1 Revised sediment calculations

We have updated the sediment calculations to include the default 75 % removal efficiency and calculate the sediment loads within each sub-catchment on-site. For the purposes of the two wetlands, we have calculated the change in sediment loads entering the wetlands (upper wetlands) and the changes downstream to enable an overall change to be determined. We have also updated the proposed earthworks programme which has enabled the sediment loads per year to be calculated. The revised sediment loads are outlined in the Tables below.

Updated sediment calculations

Earthworks year	Catchment	Maximum works area per EW season (ha)	Calculated sediment loads (tonnes)	Background sediment loads (tonnes)	Total sediment loads (tonnes)
Year 1	Upper Western Block – Wayby Wetland (South)	2.5	122.5	289.25	411.75
	Lower Western Block – Wayby Wetland (South)	0	0	685.3	685.3
	Upper Western Block – Wayby Wetland (north)	5	245	756.5	1001.5
	Lower Western Block – Wayby Wetland (north)	0	0	720.9	720.9
	Access road (Southern Block)	4	196	685.3	881.3
	Upper Waiteraire stream	0	0	1308.3	1308.3
	Landfill (Valley 1, Eastern Block)	0	0	952.3	952.3
	Total	11.5	563.5	5397.85	5961.35
Year 2	Upper Western Block – Wayby Wetland (South)	2.5	122.5	289.25	411.75
	Lower Western Block – Wayby Wetland (South)	0	0	685.3	685.3
	Upper Western Block – Wayby Wetland (north)	5	245	756.5	1001.5
	Lower Western Block – Wayby Wetland (north)	0	0	720.9	720.9
	Access road (Southern Block)	4	196	685.3	881.3
	Upper Waiteraire stream	0	0	1308.3	1308.3
	Landfill (Valley 1, Eastern Block)	0	0	952.3	952.3
	Total	11.5	563.5	5397.85	5961.35
Year 3	Upper Western Block – Wayby Wetland (South)	0	0	311.5	311.5

	Lower Western Block – Wayby Wetland (South)	0	0	685.3	685.3
	Upper Western Block – Wayby Wetland (north)	5	245	756.5	1001.5
	Lower Western Block – Wayby Wetland (north)	0	0	720.9	720.9
	Access road (Southern Block)	1.7	83.3	705.77	789.07
	Upper Waiteraire stream	3.75	183.75	1274.925	1458.675
	Landfill (Valley 1, Eastern Block)	0	0	952.3	952.3
	Total	10.45	512.05	5407.195	5919.245
Year 4	Upper Western Block – Wayby Wetland (South)	0	0	311.5	311.5
	Lower Western Block – Wayby Wetland (South)	0	0	685.3	685.3
	Upper Western Block – Wayby Wetland (north)	5	245	756.5	1001.5
	Lower Western Block – Wayby Wetland (north)	0	0	720.9	720.9
	Access road (Southern Block)	1.7	83.3	705.77	789.07
	Upper Waiteraire stream	3.75	183.75	1274.925	1458.675
	Landfill (Valley 1, Eastern Block)	3	147	925.6	1072.6
	Total	3	147	925.6	1072.6

To put the sediment loads into perspective, we have calculated the percent change in each catchment.

Percent change based on 75 % removal efficiency

Area	**% increase over baseline scenario**				
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Overall**
Upper Western Block – Wayby Wetland	10 %	10 %	0 %	0 %	5 %
Upper Western Block – Wayby Wetland (north)	13 %	13 %	13 %	13 %	13 %
Access road (Southern Block)	22 %	22 %	9 %	9 %	16 %
Upper Waiteraire stream	0 %	0 %	11 %	11 %	6 %
Landfill (Valley 1, Eastern Block)	0 %	0 %	0 %	13 %	3 %
Total	8 %	8 %	8 %	10 %	8 %

Over the earthworks period, the overall increase in sediment loads within the immediate catchments, with the increases varying between 3 % and 16 % based on the proposed earthworks programme and use of standard sediment controls (and assuming a 75 % removal efficiency).

