



# Greymouth Floodwall Rating District 2021-2024 Asset Management Plan



West Coast Regional Council

388 Main South Road  
Greymouth  
7805

## Table of Contents

<b>1.0</b>	<b>Purpose of this Document</b>	3
<b>2.0</b>	<b>Asset Management Objectives</b>	3
<b>3.0</b>	<b>Greymouth Floodwall Background</b>	4
<b>3.1</b>	<b>Greymouth Rating District Map</b>	6
<b>4.0</b>	<b>Description of Assets</b>	7
4.1	Physical Assets	7
4.2	Asset Map	8
<b>5.0</b>	<b>Existing Standard</b>	9
5.1	Service Level	9
5.2	Maintenance Programme	9
5.3	Damage Exposure	10
5.4	Prudent Reserve	11
<b>6.0</b>	<b>Funding</b>	12
6.1	Maintenance	12
6.2	Damage Repairs	12
6.3	Financial Reserves	13
6.4	Depreciation	13
6.5	Works Expenditure Greymouth	13
<b>7.0</b>	<b>Performance Measures</b>	15
7.1	AMP Review and Monitoring	17

## **1.0 Purpose of this Document**

The purpose of this document is to summarise the management philosophy that is applied to the Greymouth Floodwall Rating District including the infrastructure assets and services. This approach ensures that acceptable levels of service are provided in the most cost-effective manner and contribute to the achievement of the community outcomes identified in the West Coast Regional Council's Long-Term-Plan (LTP).

This AMP defines the objectives and performance standards of the Greymouth Floodwall Rating District for which the West Coast Regional Council bears the maintenance responsibility, including providing a basis upon which the effectiveness can be measured. The key purposes of this AMP are to:

- Provide a history of the Greymouth Floodwall protection scheme.
- Convey the long-term strategy for the management of the Greymouth Floodwall Rating District.
- Provide a tool to assist with management assets in a cost effective and sustainable manner.
- Manage the environmental, service delivery and financial risks of asset failure.
- Demonstrate that the service potential of the rivers and drainage assets is being maintained.

## **2.0 Asset Management Objectives**

West Coast Regional Council recognises that the Greymouth Floodwall Asset Management Plan is the fundamental driver of flood protection for the scheme. This AMP has been developed in accordance with the Local Government Act 2002, with the first AMP completed in 2003 with three yearly updates or earlier where information indicates a significant change from what is stated in the current AMP.

In order to fulfil the outcomes, vision, goals and objectives of these assets, the West Coast Regional Council have adopted a systematic approach to the long-term management of its assets and services on the Greymouth Floodwall by preparing this AMP.

West Coast Regional Council is committed to best appropriate practice asset management in order to achieve the following key objectives:

- Meet the service expectations of the Greymouth Floodwall community.
- Ensure maintenance activities achieve efficient results with optimal benefits.
- Demonstrate Council's approach to managing risk and meeting growth requirements towards a sustainable future.
- Comply with all statutory requirements.

### 3.0 Greymouth Floodwall Background

From the earliest days of settlement, the communities of Greymouth, Blaketown and Cobden have been exposed to the risk of flooding from the Grey River.

Major floods have occurred in 1867, 1868, 1872, 1884, 1887, 1897, 1905, 1936, 1940, 1967, 1970, 1976, 1977 and 1978. In the late 1970's the Westland Catchment Board began investigative work on the development of flood protection measures for these communities.

On March 25, 1985, the Westland Catchment Board presented an updated report and design, indicating an approximate cost of \$3 million. The design embodied a set of strategically placed stopbanks intended to contain a Grey River flood peak of 5,500 cumecs which at that time was estimated to have a return period in the order of 50 years. Financial approval was sought from Government and in December 1986, the approval for a \$3.2m scheme was given on the basis of 60% Government funding/ 40 % local funding.

