

# Hinterland Environmental Water Scheme - **DRAFT**

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**Hinterland Environmental Water Scheme**  
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# Executive Summary

## Overview

To utilise upgraded recycled water from the South Eastern Outfall (SEO) and direct it to the farming hinterland of the Mornington Peninsula.

This will reduce the volume of treated Class A recycled water exiting the outfall into Bass Strait and will assist the future-proofing of the outfall capacity due to Melbourne's population growth. In addition, the Hinterland Environmental Water Scheme (HEWS) will seek to optimise under-utilised farming land to create a secure, high-value horticulture industry.

It is proposed to extract the recycled water from the SEO at no cost and then post-treat it through a reverse osmosis filtration system to then pump to our farming hinterland. Further, the energy provision of the pumping network will be offset (where possible) by a localised on-site solar farm.<sup>1</sup>

This report is to be considered as a 'back-of-the-envelope' submission in order to verify the basic financial and design feasibility and provide government with the necessary background to invest in a full design and feasibility evaluation (see Recommendations 1).

Expertise for this full design and feasibility study will need to access intellectual property currently held by Water Shed Innovations (WSI) who have done the preliminary scientific research for this report.

Together with the construction of a trial horticultural site, we see the HEWS aligning with a vision to create a forward-thinking, highly efficient, profitable, secure horticultural industry for our region.

The proximity of the project to Melbourne guarantees a high level of food security for the city's current and growing population

## Findings

Research behind this paper has determined that the HEWS is both financially viable and feasible from an engineering perspective, with no new technology required to complete the project.

It was also deemed relevant to consider various funding proposals to construct the treatment plant, pumping station/s and the delivery pipelines, such as Public Private Partnerships and/or direct government funding.

For the latter, South Eastern Water (SEW) advised they have recently undertaken research of their customer base and determined there is appears to be a willingness by customers make an additional direct contribution to water recycling infrastructure projects.

## General

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<sup>1</sup> It is unlikely that there will be enough energy to process and pump water when the scheme is at maximum capacity although this may change with the rapid advances we are seeing in solar generation and storage technology.

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This report finds this project to be financially viable providing a return to government over the long term subject to the project being managed and structured with local expertise, knowledge and ownership.

This expertise and ownership should lead to the creation of a Hinterland Environmental Water Scheme Authority which would be a locally weighted authority familiar with local climate, soils, growing conditions, economy and historical farming practices.

The initial phase of the project<sup>2</sup> will be to construct a trial site to test the efficacy of the post-treatment filtration design and then its use on selected trial high-value horticultural crops.

The Mornington Peninsula Shire Council (MPSC) have initially agreed in principle to allow use of land at The Briars in Mt Martha for innovative horticulture and this site would be ideal as the trial site for this project due to its proximity to the South East Water (SEW) Mount Martha treatment plant.

## Other benefits

As listed below in point form and expanded within the body of the report

1. Environmental benefits
2. Food Security
3. Climate change
4. Bushfire protection
5. Green Wedge Zone preservation
6. TAFE training for future careers in horticulture
7. Regional Economic Development
8. Unlocking of prime agricultural soils for food production
9. Energy neutrality

## Recommendations

1. Obtain funding of up to \$1.5 million to undertake a full design and feasibility evaluation of the project as soon as possible
2. Obtain funding of up to \$5 million to create the trial site
3. Investigate options for future funding of recycled water infrastructure through the allocation of a 'Recycled Water Infrastructure Levy' on all waste water contributors into the Eastern Treatment Plant or the SEO

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<sup>2</sup> While not discussed in detail in this report, there is an opportunity to commence distribution of RO water to our farming hinterland from the Somers Treatment plant within 12 months

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# Introduction

## Background

The project was initially conceived by Steve Marshall and Russell Joseph, as a means to address the lack of available water to drive horticultural industry on the Mornington Peninsula. Beneficially, this would also reduce the amount of discharged recycled water via the South Eastern Outfall.

It was then determined that while the outfall water was technically suitable and approved by the EPA for irrigation, it still had the ability to cause long-term soil degradation and pollution via nutrient run-off unless it was post-treated.

It was clear at this point that the most effective means of purifying the SEO water was reverse osmosis (RO) and this report is based on this treatment methodology.

Further it was determined from initial engineering computations that if the RO water was pumped to a high point near Arthurs Seat then gravity would be able to effectively distribute the water to the majority<sup>3</sup> of the hinterland area, for both community, environmental and farming requirements.

## Interested parties in recycled water development

From the outset, this project has been discussed at a State Ministerial and Shadow Ministerial level as a non-partisan project.

As a result, Melbourne Water, South East Water and Southern Rural Water have provided technical details and design support since inception.

The MPSC have also given in-principle support at Councillor and management level.

A brief list of relevant interested parties consulted is as follows:

1. South East Water
2. Melbourne Water
3. Mornington Peninsula Shire Council
4. Southern Rural Water
5. Environment Protection Agency
6. Victorian Farmers Federation
7. Country Fire Authority
8. Horticulture Innovation Australia
9. Nursery and Garden Industry Victoria
10. Save Tootgarook Swamp (Environmental Group)

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<sup>3</sup> The final Design and Feasibility Study will determine the exact coverage but it is envisaged to be over 80% of MPSC hinterland farms

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11. TAFE Rosebud
  12. Clean Ocean Foundation
  13. Landcare Network
  14. Westernport and Port Phillip Catchment Management Authority
  15. South Eastern Metropolitan Partnership
  16. Food Industry Advisory Body (as auspiced by the MPSC)
  17. Bunurong Land Council Aboriginal Corporation

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# Outline of the Hinterland Environmental Water Scheme (HEWS)

## Why irrigate the hinterland?

### The Water

Recycled water from the South Eastern Outfall is currently being dumped into Bass Strait at Boags Rocks near Gunnamatta Beach at the average rate of 350 million litres per day,<sup>4</sup> every day.

This water volume is currently being treated to irrigation quality Class A standard at the Eastern Treatment Plant at Carrum and is also being added to by the Mt Martha and Boneo Treatment Plants.

While the water is suitable for irrigation it is also toxic to the marine environment to which it discharges. Added to which, South East Water and Melbourne Water are under considerable regulatory pressure to reduce or limit the volume of water currently being discharged. This volume will only increase as Melbourne's population increases.

At the same time, we also need to secure our future food production within close proximity to Melbourne in order to feed our increasing population. On this basis, it makes sense to divert as much of this existing outfall water as possible to our established farming hinterland.

On all counts, the Hinterland Environmental Water Scheme is the only viable solution to address both our impending demographic needs around food security and economic development, while utilising significant daily volumes from the SEO.

