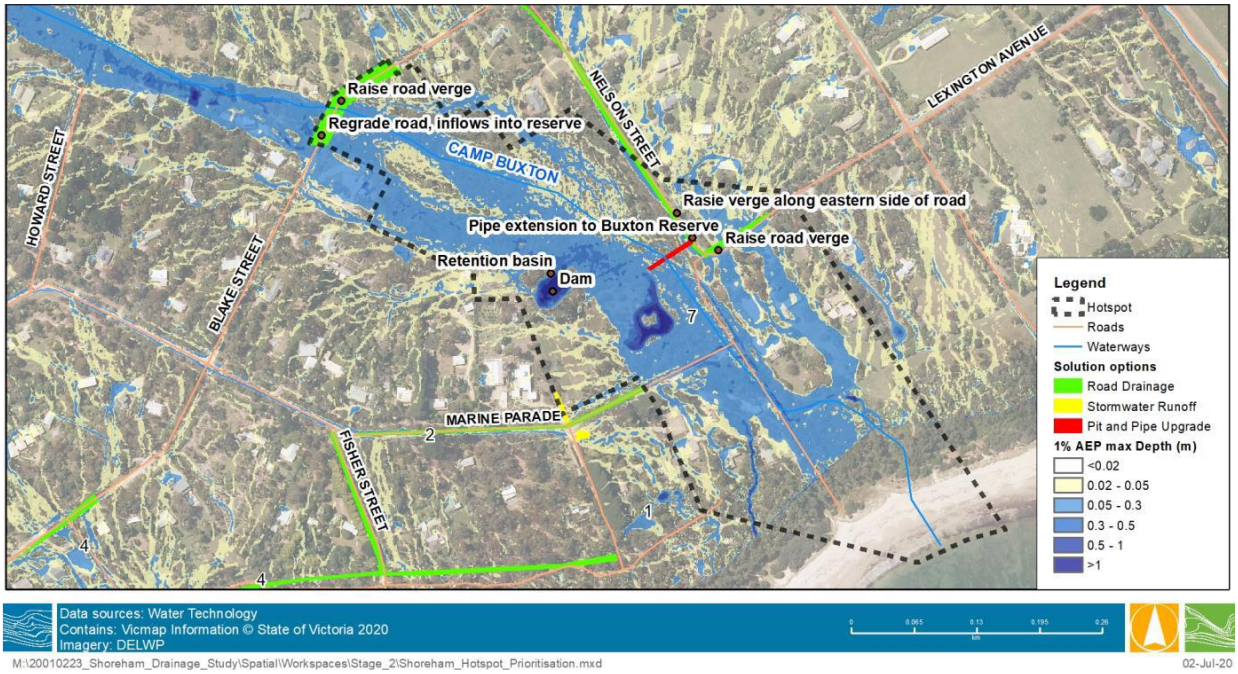

FIGURE 6-17 HOTSPOT 7 - ISSUES AND CATEGORISED SOLUTION

5.8. Hotspot 8: Pine Grove, Myers Drive and Point Court

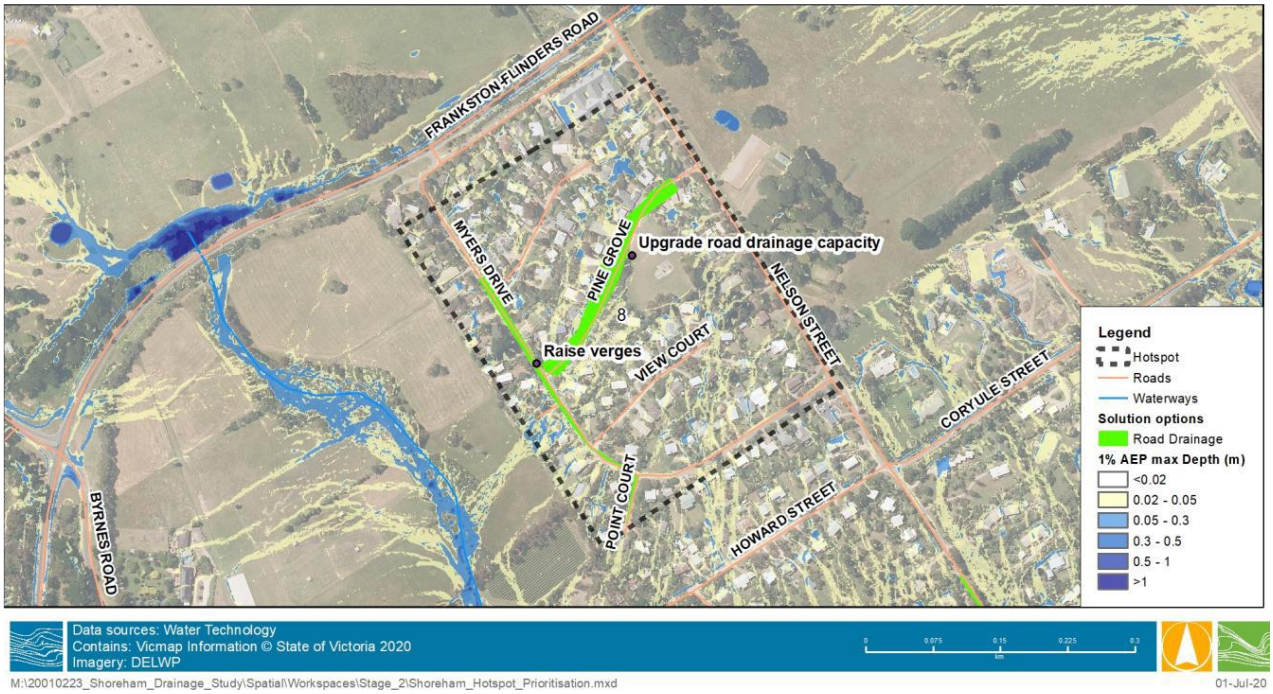

FIGURE 6-18 HOTSPOT 8 ISSUES AND CATEGORISED SOLUTIONS

5.9. Summary of solution options

There are several solution types that have been identified throughout this investigation that could be applied in different areas across Shoreham. Table 6-1 outlines how each solution type, and its associated primary issue could have various benefits and drawbacks that need to be considered. Note that they are generalised and detailed concept design is required to take options forward to the next stage of planning and assessment. The most suitable locations for different options are also outlined, with the key hotspots/roads that are suggested for the solution. It should be noted that some solutions identified can have multiple benefits, this being environmental and flood risk reduction. Solutions may also have impacts beyond the works boundary, with flow on benefits down through the catchment. For example, better defined drains could improve road drainage in the specific area it is applied to, yet it may also reduce erosion of the road and sedimentation in the drainage network further downstream.

There are a few solution types highlighted repeatedly through this investigation and should therefore be considered as generalised solutions across Shoreham.

- Improvements to the open roadside drain capacity across Shoreham could be improved so there is a continuous drainage pathway through the town, the foreshore and into the Bay. These drains could have an agreed design standard and use standard construction methods.