Work commenced in 1986 but during the construction of the Cobden stopbanks two major floods occurred on 19 May and 13 September 1988 which caused extensive inundation and consequential damage. These events gave both urgency to the completion of the project and the need to re-assess the scheme standard. The technical review which ensued resulted in the upgrading of the scheme design to 6,100 cumecs with 900 mm of freeboard. The revised scheme represented a re-assessment of the peak flow expected with an average annual exceedance probability of 2 % i.e. a retention of the 50 year return period flood capability.

This amended proposal was forwarded to Government and approval for an upgraded \$4.2m scheme was approved on the basis of 80% Government funding/20% local funding.

The first contract was let for the Cobden Stage 1 stopbank in November 1986 and the final contract for the raising of the Blaketown Tiphead Road was completed in September 1990. It was completed at an overall cost of \$4m. (80% Government/ 20% Grey District Council).

Since the completion of the protection works the system has experienced flood flows in excess of 5,500 cumecs on two occasions i.e. 5,812 cumecs (16 December 1997) and 5,667 cumecs (19 October 1998). Although some minor seepage was observed, in several places, through and beneath the scheme stopbanks during such events the structures have performed satisfactorily and averted what would otherwise have been widespread flooding and consequential damage to these communities. Concerns had been expressed by sections of the Cobden community relating to the extent of seepage observed during major floods and the implications that this might have for the structural integrity of the stopbanks.

Acting on these concerns the West Coast Regional Council commissioned an investigation of the stopbank. The purpose of this investigation was to assess the nature, cause, potential threats and remedies for the seepage problem and report findings to the Greymouth Joint Flood Wall Committee which is a joint committee of both the Grey District Council and the West Coast Regional Council.

The investigation was undertaken by Civil and Environmental Consulting Ltd. and resulted in "Greymouth Flood Protection System Integrity Report" (31 March 1999). This report concluded that there was a need to modify the Cobden stopbank to incorporate seepage control measures in order to lessen the risk of seepage induced instability. This strengthening works were carried out in 2000. The

report also recommended that consideration be given also to a re-evaluation of hydraulic capacity of the system using updated river flood flow and tide information.

As a result, the return period for the scheme design capacity event of 6,100 cumecs was determined to be in the order of 30 year event, rather than a 50 year event as previously calculated. As a result of the revised analysis, the Joint Floodwall Committee, in 2006, decided to design an upgrade to the floodwall to a new service level of 6,600 cumecs (the revised 50 Year Return Period Flood Event) with 600mm freeboard.