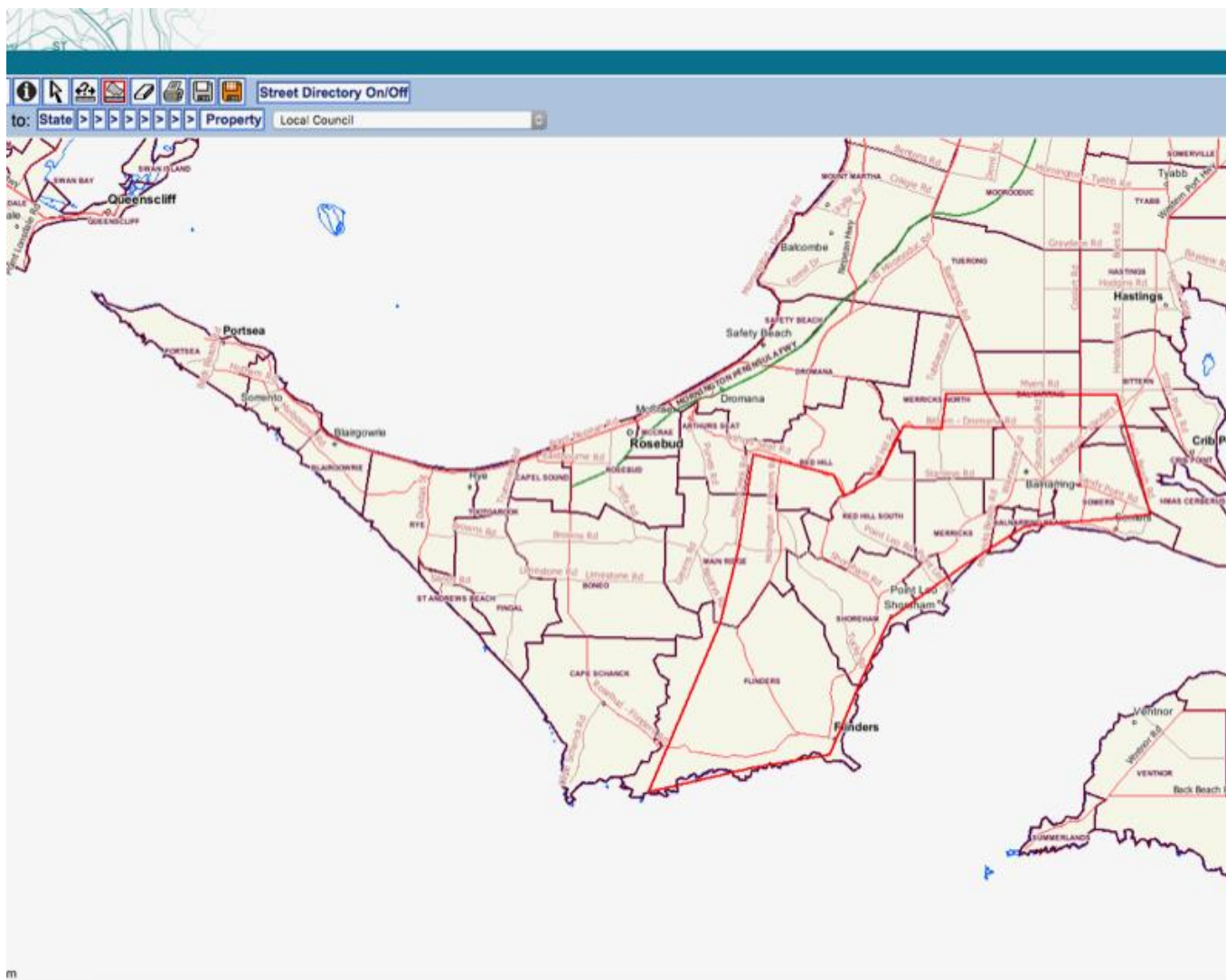
### The HEWS footprint

This report is based on a footprint of approximately 16000Ha and broadly contained within the areas outlined below.

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<sup>4</sup> This is an average number based on historical flow data from Melbourne Water (e.g.: Melbourne Water Annual Report 2011-2012) and various documents from the Environmental Protection Authority





## Current Farming Enterprises

The HEWS will have the ability to transform agricultural land within the Mornington Peninsula Hinterland by enabling a massive increase in production of high-value, high-yield and highly water-intensive crops.

Currently, the predominant farming use of this land is livestock and viticulture, both of which are low water use activities. Vines only need water during the establishment phase (usually three years) and the livestock production is based on a dry land methodology and relies mostly on rainfall except for a handful of farms with access to suitable water.

The vast majority of livestock farms are 100 acres or less and with the value of land on the Peninsula escalating at a rapid rate, many of these farming enterprises struggle to even pay their rates. For example, even with the introduction of 30 acres of high value HEWS irrigated horticulture on an existing 100 acre farm, the returns to the land holder will be far in excess of what they could currently earn. Please refer to Farm Production and costing examples in the Appendix, for detailed analysis of the farm production models.

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Currently, high-value horticultural development is inhibited in this region, due to a lack of available water resources. The existing horticultural developments have come about due to historical access to surface water storages (dams) or high quality underground aquifers. Access to these types of water resources have been heavily restricted due to legislative changes from the year 2000.

An example of a high-value horticulture enterprise, unhampered in its access to water, is the Sunny Ridge Strawberry Farm, based in the heart of the hinterland. They were able to secure early licenses prior to the year 2000 when irrigation water throughout the State, became capped. As no further irrigation dams have been approved in the years since, this has effectively stifled any further significant horticultural production.

A further example is the Boneo market garden region which originally prospered with unfettered access to high-quality aquifers (bores). Following the licensing and extraction capping of bore water, further high-value horticultural development slowed, until access to recycled water became available.

While the recycled Class A water is relatively suitable at Boneo, due to soil types, the same water is not as suitable for the hinterland, hence the need for an improved recycled water product for the HEWS.

#### Existing users of on-stream water

One of the key principles of the HEWS is for it to be a holistic environmental water project. As such, one of the long-term goals of the scheme is to reduce, and where possible remove, the demand for on-stream storage and in the process, restore crucial environmental flows.

The use of on-stream storage is a historical legacy issue which has arisen precisely because there has been, until HEWS, no alternative water supply available (other than damming a water-way).

Transitional arrangements to allow for removal of on-stream storage will need to be discussed with all stakeholders as part of the evaluation process.

## Why improve recycled water by Reverse Osmosis?

Currently, water in the SEO is of a “Class A” standard approximately 95% of the time. Class A is a general term that mainly reflects the health exposure risks to this water. It does not specifically reflect salinity, nutrient levels and other impurities.

Water extracted from the SEO would be treated by reverse osmosis, to foremost, reduce dissolved conductive ions (salts) as the current water in the SEO ranges between 700 – 1000 parts per million (PPM) and this number is in the higher range for long term use on heavier clay soils. According to test results, the Sodium Absorption Ratio (SAR) which is used to indicate the effect of long-term use of a water on soil structure, indicates that there may be some risk to hinterland soil structure by utilising untreated Class A water in its current state.

Class A water also carries a high nutrient load of both nitrogen and phosphorus compounds. These compounds present the highest risk to environmental waterways via accidental run-off, which may result in detrimental effects including algal blooms and damage to marine ecosystems. Further, the high concentration of phosphorus is detrimental to native plant species.

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Farmers often need to control the applications of such compounds at certain points of the cropping cycle. By eliminating these compounds, farmers can better utilise the water and tailor it to their crop's requirements, soil and climate conditions.

