Report No.	19-94
Information Only - No Decision Required	

HILL COUNTRY EROSION AND SEDIMENT MANAGEMENT IN THE MANAWATU WHANGANUI REGION

1. PURPOSE

1.1. This report is to update on the issue of sedimentation of rivers in the Manawatū-Whanganui Region including an overview of the various programmes to manage this including hill country erosion management, science and monitoring and linking the work in the catchment with outcomes in the river for water quality and flood protection.

2. EXECUTIVE SUMMARY

2.1. Hill Country Erosion was identified as one of the four key issues of the One Plan and sedimentation of rivers is identified in the 30 Year Infrastructure Strategy for the regions flood protection assets primarily due to the potential impact on levels of service for flood protection schemes. Climate change is also identified as a key issue in the 30 year Infrastructure Strategy in part due to its impacts on sedimentation in rivers.

2.2. Horizons has active implementation programmes to address and reduce sedimentation of rivers including the Sustainable Land Use Initiative for managing hill country erosion and management of stream bank erosion through the River Management Group's activities and the Freshwater and Partnerships Team's activities.

2.3. Through the Long-term Plan Horizons committed further funding to science in relation to the issue of sedimentation in rivers to inform the activities of council in relation to this issue. This report provides an update on the science that is being delivered through a cross organisational team with support from a range of external scientists.

2.4. The report also overviews the issue of hill country erosion in the region and progress on this, how these works are projected to influence outcomes for sedimentation in the regions rivers, and water quality state and trends for sediment indicators.

3. RECOMMENDATION

That the Committee recommends that Council:

a. receives the information contained in Report No. 19-94 and Annex.

4. FINANCIAL IMPACT

4.1. There is no financial impact of this item. The issue of sedimentation of rivers may have a financial impact for the Council into the future.

5. COMMUNITY ENGAGEMENT

5.1. This item is a public item.

6. SIGNIFICANT BUSINESS RISK IMPACT

6.1. This item is not considered a significant risk impact. The issue of sedimentation in rivers and impacts on levels of service has been identified as a key issue for the 30 year infrastructure strategy signalling that it is an important issue and does pose some risk for the Council and the community.

7. BACKROUND

7.1. This report presents a progress update on our hill country erosion programme the Sustainable Land Use Initiative (SLUI), our current in stream sediment monitoring programme, state and trends of water quality sediment indicators and new techniques we’ve recently employed to further improve our understanding of sediment erosion and the issue of sedimentation in rivers. This first section provides a broad overview of some of the impacts of sediment in rivers.

7.2. Like nutrients and algae, sediment is a natural component of any waterway. As mountains and hills erode and waterways shift, loose soil, rocks, mud and silt are washed from the surrounding landscape into our rivers and streams.

7.3. Sediment also enters our waterways as a result of human activity through gravel extraction, in-river works, recontouring of land, earthworks and run-off from urban storm water drains. It can also be released from stream banks and riverbeds.

7.4. Sediment loads vary across the region depending on catchment slope and geology, vegetation coverage and type, and how surrounding land is used. Some of our rivers receive high levels of fine sediment made up of sand, silt and mud.

Sediment effects on life supporting capacity

7.5. Within the stream, particle size determines the type of impact on aquatic life. Large-sized material will determine river morphology and habitat type while the fine particles will influence water clarity and colour (sediments suspended in the water column) and habitat quality (fine sediment deposited on the riverbed).

7.6. Sediments suspended in the water column can have effects on fish, invertebrates and plants. The effects on fish include disruptions of the migration movements, reduction of the sight feeding range, or direct abrasion of the gills. Effects on invertebrates include clogging of gills and food catching ability. Suspended sediments also have an effect on photosynthetic depth (depth at which there is enough light to allow plants and algae to grow), thus affecting plant and algal communities.

7.7. Sediments deposited on, and in, the riverbed can impact on aquatic micro-habitat quality, particularly by filling the interstitial space between rocks, cobble and gravel, where many invertebrates live. It can also reduce survival and development success of instream spawning native fish and trout spawning success by reducing the interstitial flow of water and oxygen concentration through smothering of habitat. When sediment is deposited in riparian margins similar effects are likely to occur for the species that spawn in riparian habitat. Substantial deposition of sediment can also affect macro-habitat. For example it can reduce water depth, and thus cover for fish, in pools.

7.8. Sediment also carries with it other contaminants that are bound to it such as nutrients (particularly phosphorus) and heavy metals. The nutrients that are bound to the sediment can under different river conditions become available for uptake by plants and algae in stream contributing to excessive algal growth. Potentially toxic algae (phormidium) is known to have the ability to capture sediment within the mat and mine phosphorus from the sediment for up to 20 hours of the day due to pH and oxygen concentrations within the mat. This gives it a competitive advantage in streams that are low in dissolved phosphorus within the water column.

Effects on other values

7.9. Sedimentation effects on levels of service has been identified in Horizons' Long Term Plan 2018 Infrastructure Strategy as one of the significant infrastructure issues over the next 30 years for the region. Managing sediment can influence outcomes for water quality and the effects of sedimentation on levels of service of our flood protection schemes.