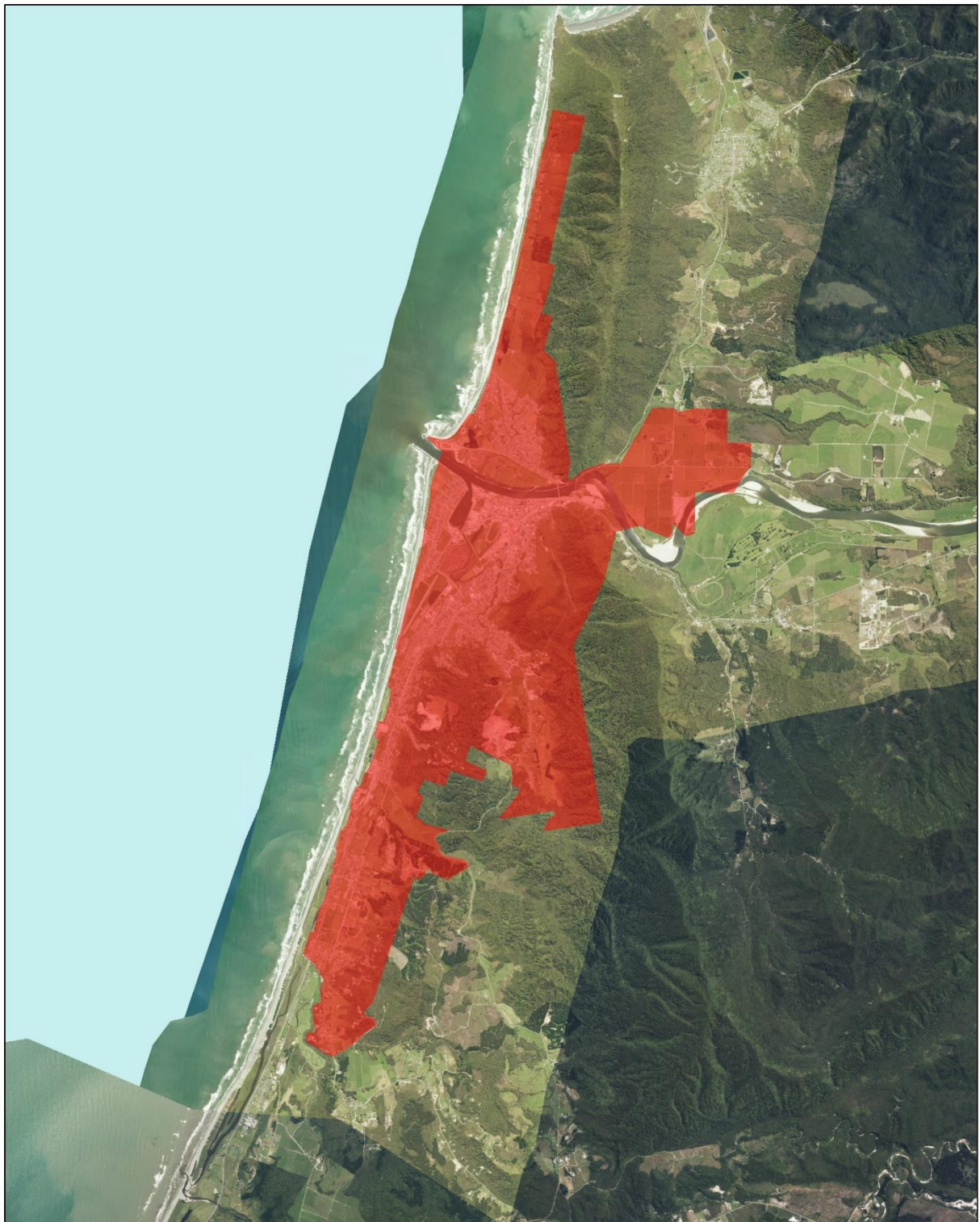
As a result of further deliberations by the Joint Floodwall Committee, it was decided to apply for a second option of a higher threshold to the 7,400 cumecs flow with 600 freeboard, which equates to a 150 year design flood. This would ensure that future development of the structure, if required, would not require additional resource consent. Resource consents for this were applied for in 2006 and were granted in December 2008. Tenders for this work were let in 2009, and work was completed in 2010 to the 50 year event level with concrete work to the higher 150 year level.

It is anticipated that in future the community will wish to bring the entire wall up to the higher flood protection level.

As a result of the community consultation for the Long Term plan in 2021, council resolved to extend the Greymouth Rating District boundary to include Coal Creek and New River Rating Districts. The assets of these two schemes will now be administered under the Greymouth Rating District.



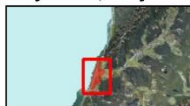
### 3.1 Greymouth Rating District Map



The information displayed has been derived from the West Coast Regional Council's GIS database and maps. It is made available in good faith, but its accuracy or completeness is not guaranteed. Positions of property boundaries are INDICATIVE only and must not be used for legal purposes. Cadastral information sourced from Land Information New Zealand. Crown Copyright Reserved. This map is not to be reproduced without permission of WRCRC. © Copyright Reserved West Coast Regional Council.

#### Greymouth Rating District Legend

**Rating District Classes**  
**Greymouth, Grey District** ■ Greymouth Rating District Boundary



0 500 1,000 2,000  
Metres

Date created: 07/12/2021, 0942  
 Author: james.bell

Scale at A3: 1:53,011

Sourced from Land Information New Zealand data.  
 Crown copyright reserved.  
 Aerial Imagery flown <date>

Coordinate System:



#### 4.0 Description of Assets

Asset	Quantity	Unit	Rate
Rock	46874.5	Tonne	Various
Fill	172436	M <sup>3</sup>	\$36.60
Rubble	3168	Tonne	Various
Top Course	3890	M <sup>3</sup>	\$41.70
Ancillary	99330.72	Various	Various
<b>Asset value</b>			\$ 13,760,193.89
Contingencies			\$ 1,376,019.39
Resource Consents			\$ 302,724.27
Emergency Work Conditions			\$ 1,376,019.39
<b>Asset Value</b>			\$ 16,814,956.93

#### 4.1 Physical Assets

Asset Type	# of Assets	Asset Components	Quantity	Rate	Value	Total Value
Floodgate	2	Ancillary	15.2	Various	\$65,994.00	\$65,994.00
Riprap	1	Rock	33709.5T	Various	\$2,602,335.50	\$2,602,335.50
Stopbank	9	Fill	170466m <sup>3</sup>	\$36.60	\$6,239,055.60	\$10,634,324.77
		Rock	10955T	Various	\$614,715.00	
		Rubble	3169T	Various	\$216,642.00	
		Top Course	3890m <sup>3</sup>	\$41.70	\$162,213.00	
		Ancillary	97285.52	Various	\$3,319,809.67	
<b>Contract variations</b>		Ancillary	2030	Various	\$449,303.62	\$461,813.62
		Rock	180T	Various	\$12,510.00	
<b>Total</b>						<b>\$13,760,193.89</b>



## 4.2 Asset Map



**Note: Not all assets have been added to the asset map due to having no spatial data to represent them.**



## 5.0 Existing Standard

The scheme now protects the town from a 6,600 cumec flood event (the revised 50 Year Return Period Flood Event) with 600mm freeboard. A flood of this size has a 2% chance of occurring in any given year. Parts of the floodwalls (the concrete sections) have been built up higher to the 7,400 cumec plus freeboard level in anticipation that the community will eventually wish to build the earth structures up to this higher protection level.

### 5.1 Service Level

The Levels of Service represented in this AMP are described and aligned with community values including affordability, quality, safety, community engagement, reliability and sustainability. Councils in New Zealand will generally adopt one of three methods for determining the level of service provided by a scheme:

- Agreeing on a scope of physical works with the community without reference to a target capacity or return period (low risk schemes)
- Providing physical works with a level of performance provided in terms of a target capacity (medium risk schemes)
- Providing physical works with a level of performance in terms of a target return period (high risk schemes)

Each of the three methods for determining the level of service may be suitable for a given scheme, provided that communities understand event likelihood, scheme and property vulnerability, potential consequences, and residual risk.

Where council staff have recommended physical works or analysis that did not proceed due to community resistance to cost, then councils are only able to track their service delivery through measures around maintenance works programmes or a general description of asset condition.

A key level of service for the Greymouth Floodwall is to prevent flooding of the townships of Greymouth, Cobden and Blaketown from the Grey River for flood events up to 6,600 cumecs.

### 5.2 Maintenance Programme

The maintenance of the Greymouth Floodwall can be broken into two categories:

1. Stopbanking
2. Erosion Control

#### **Stopbank Maintenance**

Maintenance includes repair of any scouring, vegetation removal to facilitate access and to optimize berm flow, control of vehicle access to prevent damage to stopbank batter slopes, topping up of stopbanks as required to maintain stopbank capacity in terms of design, maintenance of grass cover, maintenance of drainage provision, routine and flood surveillance operations and reporting.

Construction of drainage and sewage lines and other utility services that penetrate the bank provide potential lines of weakness through the structure. Unless proper precautions are taken in the design and construction of these penetrations there is a risk that they may become preferential lines for seepage flow. Where pressurised pipelines such as pumped drainage outfalls are installed or malfunctioning floodgates exist premature saturation of the stopbank core can occur under flood

conditions which in turn may lead to a loss of strength from elevated soil pore water pressures or induce internal erosion of the stopbank core or its foundation.

Stopbanks can be damaged in the event of an earthquake by cracking where displacement occurs, or by liquefaction of the foundation material. These actions may result in subsidence, slumping or spreading. The probability of seismic damage coinciding with a flood is considered remote.