Lastly, one of the greatest barriers to uptake of recycled water has been the level of regulatory compliance required. Currently, each individual user of recycled water from the SEO, must enter into an agreement with the regulatory authorities, precisely detailing how the water will be used and furthermore, requiring a yearly audit of that water use. By improving the water at the point of extraction from the SEO these licensing obligations can be removed from the individual user and transferred to a single entity.

It should be noted that the EPA may need to create a new category of recycled water for this RO improved water based on scientific method and risk analysis.

## What crops can/should be produced by the HEWS?

From an economic perspective, it is imperative that high-value horticultural crops be prioritised as part of the HEWS. These are generally crops requiring the most water and as demonstrated by the models in the Appendix, it is clear that these are indeed the most suitable crops for the hinterland.

For virtually all crops, it is accepted agricultural science that yields will increase under irrigation. It is the ability to securely increase yields of high-value crops through access to sufficient water, which makes this project so attractive.

We already know the following crops grow very well in our climate and with an unlimited and secured water supply we can be assured of ensuring higher yields whilst also reducing the inherent risk of crop failure through lack of water. Examples of existing crops which will become safeguarded with guaranteed water supply, include:

1. Apples
2. Strawberries
3. Cherries
4. Wine grapes
5. Avocados
6. Olives

As previously stated, the proposed trial site at the Briars will ultimately determine the suitability of a new range of crops within the Mornington Peninsula, with a focus on the hinterland. The intended crops to be trialed, subject to further investigation and evaluation, may include:

1. Hops
2. Citrus (Lemons and Limes)
3. Persimmons
4. Flowers
5. Hydroponics (glasshouse conditions)

6. Pomegranates
7. Quinces
8. Tree nurseries
9. On land (Arid) Aquaculture

### Accessing the South Eastern Outfall (SEO)

During the design of the Hinterland Environmental Water Scheme (HEWS), it was identified that the extraction point from the SEO should be at Port SEO020, with a re-injection of the concentrate into Port SEO019.

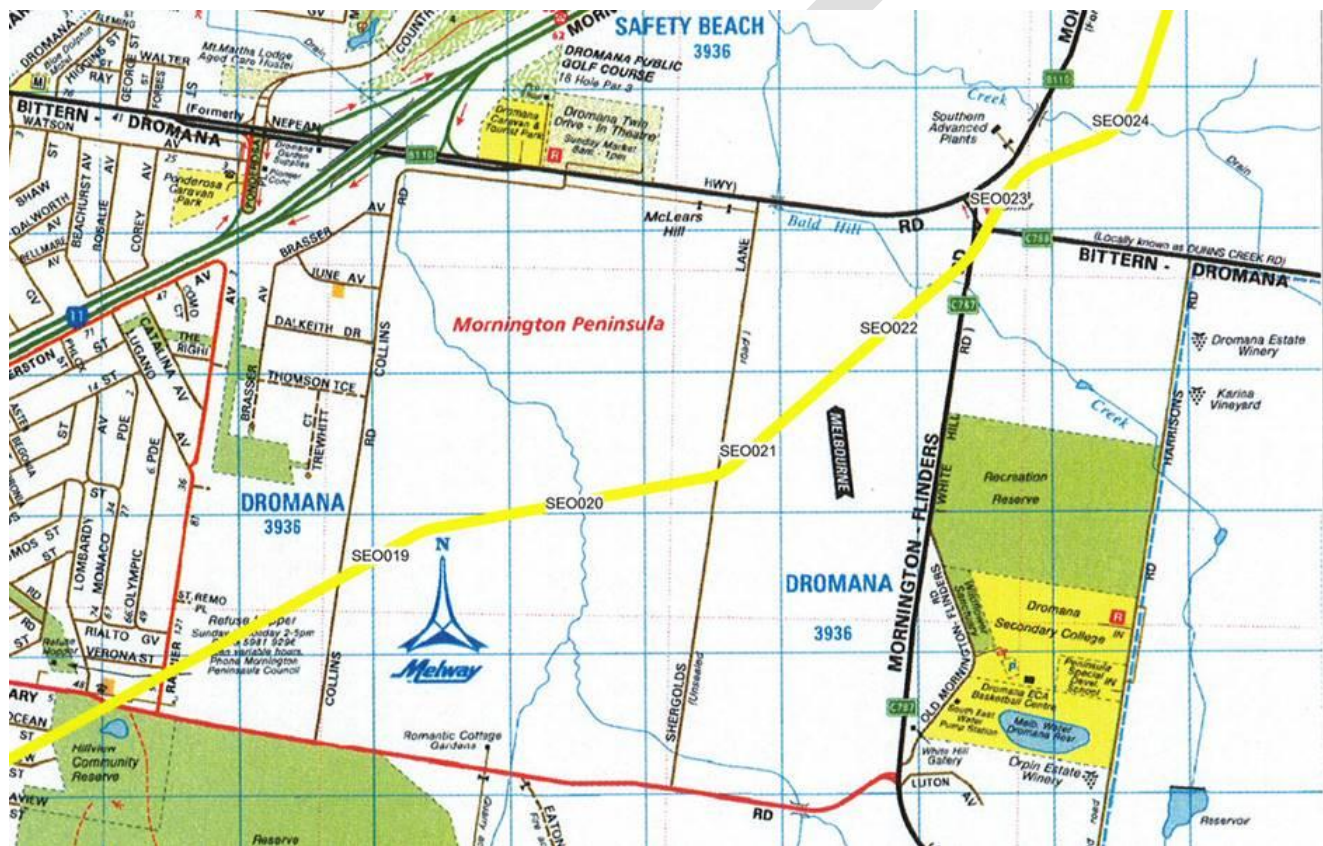


Figure 1: Map showing locations of SEO ports

Further investigation identified an enlargement of the SEO standard easement (50 metres wide) between Ports 19 and 20, located at Collins Road, Dromana. This enlarged easement area is 4Ha in size (200 metres x 200 metres) as shown in the shaded area on the image below.





**Figure 2: Satellite view of MW easement at Collins Road Dromana**

The HEWS requires a filtration plant, storage ponds and solar farm. It has been calculated that these requirements can adequately be housed within the enlarged easement area, negating the need for a compulsory acquisition of land. The easement area is currently zoned Public Work Zone (PWZ), simplifying the planning compliance required to locate the HEWs infrastructure.

In addition, the extraction will only take place in conjunction with the relevant authorities and based on adequate flows of recycled water being sent down the SEO. That is, extraction is likely to be intermittent rather than continuous.

### Treatment of recycled water

Once extracted, the recycled water will be filtered through a Reverse Osmosis (RO) process similar to how South East Water(SEW) currently process water at the Somers plant (which currently provides high-quality recycled water to the Hastings BHP Steel manufacturing sites)<sup>5</sup>.

The design capacity will extract up to 75ML of recycled water per day from the SEO at the Collins Road Dromana site and produce approximately 50ML per day of improved recycled water.