8. DISCUSSION

SLUI progress

8.1. Following the 2004 flood events, Manaaki Whenua were commissioned to develop a model to spatially predict the amount of 'Highly Erodible Land' (HEL) in the Manawatū-Whanganui Region to give direction for targeting effort under Horizons erosion control programme, the Sustainable Land Use Initiative (SLUI). This analysis of HEL was later extended across the country and found that Manawatū-Whanganui Regional Council has the largest area of HEL on private land in New Zealand (NZ), 22% of NZ's HEL in approximately 8% of NZ (Table 1).

Table 1: Percentage of Highly Erodible Land by Regional Council.

Source Robb and Brown, 2018	HEL with non woody vegetation outside DOC estate	
Region	**% of national total**	**% of land within the region**
Manawatu-Wanganui Region	22%	11%
Canterbury Region	14%	4%
Gisborne Region	12%	16%
Hawke's Bay Region	11%	9%
Northland Region	9%	8%
Waikato Region	7%	3%
Otago Region	6%	2%
Marlborough Region	5%	6%
Wellington Region	5%	8%
Taranaki Region	5%	7%
Southland Region	1%	0%
Tasman Region	1%	1%
Bay of Plenty Region	1%	1%
Auckland Region	1%	1%
West Coast Region	0%	0%
Nelson Region	0%	2%

8.2. The analysis of highly erodible land predicted approximately 263,000 ha of HEL in pasture land use and a further 200,000 ha of HEL with woody vegetation cover (protected HEL). To further target efforts within this large area of land in the region, Horizons developed a classification of target land into categories of Top, High Priority, Erodible and Not priority as shown in Table 2 below. The Table also provides a broad estimation of the sediment contribution per year on a square km basis and an estimate of what proportion the sediment contribution from each of these categories of land to rivers is likely to be.

8.3. While these are broad estimates, they show that top priority land is likely to contribute 40 to 55% of the sediment in the region's rivers and high priority land is likely to contribute a further 25-30% of the sediment. This makes top and high priority land the main target for the programme. However, targeting the erodible land is also important as that part of the farm as an overall area is likely where the predominate overall productivity of the farm is based and this land is also susceptible to erosion.

Table 2: Land classification by priority with sediment contributions.

Land Priority	Erosion to land	Erosion to water	Typical LUC class	Broad estimate of sediment (T/km$^{2/}$year) (pasture)	Sediment contribution to region's rivers
Top priority	Severe to extreme	Moderate to severe	7e, 8e, some 6e	5000	40 – 55 %
High priority	Moderate to severe	Slight to moderate	7e, riparian 6e	1000	25 – 30 %
Erodible	Slight to moderate	Slight	6e, riparian 1-5	200	15 %
Not priority	Negligible	Negligible	Non-riparian 1-5	50	2 %

8.4. Horizons has New Zealand's largest hill country erosion programme, the Sustainable Land Use Initiative. Over 11 years, with central government support $79 million has been spent resulting in over 34,000 ha of works. At the current pace, treatment of the top priority and high priority land is predicted to take in the order of 110 and 300 years respectively.

8.5. SLUI has completed farm plans for over 700 farms covering more than 500,000 ha of land. The on-farm mapping is more detailed than the regional mapping used to predict the amount of HEL in the region. The detailed on-farm mapping has confirmed the overall quantification of the size of the issue from the regional mapping exercise is accurate, however the regional mapping is correct around 50% of the time in locating the HEL within the region, reinforcing the need for the on-farm mapping to confirm the HEL areas at a farm scale.

8.6. SLUI was previously operated from a model where Whole Farm Plans are produced and works are completed in the areas of the Whole Farm Plans. Analysis of the area of Whole Farm Plans produced to date in the context of the amount of land in the region that is in the categories Top Priority, High Priority, Erodible and Not Erodible land (Table 3) shows that approximately half of the top and high priority land is within SLUI Whole Farm Plans. The recent application to the Hill Country Erosion Fund proposed a change where SLUI funds could be applied to areas without a SLUI Whole Farm Plan. Two new tools are proposed to ensure any areas treated are mapped. These are the SLUI Whole Farm Map and the SLUI Paddock Map.

8.7. Currently, 49% of the Top and High Priority land is within Whole Farm Plans, with the balance of 51% outside SLUI Whole Farm Plans. In line with the above mentioned changes, the previously separate Whanganui Catchment Strategy (WCS) – established before the SLUI will be integrated into the programme. This includes 39 WCS plans covering approximately 22 000 ha.

8.8. Further detail on the status of the erodible land in the region is possible through reporting of the amounts of erodible land in farm plans that is in pasture and the amount in woody vegetation (protected) as shown in Table 4 below. Changes in this table provides a measure of progress. Note that some areas already considered protected by woody vegetation are included in new works depending on the farm. Over the course of SLUI has completed over 35,000 hectares of works, with approximately 22,000 of these being on highly erodible land in pasture.