- Investigations into the pipe and pit network in some areas and improvements to roadside verges to increase their level and maintain more water within the roadway rather than flowing onto residential land.
- Sediment basins or soak pits should be considered, which are a water sensitive urban design feature that relies on stormwater principles of retention and infiltration. Located at the end of the stormwater drainage network, in low lying areas along the foreshore, they could collect incoming stormwater, allow sediment to settle out, and allow water to slowly infiltrate into the surrounding ground. These are a common feature used across Mornington Peninsula and will deliver water quality benefits prior to discharging to the Bay.
- Sealing of roads is another option that has been highlighted by Council as a consideration for Shoreham, particularly along some of the key access and through roads in Shoreham, such as Byrnes Road, Prout Webb Road and Marine Parade. This would prevent the frequent erosion of the unsealed roadways, preventing downstream sedimentation and blockage of the drainage network. This erosion and sedimentation issue is a persistent issue across Shoreham. However, this option of sealing the roads is expensive in addition to it potentially changing the rural character of the village.

6. Prioritisation

The eight flooding, drainage and erosion hotspots were prioritised using a multi-criteria assessment. The flood modelling results of the 1% AEP event and the VicMap property parcel layer were used to identify the properties which are likely to be inundated during a 1% AEP event. The inundated properties within each hotspot area were assessed using several weighted criteria to develop a score for each hotspot area. The score for each hotspot area was then ranked with the highest score resulting in the highest priority hotspot area.