<sup>5</sup> This treated water from Somers is used solely for the Bluescope Steel plant in Hastings and also may provide an initial start-up plant for HEWS within 12 months



Treatment via RO requires a large amount of electricity and the initial HEWS financial viability can be underpinned by powering the plant with on-site solar farm and, subject to advances in battery technology, on-site storage. In the interim, excess solar energy will be sold or banked back into the grid which will provide another income stream. Again, with advances in block-chain technologies it should be possible to sell electricity back into the grid in early evening, at times where maximum pricing is evident.

To provide water security for the HEWS, it will be necessary to construct a large storage pond on site to insure against times when flows in the SEO are disrupted.

### Supply Pipeline to the Hinterland

The underpinning engineering requirements of the HEWS demands that the water be pumped to a high elevation to allow sufficient gravity-feed supply to facilitate distribution of the water.

The Collins Road site is fortuitously situated at the shortest point to reach a suitable high point along the Arthurs Seat ridgeline. A pipeline of approximately 2.35 kilometres will convey the water from the Collins Road site to a sufficiently elevated site, along the Arthurs Seat Road.

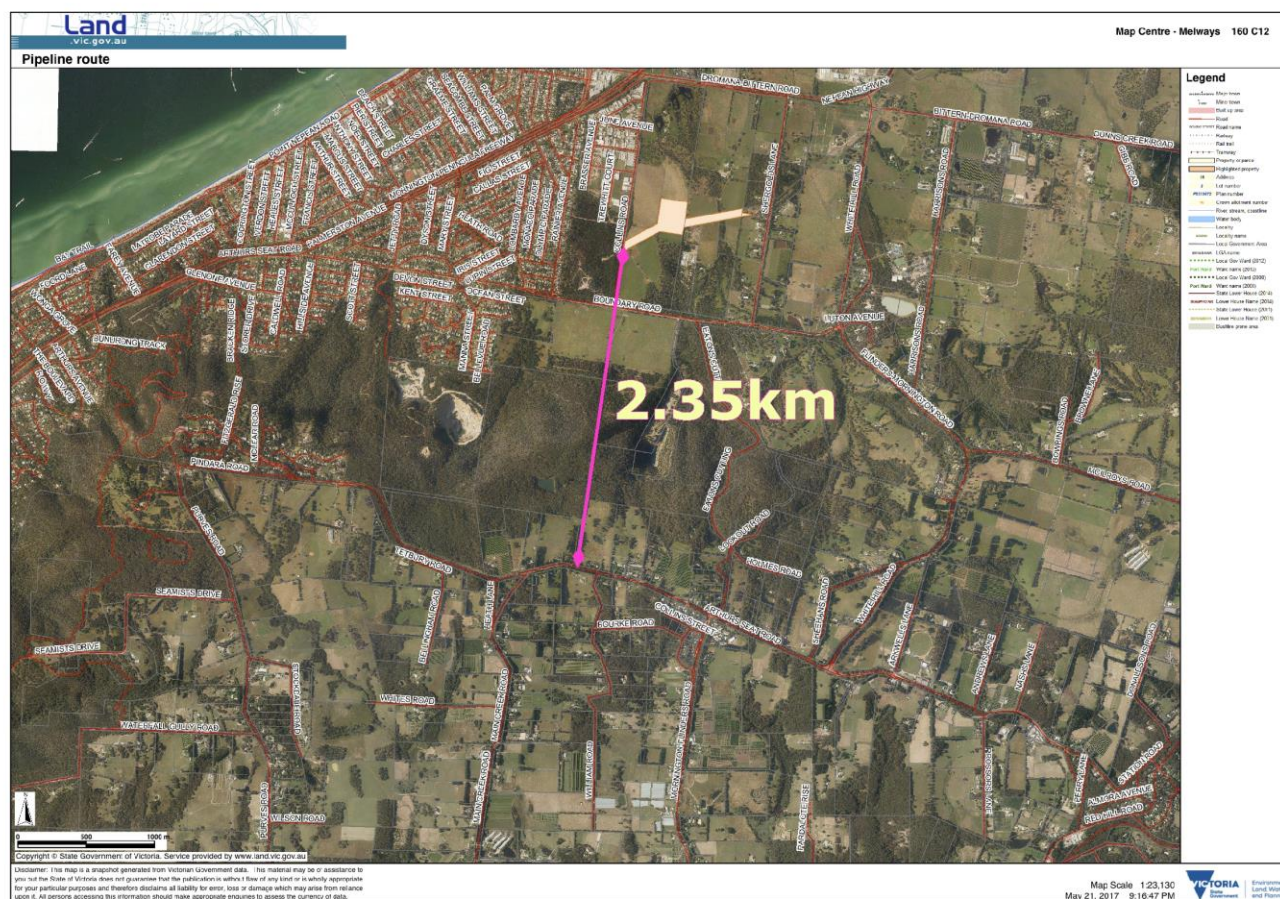


Figure 3: Approximate horizontal distance from plant to Arthurs Seat Road



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The location of the pipeline traverses existing road easements, Mornington Peninsula Shire Council-owned land, State Park and a Vic Roads easement, to reach the Arthurs Seat juncture. At no point is any private land affected by the installation of this pipeline.