8.9. The targeting of farm plans and works also uses a prioritisation system for priority farms that Horizons has developed and target Top and High priority farms based on the classification above of top priority, high priority and erodible land. At present SLUI has 55% of the 341 top priority farms within the programme and 32% of 769 the high priority farms (Table 5).

Table 3: All highly erodible land by category that demonstrates the area within Whole Farm Plans and outside of Whole Farm Plans.

All highly erodible land (in pasture or woody vegetation	**Mapped in SLUI Whole Farm Plans (WFP) (ha)**	**Additional private land (ha)**	**Total (ha)**	**Percentage in SLUI WFP**	**Percentage outside SLUI WFP**
Top priority	68,000	67,000	135,000	50 %	50 %
High priority	126,000	136,000	262,000	48 %	52 %
Erodible	237,000	438,000	675,000	35 %	65 %
Not priority	96,000	273,000	369,000	26 %	74 %
Total	527,000	914,000	1,441,000	37 %	63 %
Sum top and high	194,000	203,000	397,000	49	51

Table 4: A further breakdown of area mapped both within and outside Whole Farm Plans by woody vegetation (protected) and pasture.

	Mapped in SLUI			Additional private land			Total		
	Total (ha)	In pasture (ha)	In woody vegetation (ha)	Total (ha)	In pasture (ha)	In woody vegetation (ha)	Total (ha)	In pasture (ha)	In woody vegetation (ha)
Top priority	68,000	30,000	39,000	67,000	29,000	38,000	135,000	59,000	77,000
High priority	126,000	99,000	27,000	136,000	107,000	30,000	262,000	206,000	57,000
Erodible	237,000	207,000	29,000	438,000	385,000	54,000	675,000	592,000	83,000
Not priority	96,000	92,000	36,000	273,000	262,000	10,000	369,000	354,000	46,000
Total	**527,000**	**428,000**	**131,000**	**914,000**	**783,000**	**132,000**	**1441,000**	**1,211,000**	**263,000**
Top, high, erodible	431,000	336,000	95,000	641,000	521,000	122,000	1,072,000	857,000	217,000

Table 5: The number of plans and hectares in plans completed by priority.

Plans completed, sorted by priority (30 June 2017)										
	Number of plans					**Hectares of plans x1000**				
	Region	Top	High	Low	Other	Region	Top	High	Low	Other
Plans Completed	669	187	247	197	38	500	196	198	92	16
Total farms	11,472	341	769	1,070	9,292	1,529	311	519	275	429
Percentage Completed	6	55	32	18	-	33	63	38	33	4
Plans to do	-	154	522	873	-	-	115	321	183	-

8.10. The categorisation into Top, High, Erodible and Not Priority land is one way to target efforts to improve water quality, targeting geographically is another way. The table below shows the spread of highly erodible land (as calculated by Manaaki Whenua for the region) and how it is distributed through the region's catchments. The data shows that the Whanganui Catchment has the highest amount of HEL on private land in the region with 47% of the regions total in a catchment that represents 32 percent of the regions area.

Table 6: Highly erodible land by catchment, broken down by pasture and woody vegetation cover.

Note Highly Erodible Land (HEL) in this table is from Landcare Research & includes only the aera on private land. Catchment	Catchment Area (ha)	HEL in the catchment with pasture cover (ha)	HEL in the catchment with woody vegetation cover (ha)	Total HEL in the catchment	Percentage of HEL in catchment	Percentage of HEL in the Region	Catchment area as a percentage of the overall regional area.
Akitio River	59,136	10,953	3,241	**14,193**	24%	3%	3%
East Coast	19,979	9,582	2,224	**11,806**	59%	3%	1%
Lake Horowhenua & Hokio Stream	6,963	5	1	**6**	0%	0%	0%
Manawatu	589,215	36,282	15,417	**51,699**	9%	11%	26%
Ohau River	18,878	60	961	**1,021**	5%	0%	1%
Owahanga River	42,911	9,704	3,049	**12,753**	30%	3%	2%
Rangitikei River	393,884	30,264	13,937	**44,201**	11%	10%	18%
Turakina River	95,723	26,843	9,202	**36,044**	38%	8%	4%
West Coast	86,554	3,936	8,719	**12,655**	15%	3%	4%
Whangaehu	199,369	42,093	20,151	**62,244**	31%	13%	9%
Whanganui	719,492	93,638	123,297	**216,935**	30%	47%	32%
Grand Total	**2,232,104**	**263,360**	**200,198**	**463,557**	21%	100%	100%

8.11. The table below shows how much of each catchment's highly erodible land is currently in Whole Farm Plans. This shows that 49% of the Manaaki Whenua defined Highly Erodible Land (HEL) on private land is within SLUI farm plans and that seven of the 10 catchments with significant HEL (excluding Lake Horowhenua) have over 60 % of the defined HEL within SLUI whole farm plans. The Whanganui Catchment at 28% of the HEL in farm plans is well below the other large catchments and this is an area of focus for the future programme. However it should be noted that this does not include the 22,000 ha of plans completed under the Whanganui Catchment Strategy.