### **Erosion Control Works**

Erosion control works consist of continuous rock rip rap facings of specific sections of stopbanking. Erosion control facings are designed and constructed to provide protection to the stopbanks core from the river's erosive forces during floods.

Rock is used in the formation of these facings of the required grading to resist the forces (velocity) of the river. Routine maintenance ensures the coverage and stability of rock rip rap on stopbanks is maintained to lessen the risk of failure.

Any slumping of rock rip rap is topped up with rock that has acceptable durability, angularity and appropriate grading to provide the required protection to the underlying structure.

Where slumping of rock rip rap facings has occurred, an assessment needs to be made to ascertain cause prior to remedial works being executed in order to ensure as far as is reasonably practical the failure mechanism is thoroughly understood and an appropriate remedy found.

An annual maintenance programme will be prepared each year in consultation with the Joint Floodwall Committee prior to adoption by the Regional Council for inclusion in the Annual Plan.

In preparing the annual maintenance programme consideration will be given to:

- An inspection to identify works requiring immediate repair.
- Works anticipated as being required given a 'normal' season.
- Flexibility to meet unbudgeted damages.
- Surveillance, reporting and investigations

An annual report will be presented to the Joint Flood Wall Committee outlining maintenance expenditure for the financial year.

### **5.3 Damage Exposure**

River control works are constructed in a very high energy environment with the purpose of resisting and absorbing some of that energy. It is considered that no matter what the standard of maintenance carried out, it is inevitable that damage will occur to structures.

In the years since their construction the sections of bank faced with rock riprap have been exposed to three flood events with flows in excess of 4,000 cumecs without appreciable damage.

The mean annual flood of the Grey River at the Dobson hydrometric station is currently estimated at 3,840 cumecs. Whilst the possibility exists for premature failure of the stopbanks, performance to date indicates that the most likely cause of failure will be over topping with flows in excess of the design capacity.

Event size (AEP)	Value	Damage ratio	Damage exposure	Prudent Reserve	Prudent reserve contribution
10%	\$16,814,956	2%	\$336,299	\$336,299	100%
5%	\$16,814,956	4%	\$672,598	\$470,818	70%
2%	\$16,814,956	8%	\$1,345,197	\$672,598	50%

It has been deemed, within reason, that all Rating Districts have a prudent reserve target balance that contributes to at least 100% of the damage exposure for a 10% AEP event, 70% for a 5% AEP event and 50% for a 2% AEP event. These percentages define what is an appropriate and acceptable level of risk for Council and the community.

#### 5.4 Prudent Reserve

Why do we need a prudent reserve?

- Minimise the financial impact of unplanned works, such as those caused by weather events
- Ensure the rating district is able to contribute funding that is sustainable and affordable
- Ensure Council's debt level is managed, and that borrowing is still available when required
- Ensure the debt levels of the rating district do not exceed the ability to fund the repayments

This target balance for the 'prudent reserve' for this rating district is \$250,000 as agreed by council. This prudent reserve is immediately available. It is likely the current reserve will only cover a portion of the actual cost of the potential damage that could occur.

If an event were to occur and the prudent reserve does not cover the full repair and rebuild cost of the assets, it is understood by the community that the remaining costs will be paid by loan or the rating district accounts will be in overdraft. In the instance of extreme weather events, NEMA funding and the Council's private insurance will be accessed for cost recovery if the criteria are met. The West Coast Regional Council's insurance policy has a \$400,000 excess. 40% of eligible rebuild costs will be met by this policy.

Below are the key criteria that needs to be met to access the NEMA funding, which can cover up to 60% of eligible rebuild costs

*The provisions for government financial support to local authorities apply whether or not a state of emergency is, or has been, in force*

*Government assistance will not normally be available for assets which receive a subsidy from any other source, unless:*

- *the local authority has adequately protected itself through asset and risk management including mitigation, where appropriate, and the proper maintenance of infrastructure assets, or*
- *the local authority has made sound financial provisions (such as the provision of reserve funds, effective insurance or participation in a mutual assistance scheme with other local authorities) to a level sufficient to ensure that the local authority could reasonably be expected to meet its obligation to provide for its own recovery*