6.1. Final prioritisation ranking for flooding hotspots

Rank (Priority): 1 **Hotspot Reference: 5**

Description	Summary of Issues	Summary of Mitigation Options
Sydney Rd, May St, Oxford St, Higgins Lane & Cliff Rd	Heavy runoff flowing down Sydney Road from Cliff Road and onto May Street properties. On May Street there is potential of undermining of a building structural integrity on property, and ineffective strip drain along the road in places. Flow path through gardens on Oxford Street and runoff along Higgins Lane.	Diversion of flows from May Street by implementing swale on Sydney Road and implementing a cut-off drain on the uphill side of May Street to capture overland flows and diverting them onto Byrnes Road; one also placed on the southside of Sydney Road Road construction including easement on May Street and Sydney Road. The cut off drain on May Street would drain through to Stony Creek. Formalise roadside drainage in hotspot to include cross over drainage connections under driveways. Raise road crest on May Street. Could potentially combine with a maintenance regime to solve the issue of runoff onto properties on May Street. This would include an initial scheme developed by council to clear the drainage and then offer up to the private residents to maintain. Review capacity of drain along eastern side of May Street. Build headwall and pond at crossing in road reserve at the corner of May Street and Sydney Road, to restrict flow. Erosion control measures through drainage path at property on 6 May Street, to include a rock chute. Future dwellings to be raised by a minimum of 300mm from the ground level, however the level needs to be considered on a case by case basis.

Rank (Priority): 2 **Hotspot Reference: 7**

Description	Summary of Issues	Summary of Mitigation Options
Buxton Reserve to Foreshore and Nelson Street	Path at Lexington Avenue has been washed out on multiple occasions as a result of path not coping with flow. Road verge is too low causing some properties to flood from road runoff. Sedimentation along Blake Street at northern end by the entrance to Buxton Reserve	Raise the road verge of Nelson Street and Lexington Avenue. This would ensure road runoff doesn't spill on to properties. The pit and pipe capacity also needs investigating further. Potential to improve function of Dam in Buxton reserve and its ability in capturing and storing water. Regrade road on Blake Street by Buxton Reserve and add discharge points to reduce stormwater runoff along road.

Rank (Priority): 3 **Hotspot Reference: 2**

Description	Summary of Issues	Summary of Mitigation Options
Marine Parade 2	Heavy runoff along Marine Parade scouring the road edge reducing the road width. Siltation issues affecting drain capacity.	Better define drains onto culvert entry (deepening, widening and lining) at Nelson Street and Marine Parade. Could be undertaken through private properties adding rocks to flow paths, to reduce velocity and control erosion. Roadside drains/swale to be designed with 10% AEP level of service. Road construction of Marine Parade and the walking track at the end of Nelson Street, with defined drainage along it.

Rank (Priority): 4 **Hotspot Reference: 1**

Description	Summary of Issues	Summary of Mitigation Options
Marine Parade 1	Runoff from Marine Parade onto properties on the low side of the road, then onto foreshore affecting the use of camp sites.	Swale to store water with an informal retention basin, placed at Buxton Reserve. Review roadside drainage capacity and include allowance for driveway crossovers (landholder's responsibility with technical assistance from Council). Raise campground pitches to 300mm above the ground.

Rank (Priority): 5 **Hotspot Reference: 8**

Description	Summary of Issues	Summary of Mitigation Options
Pine Grove, Myers Drive and Point Court	Inundation around Myers Drive, Pine Grove and Point Court. Due to blocked drains causing ponding and runoff bypassing the pits. Low road verge along Myers Drive. Some driveways in Pine Grove have no drainage crossovers, blocking roadside drainage.	Raise roadside verges along Myers Drive and Crossover drains along Pine Grove to assist in formalising drainage (landholder's responsibility with technical assistance from Council). Review pit capacity in the hotspot.

Rank (Priority): 6 **Hotspot Reference: 6**

Description	Summary of Issues	Summary of Mitigation Options
Byrnes Road and Steen Avenue	Village common drainage issues – the verge on south side of Byrnes Road adjacent the common gets boggy, impacting roadside parking, and movement to path. Issue causes water to pool. Cases have reported blocked drains in the area along both Steen Avenue and Byrnes Road.	Improving pipe network by cleaning and reshaping and investigate drainage further to determine if pit capacity of Byrnes Road could be improved. There might not be a pit on Byrnes Road by town hall – it might reach the hall and then across the road to the bus stop. Uncertain of pathway. Local drainage improvements on Byrnes Road and Steen Avenue. Raise footpath by town hall car park. Creation of underground storage in the area around the town hall could be used to drain local ponding from a low point which could then drain into the Council drainage network.