Table 7: Highly Erodible Land (HEL) within and outside SLUI plans by catchment.

Note Highly Erodible Land (HEL) in this table is from Landcare Research & includes only the aera on private land. Catchment	Total amount of HEL in the catchment	Area of HEL in the catchment in SLUI Farm Plans (ha)	Area of HEL in the catchment not in a SLUI Farm Plan (ha)	Percentage of HEL in catchment in a SLUI Farm Plan	Percentage of HEL in catchment not in SLUI Farm Plan
Akitio River	14,193	9,234	4,959	65%	35%
East Coast	11,806	8,884	2,922	75%	25%
Lake Horowhenua & Hokio Stream	6	-	6	0%	100%
Manawatu	51,699	36,374	15,325	70%	30%
Ohau River	1,021	-	1,021	0%	100%
Owahanga River	12,753	7,738	5,015	61%	39%
Rangitikei River	44,201	33,055	11,145	75%	25%
Turakina River	36,044	23,400	12,644	65%	35%
West Coast	12,655	4,262	8,393	34%	66%
Whangaehu	62,244	43,390	18,854	70%	30%
Whanganui	216,935	60,419	156,516	28%	72%
Total	**463,557**	**226,757**	**236,800**	**49%**	**51%**

Modelled water quality outcomes resulting from SLUI implementation

8.12. Over the last five years, Horizons has commissioned a number of research projects aimed at both quantifying the impact SLUI has had on water quality outcome and better refining our understanding of sediment sources and sedimentation issues. This section provides a brief overview of this work and the current research to inform work programmes.

8.13. The SedNetNZ model, developed in collaboration with Manaaki Whenua, estimates sediment loads to rivers and by including spatial data from the SLUI Whole Farm Plans, can predict the effective reduction in sediment load as a result of the work. The model was developed over a number of years following the establishment of SLUI in 2006 and was calibrated using Horizons continuous suspended sediment and turbidity monitoring data. In 2014, following refinement of the model and establishment of assumptions, the first model outputs were produced. It was predicted that based on the most likely scenario (at that time) of continuing with 35 000 ha of Whole Farm Plans per year with no limit to afforestation (i.e. grants on forestry >5 ha are still provided) that there would be a 27% overall decrease in sediment loads by 2043. Later research predicted that these decreases may reduce to 19%, 12% and 5% with the impact of minor, moderate or major climate change scenarios. It is noted that this year the programme is producing approximately 20,000 ha of new whole farm plans (less than the scenario modelled).

8.14. An updated assessment factoring climate change into these scenarios in 2018, showed the programme may not offset the increases in sediment load from climate change in the longer term, as climate change is predicted to increase sediment loads in rivers by between 41 to 179% by 2090 depending on the severity of climate change. This suggests the long-term effectiveness of work already undertaken through SLUI is expected to reduce under climate change, as heavier rainfall events increase sediment loading in the region's rivers. It also means that continued investment in SLUI, or other programmes for erosion mitigation, will be required to offset the potentially severe effects of climate change.

Monitoring sediment

8.15. Monitoring of sediment (directly and indirectly) in water throughout the region occurs through the different programmes that comprise state of the environment monitoring network.

- Suspended Sediment monitoring as total suspended solids and suspended sediment concentration occurs at all of the river state of the environment and discharge monitoring sites monthly using grab samples. Sixteen of these sites have a continuous record available due to the rating curves developed between suspended sediment concentrations and the continuous turbidity measured at these sites;
- Deposited Sediment is measured at 65 periphyton sites using a bathyscope on a monthly basis and the remainder of the state of the environment network includes a bankside visual estimate of substrate;
- Particulate organic matter is monitored upstream and downstream of 26 major point source discharges across the region. Historically this was monitored across the network but continually low concentrations at the state of the environment sites has meant this measure is now only utilised for measuring direct discharges;
- Turbidity is measured at all of the state of the environment sites monthly using a grab sampling method. It is also measured at 16 of these sites on a continuous basis to allow for calculation of continuous sediment loads; and
- Visual clarity is measured at the majority of state of the environment sites monthly and is a field measurement.

8.16. For an explanation of the parameters and water quality targets associated with them see Annex 1.

Current state and trends

8.17. Land Water People (LWP) ltd assessed achievement of One Plan targets and trends (10 and 20 year) for visual clarity (distance and change) and particulate organic matter (Fraser and Snelder, 2018). The supplementary information that was provided with the report also gave trend analysis for the other sediment parameters with the exception of deposited sediment. The deposited sediment data set has not been analysed to date.