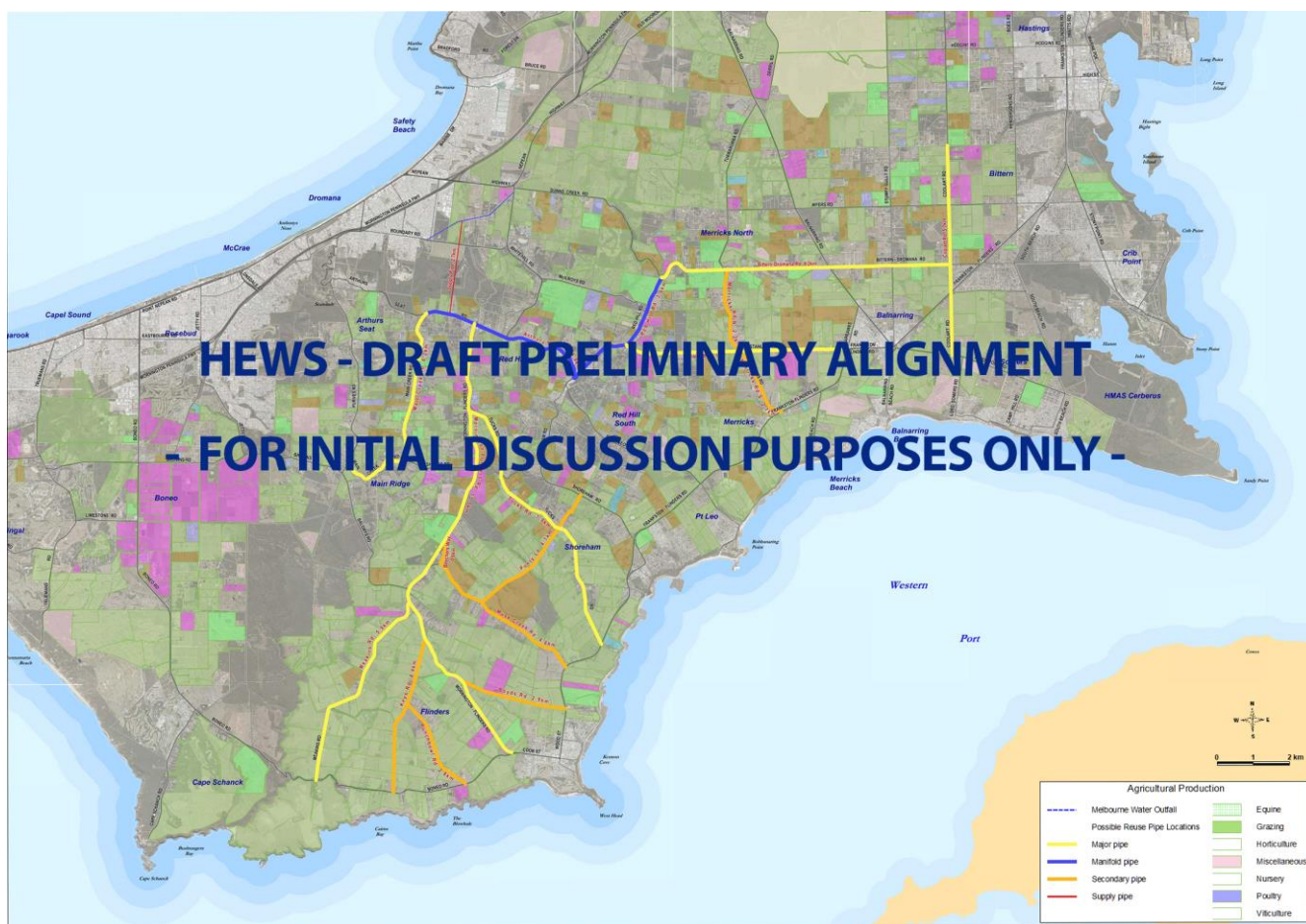
From this distribution point, it is proposed to utilise the wide and mostly cleared easements already in place for electrical supply to the hinterland. These cleared points of access located along the ridge-line roads would allow for more economical installation of pipelines and minimal disturbance to vegetation and residents.



*Figure 4: Typical wide easements within hinterland*

#### Pipeline to the distribution network

The unique topography of the hinterland allows for a gravity-feed system via a distribution network starting with a pipeline along the Arthurs Seat Road with spur lines branching out at each major ridgeline road.



## Proposed HEWS Management structure

From discussions with statutory authority stakeholders it is likely the HEWS will require a new and separate entity, e.g. the Hinterland Environmental Water Scheme Authority (HEWSA), to manage the entire Scheme and hold the appropriate licenses for the water treatment and distribution.

The authority will initially contract directly to design and construct the Scheme infrastructure and deliver it within a timeframe and to a specified budget.

The State Government, in the event of a state government funded project, could also enact a specialised funding model in respect of establishing the Recycled Water Infrastructure Fund (RWIF) - see page 14 for a more detailed explanation. The first tranche of funds would easily fund the Briars trial site in its entirety.

Once the appropriate HEWS authority and board is in place, they would then be able to set up and manage the operation of the trial site on a lease arrangement with MPSC.

The HEWS authority will then be the responsible entity to install the infrastructure and deliver the project. The HEWS authority will develop an operations structure to oversee operational and maintenance side of the Scheme.

## Financial modeling for HEWS



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## Design and Evaluation Funding

Based on other irrigation schemes of similar scale<sup>6</sup> it is believed that up to \$1.5 million would be required to fund a full design and evaluation study.

This study needs to confirm all the technical, engineering, planning, design, management and financial modeling required.

## Capital funding model to construct HEWS

At this stage it is believed that the most suitable funding model is via a contributor-based levy.

South East Water (SEW) have undertaken initial customer surveys which indicate general public approval on the basis that a levy on existing customers be quarantined as dedicated funds specifically for this and other recycled water projects which may be proposed.

For example, if Melbourne Water levied their 2,000,000<sup>7</sup> customers \$20 per annum (\$5 per quarterly bill) then \$40,000,000 would be raised annually, to create a Recycled Water Infrastructure Fund (RWIF) used to finance the HEWS and other similar projects.

The income stream received from the HEWS project could then be used to reinvest back into the RWIF.

A public/private partnership (PPP) or standalone government capital investment (State and/or Federal) were both considered, however at this stage these were deemed unfavourable compared to the levy option, because they do not achieve community “buy-in” or ownership which is paramount to the long term cost effectiveness, adoption and ultimately the success of the Scheme.

## Estimated capital cost

Based on proposed layouts as attached to this report we estimate a total pipeline (approx. 90km) and plant costs to be in the range of \$140- \$180 million dollars.

## Recurrent costs

The filtration and pumping process will constitute 80% of operational costs. The addition of the solar farm at the Collins Road site will provide, on a gross basis, adequate electricity for the initial stages of the project. Costs at maximum capacity, coupled with technology supported (e.g.: block chain) sales back to the grid are beyond the scope of this report but will need to be evaluated in a future design and feasibility study.

Maintenance of plant and equipment is the other significant identifiable cost at this stage and these numbers can be ascertained in more detail in the further design and feasibility study sought from this report.

## Income Streams

1. License sales

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<sup>6</sup> See this link for description of the simpler Bunyip Food Bowl plan  
<https://vff.org.au/vff/Documents/2014%20Election%20Docs/FINAL%20WATER%20.pdf>

<sup>7</sup> Estimated number of commercial and domestic Melbourne Water customers

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2. License renewals
  3. Water sales (farming)
  4. Water sales (environmental)
  5. Excess solar grid sales
  6. Insurance company financial support

## Scheme Benefits

### Overview

HEWS offers an unheralded opportunity to tie-in multiple layers of benefit to the community, across a range of issues, involving traditionally opposing stakeholders. The adoption of existing technologies to provide an environmental solution and food security outcome for Greater Melbourne, is an opportunity that should be explored.

When assessing the possible benefits, it is difficult to rank issues by importance. The points raised below, are not to be considered in any order of merit, but should be judged on their individual impact and the cumulative effect on a total outcome.

### Environmental benefits

The HEWS incorporates a vast number of environmental benefits, including:

- a reduction of total annual discharge volume of recycled water into our saline marine environment;
- increased stream flows;
  - as farm dams would have the capability to store improved recycled water from the HEWS, thereby negating the need for dams to utilise run off.
  - This “run off” would then be able to flow naturally to waterways, returning them closer to their original state.
  - The placement of improved Class A recycled water into dams highlights the need for this water to be improved to a greater standard so that it will pose no risk to the environment if accidental releases occur (vis-à-vis Class A recycled water);
  - Further, this improved RO filtered water, unlike existing Class A from the SEO, will not contribute any nutrient load to the wider environment.

It is hoped this water will even be certified by the EPA for discharge into creeks during Summer to ensure environmental flows and manage previously high saline levels. This is an option which should be investigated in the further design and feasibility study.

In addition, should government wish to purchase this water for environmental replenishment of creeks and streams then the RO plant could reserve a portion of its daily production for this use.