## **Threshold**

*Threshold for reimbursement; As with other response claims, Government policy is to reimburse 60 percent of the combined eligible costs (response and essential infrastructure costs), above the following thresholds:*

- *0.0075 percent of the net capital value of the city council, district council or unitary authority involved*
- *0.002 percent of the net capital value of unitary authorities where the assets in question are of a type that ordinarily are managed by regional councils, or*
- *0.002 percent of net capital value in the case of regional councils*

## **6.0 Funding**

### **6.1 Maintenance**

Maintenance is funded by targeted rates, the level of rating being determined each year in the Annual Plan process. This involves:

- a) Preparation of an annual works programme and corresponding budget in consultation with the Greymouth Joint Floodwall Committee.
- b) Adoption of the annual works programme and budget by the Greymouth Joint Floodwall Committee.
- c) Discussion of the works report and budget with the ratepayers.
- d) Adoption of final budget in the Council's Annual Plan.

The aim of maintenance is to ensure the infrastructure assets are kept at a standard where they can always perform to their service level. Where rock is required to be placed on an existing stopbank under direct attack from the river, the protection required to maintain the existing stopbank at its same service potential would be charged to the scheme maintenance account.

Capital works are generally defined as works which increase the service level of the scheme. Such work would include increasing the design standard or the area covered by a scheme and works to increase security or performance of an erosion control system or structure over and above that identified in the asset plan.

### **6.2 Damage Repairs**

Routine damage repairs are funded by a combination of:

- a) Carrying out work as scheduled in annual works programme.
- b) Reprioritising works identified in the annual works programme.
- c) Use of financial reserves.

Major damage repairs would be funded by loans raised by the Council and repaid by targeted rating over a number of years.

### 6.3 Financial Reserves

Financial reserves are held within the rating district account to:

- a) Meet the costs of unscheduled works.
- b) Enable an immediate response to flood damage repairs.
- c) Prevent major fluctuation in rating levels annually.

The levels of financial reserves held in the rating account are determined by the estimated damage exposure and the likely need for un-programmed works.

### 6.4 Depreciation

River control schemes are designed to be maintained in perpetuity by constantly repairing and replacing component parts which are damaged by floods or by the constant wear and tear encountered in a river environment.

The performance measure is that the infrastructure assets are maintained to meet their service levels at all times.

As there is a constant cycle of replacement of elements of the infrastructure as necessary, depreciation of the value of the assets is not appropriate and funding of depreciation is not necessary. This approach is consistent with the NZ Infrastructure Asset Valuation and Depreciation Guidelines, Section 5.4.4.

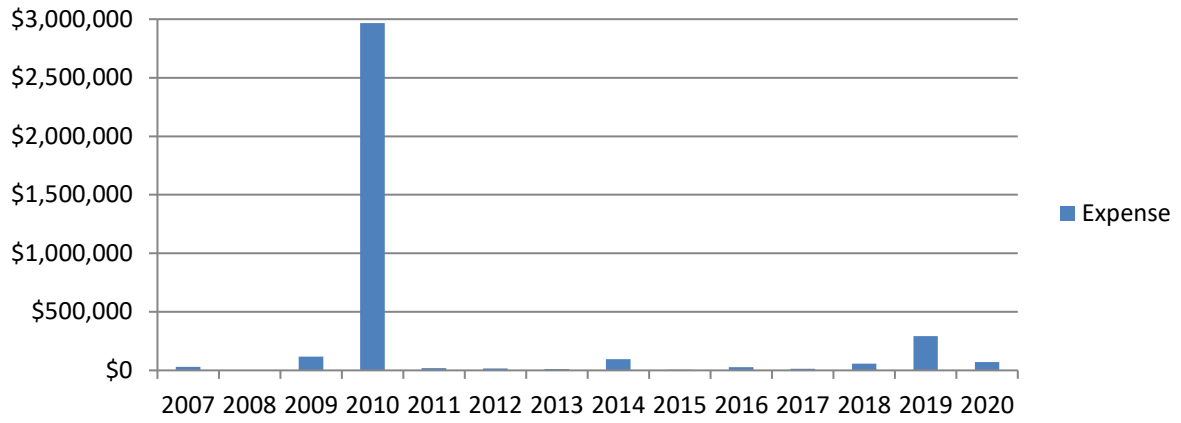
### 6.5 Works Expenditure Greymouth

This chart reflects the construction costs of infrastructure assets on the Greymouth Rating District.