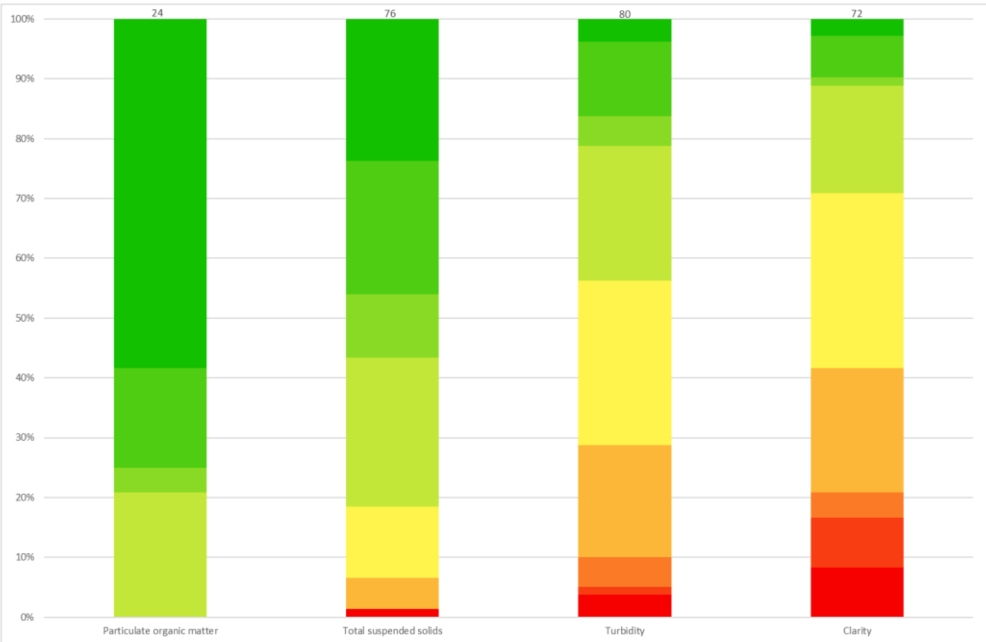
<u>State</u>

8.18. The analysis undertaken by LWP ltd found that at both state of the environment and impact (directly downstream of point source discharges) sites clarity targets were predominantly not being achieved but targets for particulate organic matter were being achieved. The percent reduction in clarity targets were also largely not met between upstream and downstream of the monitored point source discharges.

8.19. Additionally 5 of 40 estuaries regionally have been identified as being highly vulnerable to nutrients and sediment and a further 2 moderately vulnerable.

<u>Trends</u>

8.20. Over the 10 year period to July 2017 regional trends at state of the environment sites in clarity were predominantly degrading (i.e. decreasing visual clarity) whereas trends in particulate organic matter and TSS were predominantly improving (i.e. decreasing concentration of particulate organic matter and TSS). Over the 20 year period the results were mixed for clarity, turbidity and TSS, the only site with sufficient data for analysis for particulate organic matter was certain to be improving (Figure 1).