Rank (Priority): 7 **Hotspot Reference: 3 A & 3 B**

Description	Summary of Issues	Summary of Mitigation Options
Prout Webb Road (3A)	Coastal erosion risk and stormwater flooding	Install erosion control and soak pit at Prout Webb Road, increase drain capacity to enable creation of a continuous pathway through Shoreham. The more defined open drains would be targeted along the western side of the road, and then at the east side to the corner of the lane too. Upgrades to the pipe network at top end of Cliff Road, to allow for a continuous drainage pathway through Shoreham reducing runoff along Cliff Road and Prout Webb Road.

Cliff Road (3B)	Runoff along Cliff Road causing saturation of land and flooding in gullies that spill over.	Increase capacity where possible to increase capacity and ensure that the gullies in the area are well regulated to minimise erosion

Rank (Priority): 8 **Hotspot Reference: 4**

Description	Summary of Issues	Summary of Mitigation Options
Blake Street, Fisher Street and Foreshore	Issues of runoff along towards the bottom of Blake Street, entering Prout Webb Road. Runoff through the land area between Blake Street and those properties on Fisher Street, with pathway flowing down towards the Foreshore.	Improve capacity of roadside drains to prevent overflows damaging road, which continues through the foreshore to a defined gully discharging to Western Port Bay. Include end of line storage area through creation of detention basin (dam/tank/water reuse).

7. Recommendations

Based on the flood model results, discussions with Council, public engagement, and a site visit, and the subsequent assessment of issues and prioritisation of hotspots, Water Technology has provided the following recommendations.

The Multi-Criteria-Assessment showed that the following hotspot areas should be considered the highest priority for further investigation and future works.

Sydney Road, May Street, Oxford Street and Cliff Road

- Cut off drain on south side of Sydney Rd
- Raised entrance to May St off Byrnes Rd with pipe under May St to keep flow from Byrnes Rd heading along Byrnes Rd to Stony Creek
- Roadside drainage on May St to control flow to outfall locations (Byrnes St and 6 May St)
- Raised verge or road crest on May St
- Headwall and small storage area upstream of May St with upgraded pipe under May St to 6 May St outfall
- Rock chute erosion control at 6 May St
- Oxford St formalised drainage with controlled and defined outfalls
- Planning for overland flow and site-specific protection measures including driveway crossovers and advice on future dwellings to be raised by at least 300mm above ground level

Solutions to the flooding, drainage and erosion issues facing these following hotspot areas are likely to be longer term projects requiring significant budget allocations in coming years. Other projects which did not rank as high but are still important in the short to medium term include the following.

Marine Parade (Hotspot 1)

- Creation of a swale in Buxton Reserve
- Improvements to roadside drains
- Road construction of Marine Parade

Marine Parade (Hotspot 2)

- Better define drains onto culvert entry
- Upgrades to roadside drains
- Raise campground pitches to 300mm above the ground

Pine Grove, Myers Drive and Point Court

- Raise roadside verges along Myers Drive and
- Crossover drains along Pine Grove to assist in formalising drainage (landholders' responsibility with technical assistance from Council).
- Review pit capacity in the hotspot.

Buxton Reserve to Foreshore and Nelson Street

- Raise the road verge
- Regrade road on north end of Blake Street and add discharge points to reduce flow along road to enter into Buxton Reserve
- Investigate pit and pipe capacity

Other projects which were ranked lower but which are still important to consider include:

Blake Street, Fisher Street, Foreshore and Myers Drive

- Improve capacity of roadside drains and include end of line storage
- Upgrade pipe along top end of Cliff Road to increase flow capacity

Prout Webb Road

- Erosion control and standard soak pit at Prout Webb Road

Cliff Road

- Increase capacity of drains where possible and ensure the gullies are well vegetated

Council should consider budget for undertaking a functional design and costing for priority flooding hotspots identified in this study. Water Technology can assist with progressing the works to the next stage, which would assist Council in then seeking funding to complete the detailed design and construction of the works.

8. Funding and Implementation

Outcome of further detailed investigations on the above findings and recommendations will help develop business cases for the delivery of appropriate mitigation options in the future. Funding options for these projects will be determined dependent on the nature of the projects and their suitability for schemes, grants and incentives from applicable agencies.

Minor drainage improvements recommended in the report will be considered for implementation, which requires improved community understanding, upgrade and/or maintenance of property driveway culverts and reporting of blockages and issues.