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## Food Security

High-value horticulture, close to cities, has been and continues to be reduced by urban sprawl and realignment of the Urban Growth Boundary. Increasingly, our productive soils are being removed permanently from food production due to the development of housing estates. The Mornington Peninsula hinterland through the use of HEWS, is uniquely placed to not only maintain but increase its production of fresh foods to the growing population. It can intensify production at the same time as other food bowl “regions” (such as the market gardens of Cranbourne) are squeezed by urban growth development pressures.

The Mornington Peninsula has already been earmarked for preservation as a significant farming area, by its scheduling as a Green Wedge Zone. The HEWS puts another level of protection on the food production region, by increasing the value and diversity of crops that may be grown in the face of increased property values and inappropriate development.

It has been identified by *Melbourne’s Food Future: Planning a resilient city foodbowl* (A Foodprint Melbourne Report, November 2016) that Melbourne faces not only food security but food production shortfalls, in the near future. The Report goes on to further highlight that the challenges faced for Melbourne’s food supply, revolve around climate change, including water scarcity and extreme weather events. The HEWS will provide a viable solution to these problems being faced by agriculture right around the world.

## Climate Change

One of the predicted effects of climate change is extreme temperature days which can be devastating for any horticultural crop. However, when water is abundantly available as the HEWS proposes then the risks to crops posed by these adverse weather events can be managed and even mitigated.

If adequate on-site water storage and/or pumping capacity is available, the HEWS will ensure that a supply of irrigation water is available to support the protection of crops in extreme weather events. This would be backed up by the large reserve capacity at the Collins Road site, to further reinforce this defensive tool.

HEWS will therefore provide a guaranteed supply of water as a long-term insurance policy against the possible effects of climate change and the predicted increased frequency of extreme weather events.

## Bushfire protection

The Hinterland of the Mornington Peninsula is identified as an extreme fire danger area with many areas virtually undefendable.

The network of pipelines associated with the HEWS, will enable the establishment of a fire-fighting mains supply system for fire-fighting purposes. Currently, appliances must leave the fire ground in order to be replenished or rely on tankers cycling to fill points. The HEWS pipeline, when used as a fire defence system, will allow for a “stand and fight” scenario in some of the highest-risk areas already identified in the hinterland.

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The inaccessibility of particular areas on the Mornington Peninsula, relies on aircraft to fight fires and defend property. The effectiveness of this technique relies on the shortest cycle time to dump and reload, usually from the closest nearby water source, which in most cases, are farm dams.

The goal of the HEWS system, is to maintain dams at a higher level than if reliant only on rainfall. Consequently, suitable dams near high-risk areas that are identified as appropriate for aerial fire-fighting purposes, may be topped up, particularly over the crucial Summer months.

The current water supply response to these undefendable areas has been to install strategically located water tanks. While providing an ability to refill a small amount of tankers, the HEWS system would allow such storage tanks to become continuous-fill points in the event of an emergency.

As the HEWS will be powered by gravity into the hinterland, water will flow for a time even if the electricity grid has failed. Further, the underground pipe network would be naturally protected from fire and has significant storage capacity, should the supply from the Collins Road facility fail.

The safety of fire refuge areas will be greatly improved as the pipeline's water will be able to provide unlimited water to help defend these areas in the event of a catastrophic fire situation.

## Green Wedge Zone preservation

Much of the footprint proposed for the HEWS is on Green Wedge zoned land. This land is mostly agricultural land with some also being dedicated to conservation.

The pressures on the Green Wedge and the pushes to realign the Urban Growth Boundary for housing development are growing every year and will only increase.

The HEWS will start to return farming viability to much of the hinterland enabling this area to become, once again, the predominant land use alongside conservation.

The HEWS will then support both preservation of Green Wedge land and restore natural environmental flows to our hinterland creeks which will also play a major role in future conservation.

In short, if we want to keep the Green Wedge green, then we must water it.

## TAFE training for future careers in Horticulture

One of the goals of HEWS, is to not only deliver water to the hinterland, but to develop new crops for the region, which will require a significant labour force.

The potential increased farming activity that will be achieved under the HEWS, can only be realised with an appropriately trained work force (and as mirrored by the recent research report *Future job openings for new entrants by industry and occupation*, March 2018, commissioned by the National Centre for Vocational Education Research, the national need for farming and farm manager roles will remain strong in future years).

Chisholm TAFE have offered significant resources to help operate the proposed trial site at The Briars, as envisaged under Stage 1 of the HEWS.

A long-term goal would be to establish an educational hub (possibly located at The Briars) focusing on environmental and horticultural studies, to serve the HEWS and any other schemes.

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## Regional Economic Development

The fundamental principle of the HEWS is to deliver water, which currently has no value, to under-productive land and in so doing create the opportunity to increase the return per hectare as seen in the examples provided in the Appendix to this document.

As previously stated, 90% of the SEO water is currently being dumped into Bass Strait as waste water and the loss of this valuable resource provides a direct loss in potential regional economic value.

By capturing the potential value of this resource, the HEWS will benefit the State and the Mornington Peninsula by reducing significant environmental impacts and concurrently optimising the potential of the hinterland region for future secured food production.

Increased development at the primary production level, has significant knock-on effects into the secondary and tertiary levels of business. For examples, tractors used on farms, require servicing by local mechanical services. The packaging & transportation of produce to market, is another example of the types of industries that will benefit from the HEWS.

The full economic analysis will be undertaken as part of the broader design and feasibility evaluation sought as a result of this report.

## Unlocking of prime agricultural soils for food production

To quote from the conclusions of the Mornington Peninsula Shire Agricultural Audit 2010:

*“The region has the capacity to obtain high yielding quantities of product and achieve very high quality. However, the amount of production is limited by such factors as land parcel size, soil type, water access, seasonality constraints (temperature, rainfall, wind) and economic pressures on production margins.”*

These initial agronomical studies showed the potential for significant increase in capacity and economic development is available on the Mornington Peninsula.

Water access and reliable rainfall are the significant constraints and the HEWS will address these in totality and help restore land value as a direct consequence of horticultural productive enterprise. Currently our hinterland property values are often associated merely to a rural lifestyle and the HEWS will help restore the value proposition of agricultural land back to agriculture.

## Energy neutrality

The goal of the HEWS project is to utilise renewable energy such as solar energy to power the project. An initial 2.5Ha solar farm at the Collins Road site will provide the early needs of the project and will keep energy costs to a minimum during early development of the scheme.

With advances in technology and expansion of solar farm footprints on the Peninsula it is hoped that energy neutrality can be achieved and these calculations can be addressed during the next stage of feasibility and design.

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By utilizing floating solar panel technology, the storage ponds for the improved recycled water, will have a dual purpose. This has the added benefit of also reducing evaporation of the ponds and thereby conserving even more water.

It is envisaged that the solar farm would be built to maximum capacity at the earliest stage in the project development. The selling of excess electricity back to the grid, would also help provide an initial income stream.

An allowance in the design has been made for an area of battery storage for when the appropriate technology becomes viable.

Another option for energy generation is to explore a connection to the OT Dam on Arthurs Seat to develop a solar powered pumped hydro generation system. This would be a significant potential energy source to be fully researched in future design and feasibility studies.