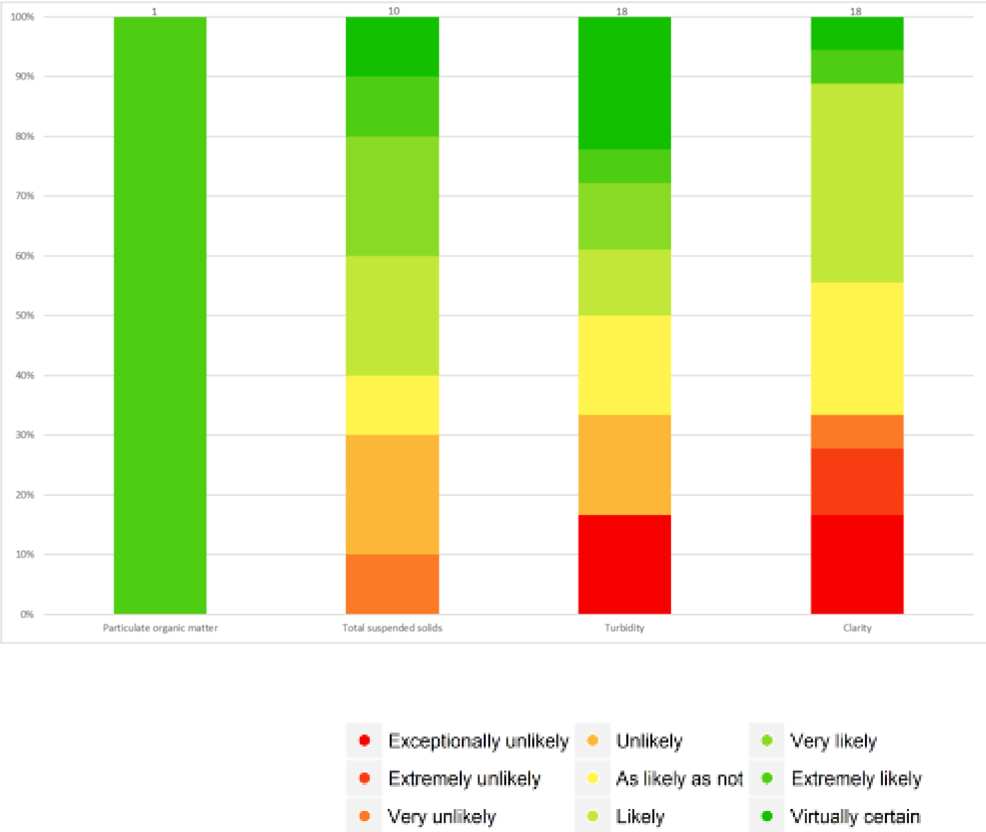
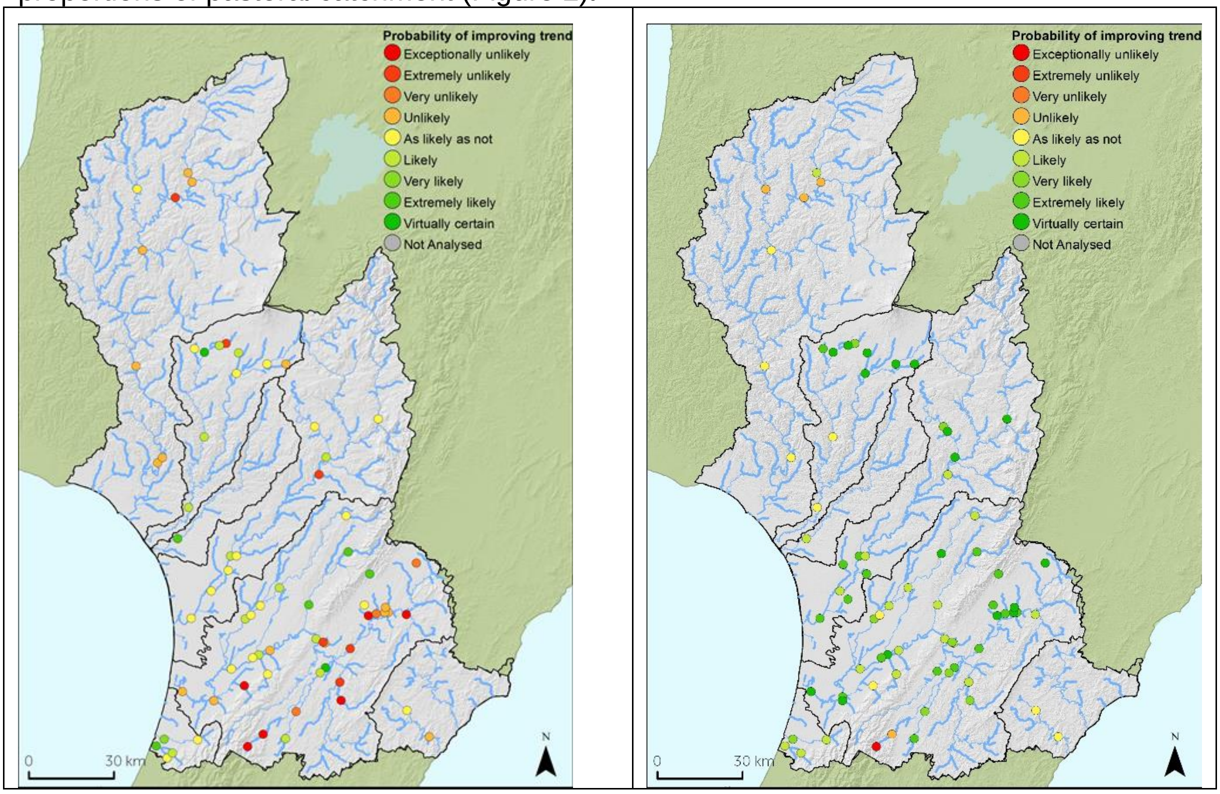


Figure 1: Proportion of SoE sites showing the likelihood of an improving unadjusted trends for the 10-year period (top graph) and 20-year period ending July 2017. The number at the top of each bar indicates the number of sites in the analysis. Green indicates improving trends whereas orange/red indicates degrading trends.

8.21. In the ten year dataset declining trends in the measured parameters have been observed at sites with large proportions of the catchment in native cover as well as sites with higher proportions of pastoral catchment (Figure 2).



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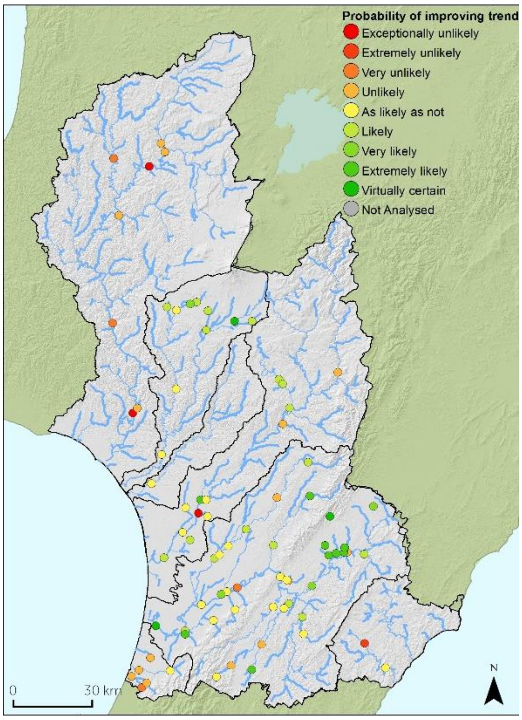
<tr><td>Probability of improving trend in visual clarity</td><td>Probability of improving trend in TSS</td></tr>
<tr><td colspan="2">

Probability of improving trend in Turbidity</td></tr>
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Figure 2: Location of SoE sites showing probability of improving unadjusted trends for the 10-year for each of the sediment parameters. . Green indicates improving trends whereas orange/red indicates degrading trends.