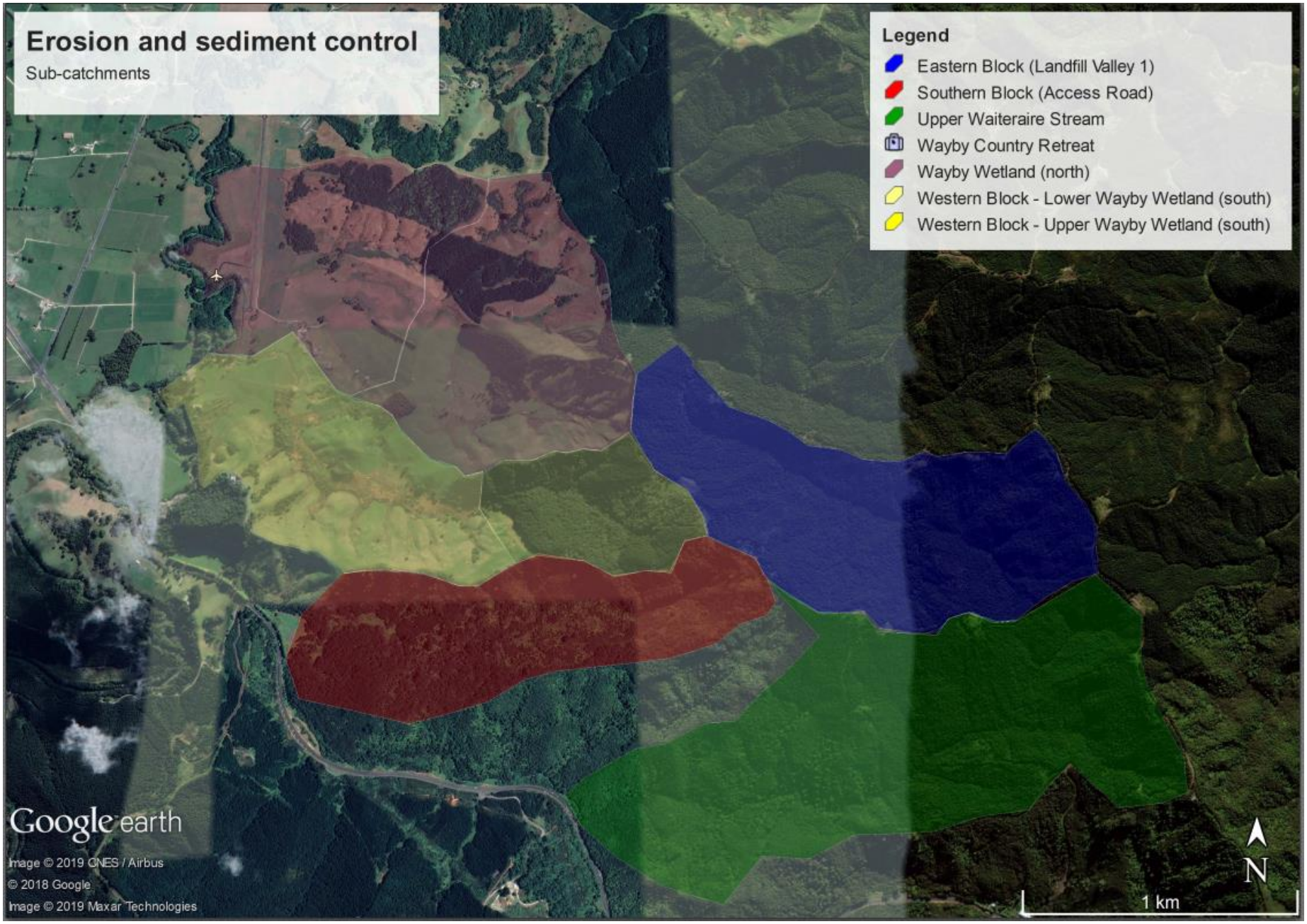
These calculations are based on achieving the standard 75 % removal efficiency. As discussed within the application, a higher level of removal efficiency is expected with the use of multiple devices in series and monitoring and feedback during the project. Recent experience at other earthworks projects in Auckland where a high level of control has been implemented has shown that the USLE calculations significantly over estimate sediment loads and sediment removal efficiencies of over 99 % are achievable.

To understand the impact that a higher removal efficiency would have on the results, we have recalculated the percent change based on the default 75, 90, 95 %.

Percent increase in sediment loads 75, 90 and 95 % sediment removal over the construction period

Area	**% increase over baseline scenario**		
	75 % removal efficiency	**90 % removal efficiency**	**95 % removal efficiency**
Southern wetland	5 %	1 %	<1 %
Northern wetland	13 %	4 %	<1 %
Southern valley	16 %	4 %	<1 %
Upper Waiteraire stream	6 %	1 %	<1 %
Landfill	3%	1%	<1%
Total	8%	2%	<1%

Therefore, achieving 90 and 95 % sediment removal efficiency reduces the increase in sediment loads to 2 and <1 %, respectively.


Erosion and sediment control
Sub-catchments
Legend
Eastern Block (Landfill Valley 1)
Southern Block (Access Road)
Upper Waiteraire Stream
Wayby Country Retreat
Wayby Wetland (north)
Western Block - Lower Wayby Wetland (south)
Western Block - Upper Wayby Wetland (south)
Google earth
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N
1 km