## Project timeline

### Project evaluation

A grant to fund a third-party evaluation of the proposed Scheme, from engineering, horticultural and financial viewpoints, will be sought from an appropriate government source.

Following the evaluation, it is hoped that Stage 1 of the HEWS could commence, as per the timeline as per Table 2: HEWS Timeline.

### Stage 1 of the HEWS - Trial site

As previously stated, the intention is to install a trial site at The Briars Mt Martha, or another suitable site within reasonable access of the South Eastern Outfall. This would allow for an investigation of new crops for the hinterland, in order to diversify the opportunity that this improved recycled water will provide, thereby expanding the potential food production base.

This aligns with the overall vision of creating an innovative, profitable and secure horticultural industry within an hour of Melbourne, thereby guaranteeing a reasonable level of food security for our future population growth.

At this stage, and subject to Council agreement, the Briars site is the preferred option and it would be expected that early funding will enable the trial site to proceed under a partnership between Mornington Peninsula Shire Council and the Hinterland Environmental Water Scheme Authority.

### What would the Briars trial site look like?

The preferred trial site at the Briars will involve accessing Class A water from the adjacent Craigie Rd treatment plant in Mt Martha. This will require a pipeline for delivery of Class A water and (after RO treatment of that water), return of the brine concentrate back to the treatment plant. Both Melbourne Water and SEW have, in principal, been supportive of this arrangement.

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The RO treated water (creating “improved recycled water” as planned under the HEWS model) will then be used to irrigate these crops replicating what is reasonably expected that HEWS may be able to achieve on a directly scalable model.

The required infrastructure will be:

- Installation of a portable RO plant self-contained in a shipping container (supplied and installed at no cost by WSI for a limited time period) to process up to 400,000 litres of Class A water every day;
- Construction of two x 500,000 litre storage tanks for the RO water as this will negate the need to upgrade the existing dam and will ensure the product water is separated until appropriate EPA licensing, if needed, has been acquired;
- Supply of 100Kva electricity at 415V (three phase) to power the RO plant and irrigation pumps for crops. Note that a 415V supply already exists to the site however this may need a transformer upgrade; and
- Set out of 10 x 4Ha crop sites occupying up to 60 Hectares (this includes windbreaks, access ways and non-useable land) of existing under-utilised agricultural land at the Briars.

## Who will operate the trial site?

The HEWS authority will need to be responsible for engaging a full-time farm manager (with potential on-ground labor support from Chisholm TAFE students and staff) whose responsibilities will include operation and monitoring of the filtration plant and maintaining all aspects of the crops.

## How does the Briars site compare with hinterland property?

The trial site is currently quite degraded as agricultural land however, immediate improvements can be made to the health of the soils by proven methods of carbon sequestration, in particular the laying of the correct balance of organic materials on site.

Aeration of the soil may also be required as the site has been quite degraded for some time but it is recoverable.

In essence, if high-value crops can be established on a site that initially had degraded soils, then there is significant potential for lifting the productivity of higher quality soils in the hinterland, which currently are largely used for broad-acre cattle farming.

## Expected costs of set up

From the above it is estimated the initial costs for set up of the trial site are as follows:

(These numbers are based on the site being made available by the shire for a peppercorn lease).



**Table 1: Trial Site costs – Briars example**

Item	Detail	Estimated Cost
Pipeline	Supply and installation of pipelines from the SEW treatment plant to the Briars	200,000
RO Filtration	While the initial plant will be loaned for 12 months, we will need to then use that plant to then research, design and build a tailored plant for the trial site going forward and this then being a forerunner for the final HEWS RO plant design	250,000
Power	Cabling from existing point and likely transformer upgrade to a site adjacent to the existing nursery	120,000
Site Preparation	Leveling and grading of processing and tank storage sites	30,000
Irrigation infrastructure	Supply and install 2 x 500KI tanks and various pumping stations and shedding	250,000
Trial crop sites	Design, Supply and plant all trees, to each trial plot including irrigation lines @ \$60K per Hectare (40 hectares in total) and soil improvement works	2,400,000 <sup>8</sup>
External consultants	Research on crops which may be suitable and to work with TAFE and HEWS to develop a crop management plan for each cropping site	100,000
Plant and Machinery	Tractor and implements	150,000
Recurrent costs	As the trial site will take up to 5 years to pay for its own management, this will need to be funded as part of the HEWS budget. Estimate based on a farm manager, power supply, 1 employee, fuel and other overheads, membrane maintenance - \$200K per annum	1,000,000
Total Estimated Costs		\$4,500,000

<sup>8</sup> The amount for establishing the Trial Crop is based on commercial rates outside of TAFE training opportunities



**Table 2: HEWS Timeline**

Item	Date Commence	Date Complete
Fund <sup>9</sup> and complete the design and evaluation study	July 2018	May 2019
Complete the planning process for Stage 1 HEWS (The Briars)	July 2018	May 2019
Commence collection of RIF levy	June 2019	Ongoing
Establish the HEWS management authority and appoint a board	July 2019	September 2019
Construct the pilot project at The Briars (Stage 1 HEWS)	August 2019	October 2019
Engage with potential subscribers	July 2019	Ongoing
Complete planning process for Stage 2 (Collins Road facility, Collins Rd – Arthurs Seat Road pipeline) and Stage 3 HEWS (Road pipelines)	September 2019	June 2020
Construct of Stage 2 HEWS – Collins Road facility, Collins Rd – Arthurs Seat Road pipeline	September 2020	May 2021
Construct Stage 3 and 4 HEWS – main ridge line roads	March 2021	June 2022
Pump first commercial delivery of HEWS product <sup>10</sup>	July 2022	
Complete Stage 3 and 4 with final commissioning	June 2023	

<sup>9</sup> Funding would be preferable through a new RWIF as this would enable funds to flow immediately for both the feasibility study, board establishment and the pilot site

<sup>10</sup> Note that if the Somers treatment plant option is activated then HEWS water could be delivered to parts of the designated scheme area by the end of 2019

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## Conclusion

From all data collected and initial calculations and discussions with key stakeholders it is evident that the HEWS project is worthy of further consideration.

The next step should be a clear commitment to fund an expanded design, feasibility and evaluation study to then confirm the more precise benefits and at the same time clarify some of the more detailed technical issues and costs.

From this early stage, it appears clear the HEWS will deliver profound benefits across a complex range of issues and across a number of important sectors and policy portfolios.

Initial numbers investigated by the authors provide a sound basis for a more detailed study to confirm and document a robust cost-benefit analysis.

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# Appendix

## Farm Production and costing examples

### Cattle - 40 Hectare (100 acres) Farm, without HEWS irrigation<sup>11</sup>

In this example, the farmer runs a maximum of 50 head of breeding cattle running a cow and calf every 2 acres.