8.22. Earlier analysis (February 2018) conducted by LWP provided an assessment of recent reductions in on *E. coli* and three sediment related parameters (visual clarity, suspended sediment concentration and turbidity) in the Manawatū -Whanganui Region. This analysis included spatial modelling to look at the associations between interventions and water quality outcomes. The results showed weak but statistically significant associations between improving trends for all water quality variables and the proportion of catchment involved in SLUI farm plans. There were also significant associations between improving water quality and additional HRC initiatives associated with riparian planting and new fencing.

8.23. Spatial modelling of state and trends across the dataset utilised in the later LWP analysis for all water quality variables is currently being undertaken in a similar manner to that of the earlier report for *E. coli* and sediment. This analysis is investigating the associations between interventions, climate and land use change with state and trends of river water quality across the region and is expected to be delivered later in the calendar year.

Fluvial research

8.24. Over time Horizons has surveyed rivers that inform management of flood control schemes and gravel management. Internally within Horizons the survey programme is coordinated between the Science, River Management and Survey Teams. In the past, fluvial surveys were carried out on the wetted channel of the river only. Through advances in our equipment, they are now able to extend from stopbank to stopbank, providing a better overall picture of sedimentation and gravel resources in our rivers. Council has increased its investment in fluvial science over time, in particular to research the issue of sedimentation impacts on levels of service for flood protection. The Science and River Management Teams have collaborated with scientists from Manaaki Whenua and Massey University to complete this research and some of these studies are shown below.

Oroua catchment sediment fingerprinting case study

8.25. The Oroua River is a priority catchment for SLUI works reflecting the issue of sedimentation on the Lower Oroua and impacts on flood protection. To further understand sources of sediment in the catchment, Horizons commissioned a project to Manaaki Whenua in 2017 to undertake sediment fingerprinting in the Oroua Catchment. Sediment fingerprinting techniques involve taking samples from both 'source' and 'sink' sites within a catchment and evaluate particle size, mineralogy and geochemical properties to characterise the sample and trace the in-channel deposited sediment ('sinks') to their likely sources.

8.26. The results determined that the dominant sediment sources contributing of overbank sediment deposition were hill subsurface (31-37 %) and unconsolidated sediment sources (26-27 %). The remaining proportions comprise Mudstone (9–10 %), Mountain Range (9–15%), and Hill Surface (7–8%) sediment sources, with a possible Channel Bank sediment contribution of up to 18%. Sediment fingerprinting has been applied elsewhere on the region outside of this study. Dr Simon Vale (Manaaki Whenua) will discuss this further during the Committee meeting.

8.27. The figure below demonstrates the total specific yield derived from sediment fingerprinting proportions distributed across spatial extent of source material.