This chart **does not** reflect the total annual expense incurred by the Greymouth Rating District.

Please refer to the annual works and financial report for the total expenses.

### Greymouth Rating District Works Expenditure 2007-2020



#### Expenditure 2007 - 2020

<b>Total expenditure</b>	<b>\$ 3,725,185.73</b>
<b>Average expenditure</b>	<b>\$ 266,084.70</b>
<b>Total asset value</b>	<b>\$16,820,179.76</b>



## 7.0 Performance Measures

The overall performance measure is that the infrastructure assets are maintained to meet their service levels at all times. This includes:

1. Ensuring all floodbanks continue to protect the town from a 6,600 cumec flood event plus freeboard.
2. Maintaining rock rip rap facings and grass cover on stopbanks to prevent active erosion of the stopbank core.
3. Maintaining stopbank drainage systems to control seepage flows and prevent internal erosion of the stopbank core and foundation and loss of stability.

The following procedures may be adopted to ensure the adequacy of maintenance.

Period	Procedure	Performance Measure
Annually	Produce annual works reports for the rating district to include type of work to be undertaken, quantities, location and costs.	<ol style="list-style-type: none"> <li>1. No reports of reduced freeboard anywhere along the stopbank system, without an agreed hydraulic and hydrological investigation in progress and a precursor to consideration of appropriate response measures.</li> <li>2. No reports of: <ul style="list-style-type: none"> <li>- stopbanks and bank protection erosion requiring repairs</li> <li>- sand size or greater erosion products being present in seepage flows exiting the stopbanks or their foundations under flood conditions</li> <li>- Increasing seepage flows exiting the stopbanks or their foundations under flood conditions</li> <li>- obstructed stopbank drainage facilities</li> <li>- Cracking of stopbank crest</li> <li>- Evidence of slumping or foundation heave</li> </ul> </li> </ol> <p>Without an agreed programme of remedial work in progress.</p>
	Organise contracts for agreed scheme work, oversee contract completion and report to Council.	
	Report on works undertaken during the previous financial period to the rating district ratepayers and Council.	
	Inspect all works and prepare a maintenance programme and budget.	

Decennial	Re-survey all river cross-sections between the Grey River mouth and the Cobden bridges and re-evaluate the hydraulic capacity of the stopbank system and report findings against the current design standard.	Report to Council and ratepayers on revaluation of assets and the Plan review.
	Re-measure cross section river profiles and carry out a comparative analysis with preceding surveys to establish possible bed level trends and effects on flood carrying capacity.	
	Carry out an assessment of hydrology at the Dobson recorder and update for scheme design discharge and report findings.	
	Revaluation of the existing infrastructural assets to include any additional volumes to stopbanks and bank protection works from previous reviews.	
	Critically evaluate the performance of the stopbank under service conditions with particular emphasis on seepage control and stability.	

### 7.1 AMP Review and Monitoring

This plan is a living document, which is relevant and integral to daily activity. To ensure the plan remains useful and relevant the following on-going process of AMP monitoring and review activity will be undertaken:

- Formal adoption of the AMP by the West Coast Regional Council.
- Review and formally adopt Levels of Service to comply with the Joint Floodwall Committee.
- Revise this AMP three-yearly prior to the Long Term Plan (LTP) to incorporate and document changes to works programmes and outcome of service level reviews.
- Quality assurance audits of asset management information to ensure the integrity and cost effectiveness of data collected.
- Peer review and external audits will be undertaken to assess the effectiveness with which this plan meets corporate objectives. Periodic internal audits will be undertaken to assess the adequacy of asset management processes, systems and data and external audits will be undertaken to measure asset management and performance against 'best practice'.