A	Site Area	40	Hectares
B	Sale of steers per annum	50	each
C	Sale price of steers	1,000	Dollars each
D	Gross return (B x C)	50,000	Dollars
E	Other overheads	13,000	Dollars per annum
F	Net profit	37,000	Dollars
K	<b>Net Profit per Hectare (F ÷ A)</b>	<b>\$925</b>	<b>Dollars per Hectare</b>

### Avocados - 4 Hectare (10 acres), with HEWS irrigation<sup>12</sup>

Assuming this farmer converted to 4 hectares of Avocados using HEWS irrigation then based on returns already attained on the Mornington Peninsula:

A	Site Area	4	Hectares
B	Yield per Hectare	10	Tonne
C	Total Yield (A x B)	40	Tonne
D	\$ per tonne wholesale	3000	Dollars/Tonne
E	Total Income (C x D)	120,000	Dollars
F	Water Volume for site (Annual)	15	Megalitres
G	Estimated cost of HEWS Water	1000	Dollars/megalitre
H	Total Water cost	15000	Dollars/Annum
I	Overhead and Production Costs	72000	Dollars/Annum
J	Net Profit from site (E-H-I)	\$33,000	per annum
K	<b>Net Profit per Hectare (J ÷ A)</b>	<b>\$8,250</b>	<b>Dollars per Hectare</b>

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<sup>11</sup> From numbers supplied by local cattle farmers

<sup>12</sup> From numbers provided by Peninsula Avocados

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### Hay Cutting - 8 Hectare (20 acre), without HEWS irrigation<sup>13</sup>

In this example, the farmer only cuts hay into round bales once per year

A	Site Area	8	Hectares
B	Bales per Hectare	10	Bales per hectare
C	Selling price (average)	45	Dollars per bale
D	Gross return (A x B x C)	3,600	Dollars
E	Cost of production	35	Dollars per bale
F	Total cost of production	2,800	Dollars
G	Net Profit from site (D - F)	800	Dollars
K	<b>Net Profit per Hectare (G ÷ A)</b>	<b>\$100</b>	<b>Dollars per Hectare</b>

### Wine Grapes - 6-hectare, without HEWS irrigation (15 acres)

In this example, a vineyard growing premium grapes under contract to a winery

A	Site Area	6	Hectares
B	Tonnes per Hectare yield	6	Tonnes per hectare
C	Selling price per tonne	3,500	Dollars per tonne
D	Gross return (A x B x C)	126,000	Dollars
E	Cost of production per hectare	20,000	Dollars per hectare
F	Total cost of production (E x A)	120,000	Dollars
G	Net Profit from site (D - F)	6,000	Dollars
K	<b>Net Profit per Hectare (G ÷ A)</b>	<b>\$1,000</b>	<b>Dollars per Hectare</b>

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<sup>13</sup> From numbers provided by WSI

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# About the authors

Steven Marshall

**Qualifications:** University of Melbourne - Bachelor Agricultural Science (1996)

Emerging leaders in Horticulture - Business development course (2012-13) run by Horticulture Australia Limited

Young Food Innovations Course (2017-2018) run by Meat and Livestock Australia Donor Company and Horticulture Innovation Australia

**Industry**

**Membership:** Avocados Australia, Victorian Farmers Federation

## *Professional Experience:*

**[1992 - Current]**

**Peninsula Horticultural Designs Pty Ltd – Managing Director**

A horticultural consulting and contracting company, specialising in the management of avocado plantations, wine grapes and olive groves. Since 2006 P.H.D. has been at the forefront of bringing desalination technology into horticulture in an effort to find water solutions for its clients. More recently into solar technologies to help farms become energy neutral.

**[2002 – Current]**

**Peninsula Avocados Pty Ltd – Managing Director**

The company operates the harvesting, processing (grading, cleaning & packing) and marketing of avocado fruit in a co-operative style arrangement with 5 key clients (growers) on the Mornington Peninsula

**[2018 – Current]**

**Watershed Innovations Pty Ltd – Managing Director**

A company set up to investigate the technical parameters for a recycled water project servicing the Hinterland of the Mornington Peninsula, setting a new standard for recycled water use in horticulture

**[2017 – Current]**

**Victorian Farmers Federation Peninsula Branch- Treasurer**

**[2017 – Current]**

**Working as a Horticultural Consultant in Vietnam**

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Consulting to private and government clients within the Republic of Vietnam, focusing on the province of Dak Lak and areas surrounding Ho Chi Minh City specializing in avocados.

[2012 – 2016]

Enviromix Pty Ltd – Consultant Agronomist

A green waste recycling company based in Melbourne who produces organically certified compost from green waste.

*Non-Executive Experience:*

[2014 – Current]

Mornington Peninsula Shire's Food Industry Advisory Body - Committee Member and Chair (2015 – current)

FIAB provides advice to the Shire on matters relating to food production within the region. It recently developed an ACCC registered trademark for produce grown on the Mornington Peninsula [www.mpproduce.com.au](http://www.mpproduce.com.au).

[2016 – Current]

Peninsula Reclaimed Water Concept - Member of Working Group

Invited by local state MP, the Honorable Martin Dixon, to join a working group to examine the possible use of treated water (up to 350 million litres per day) for horticultural use.

South Eastern Water – Member of Community Consultation Group

Examining the potential uses for the expected increase of recycled water available after the expansion of three of its treatment plants on the Mornington Peninsula

[2015]

Victorian Agribusiness Summit 2015 – Member of the Organising Committee

[2014 – 2015]

Farmer Reference Group Panel (Landcare & Port Philip & Westernport Catchment Authority) Member

Five Year Sustainable Farming Project - reviewed & approved applications (43 granted funding)

*Recent public speaking events*

- Gippsland Food Growers & Makers “Growing Cool Climate Avocados” presenting in the PechaKucha Style (20 slides shown for 20 seconds) – 2016
- Launch of the Mornington Peninsula Produce Trade Mark – The Briars, Mount Martha: “Benefits of the Mornington Peninsula Produce Trade Mark” - 2016
- Victorian Agribusiness Summit presentations “Growing avocados on the Mornington Peninsula” - Red Hill, Victoria – 2015

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- Victorian Agribusiness Summit Dinner keynote address “ The need for a registered trademark for Mornington Peninsula Produce - Red Hill, Victoria

### **Recent Media**

- “Crop loss to heat stress highlights climate change: avocado grower” - [ABC Rural](#)
- “Mornington Peninsula Produce trademark launched for food grown or produced entirely on peninsula” – [Herald Sun](#)
- “Toil and Soil” – [ABC Landline](#)
- “Peninsula Avocados at Red Hill South go from strength to strength” –[Weekly Times](#)
- “Mornington Peninsula: Regional produce protected” - [Weekly Times](#)

## **Russell Joseph**

### **Professional Experience**

- 1986 – 2015  
Self Employed builder and construction manager
- 1998 – 2008  
Company: M.R. Constructions (Vic) Pty Ltd  
Role: Director and Construction Manager
- 2008 – 2014  
The Construction Managers: Sole Director, Senior Construction Manager
- 2012 – 2015  
Employer: Parliament of Victoria  
Title: Electorate Officer Part time
- 2014  
Employer: Dept of Premier and Cabinet  
Title: Advisor
- 2015 – Current  
Employer: Parliament of Victoria  
Title: Electorate Office Manager, Full time