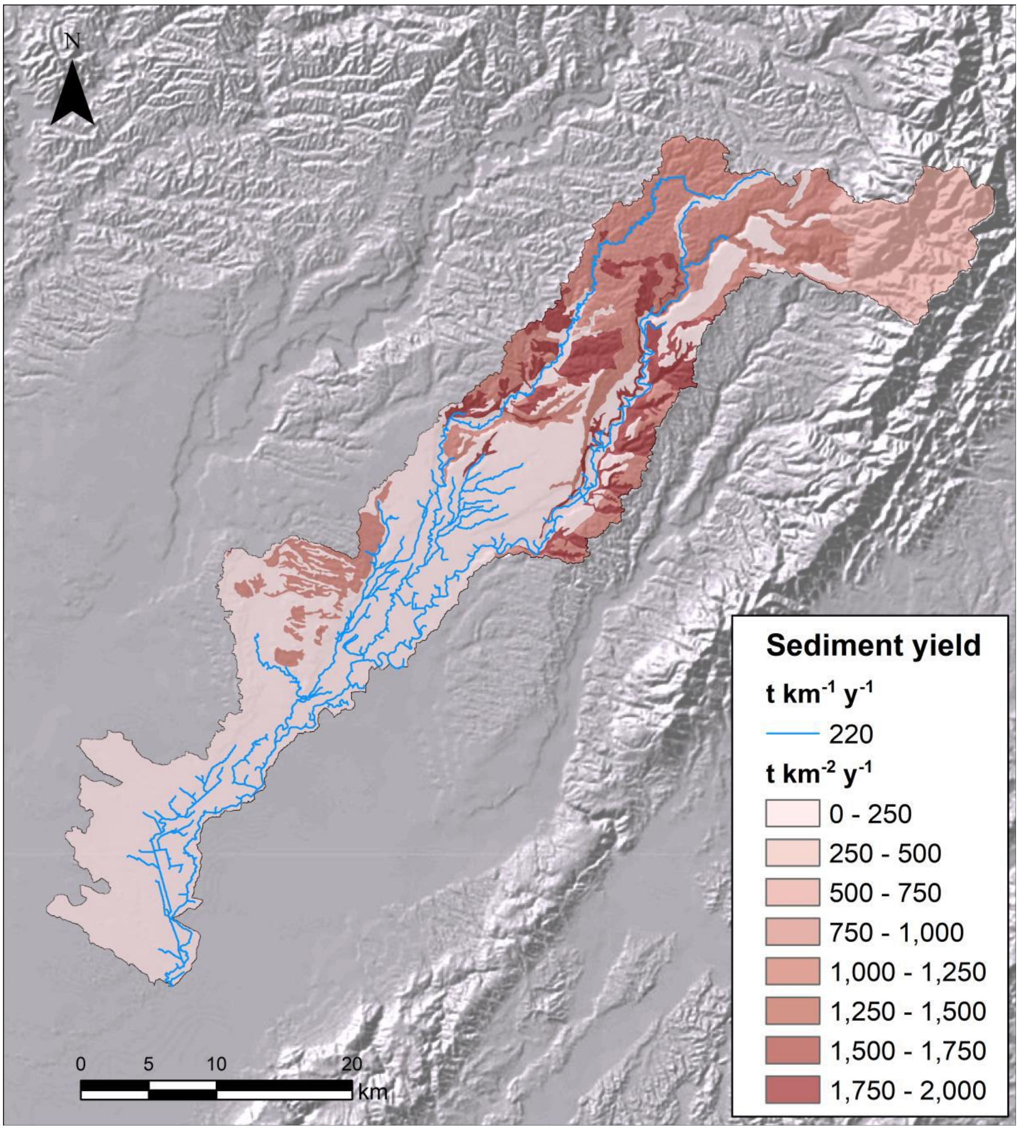

Figure 3: Sediment yield based on sediment fingerprinting to identify key source areas.

Technological advances in fluvial science

8.28. A new technique for establishing changes in channel erosion and sediment deposition over time is being exposed through the use of aerial LiDAR (Light Detection and Ranging). In 2018, a comparison between LiDAR derived Digital Elevation Models of the Oroua River taken in 2006 and 2016 was carried out to assess volume change over the ten year period and where along the river aggradation and degradation were occurring. This work was completed by Prof Ian Fuller and Robert Dykes at Massey University and demonstrated that net deposition was recorded in the upper reaches and erosion dominated the lower reaches. In 2017/18 the first full cross section survey of the Manawatū River from the Manawatu Gorge to the Sea was completed and LiDAR was flown over this area.

8.29. Horizons has a current project underway working with Tonkin & Taylor on a sedimentation study in the Lower Manawatū which will take into account the previous work completed in the Oroua, as well as cross-section information and LiDAR flown in the Lower Manawatū.

Current research

8.30. Manaaki Whenua, through support of Horizons Regional Council and other stakeholders have secured MBIE funding for a five year project titled, “Smarter targeting of erosion control”. The aim of this project is to develop models and tools that will improve our understanding of the links between erosion sources and sediment related water quality, determine the performance of erosion control measures and develop a framework for national scale assessment of erosion sediment redistribution and economic impacts.

8.31. Key streams of this research include developing a model at the storm event scale (from SedNetNZ using average annual loads in the past), characterization of sediment quality linking erosion source to sediment quality and improving erosion modelling. The Manawatū and Whanganui rivers are two catchments that will be studied in this project. Horizons are partnering with Manaaki Whenua with this research by providing data and knowledge of the study areas. John Dymond (Manaaki Whenua) will discuss this in more detail at the Committee meeting.

8.32. Understanding of channel bank erosion has in the past been limited and required assumptions in the SedNetNZ model. A recent paper published by Manaaki Whenua (Smith et al, 2019) presented a new spatial model of bank erosion. This was calibrated and tested using spatial data in the Manawatū Catchment and the revised model predicts that bank erosion contributes more sediment to the overall sediment load than the previous model.

8.33. Horizons continue to work alongside other organisations across water quality and erosion and fluvial research to develop our understanding of sediment processes and linking erosion prevention to water quality outcomes. Spatial modelling of state and trends, the Lower Manawatu sedimentation study and the Smarter Targeting of Erosion Control programme are ongoing and will be reported on further to Council in due course.

9. SIGNIFICANCE

9.1. This is not a significant decision according to the Council’s Policy on Significance and Engagement.

Staci Boyte
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Maree Patterson
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Grant Cooper
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Jon Roygard
GROUP MANAGER NATURAL RESOURCES & PARTNERSHIPS

ANNEXES

A Water Quality Monitoring