GHD Advisory

Environmental effects offsets: Estimating financial contributions FINAL

Greater Wellington Regional Council

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GHD Limited

Level 1, Grant Thornton House

Wellington, 6011, New Zealand

T +64 4 495 5800 | **E** wlgmail@ghd.com | **ghd.com**

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The Power of Commitment

1. Executive summary

This Executive Summary and the remainder of the report should be read in conjunction with the scope and limitations set out in the Introduction.

The National Policy Statement on Freshwater Management (NPS FM) requires water quality to be maintained or improved. Likely greenfield development in the Te Awarua-o-Porirua and Te Whanganui-a-Tara whaitua catchments will come with an unavoidable increase in stormwater contaminants entering receiving freshwater and coastal environments, even with best practice contaminant treatment systems in place. Greater Wellington Regional Council (GWRC) proposes a compensatory offset in the form of a financial contribution (FC) be collected from greenfield development to cover the ***residual contaminants*** (specifically zinc and copper in this instance) that cannot be practically covered by best practice contaminant treatment systems onsite. These FCs would be used to construct or upgrade a stormwater treatment system to serve the same sub-catchment.

GWRC commissioned GHD to investigate the likely extent of greenfield development over the next 30-50 years in the Te Awarua-o-Porirua and Te Whanganui-a-Tara whaitua, to work with GWRC to understand the contaminant implications of that development, to estimate the scale and cost of an appropriate intervention to offset the contaminants, to estimate the likely scale of financial contribution required to cover this cost, and to comment on the economic implications of the FC on development activity.

Almost 12,000 new ***dwellings*** are expected to be added to greenfield areas across the two whaitua over the next 50 years, with 6,450 in Te-Awarua-o-Porirua and 5,470 in Te Whanganui-a-Tara. These dwellings will be a mix of stand-alone homes and townhouses. Between them, they are expected to generate around 606 hectares of roading, hardstand and roof cover. An estimated 88 hectares of roof, roading and hardstand cover is expected to be built out in ***non-residential*** greenfield areas over around 30 years, all of it in Te Awarua-o-Porirua.

It was estimated that, while the bulk of zinc and copper contaminants would be dealt with within greenfield developments, approximately 6.2 hectares of wetland type infrastructure would be needed to offset the residual contaminants not dealt with onsite. Around 1.7 hectares would be needed in Te Whanganui-a-Tara and a further 4.6 hectares in Te Awarua-o-Porirua (where all the non-residential greenfield land is expected to be developed).

Wetlands are expensive to construct, at an estimated cost of around $4 million per hectare, implying a total cost across the two whaitua of around $25 million at today's costs.

FCs were calculated using an interest rate assumption of 6.15% to fund the interventions, while an average annual cost escalation of 5% was assumed, and a delivery timeframe for the wetlands of 2037-2039. FCs were calculated on the basis of Equivalent Household Units (EHUs), with dwellings with a roof site coverage of less than $55m^2$ assumed to be 0.6 of an EHU. Non-residential FCs were estimated at a rate per $100m^2$ of hardstand or roofing cover. The consequent FCs are set out below.

Residential FCs per EHU	**$ excl GST**
Whaitua te Whanganui-a-Tara	$ 4,240
Te Awarua-o-Porirua Whaitua	$ 4,599
Non-residential FC per 100m2 hardstand or roofing	**$ excl GST**
Te Awarua-o-Porirua Whaitua	$ 858

By not requiring development to pay to offset its impacts on the environment, development is incentivised to happen in a way that is not cognisant of those impacts. This ignores the economic principle of user (or polluter) pays. Evidence from New Zealand and abroad shows that accurately charging to offset these negative impacts will push raw land prices down, not property prices up. The scale of the FCs is small relative to the overall price of delivering a dwelling into the market. Nevertheless, there may be an impact on those developers who have paid a price for land that does not reflect the cost of mitigating their environmental impacts. At the margins, the policy will make some developments infeasible.

Developers who have overpaid may resell, hold onto the land until land prices rise again, or rework their proposed development. Regardless, this situation does not justify ignoring these residual contaminants; perpetuating the current state because some developers have overpaid or because of cyclical weakness in the housing market will only exacerbate the environmental challenge.

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2. Introduction

Purpose

Greenfield development comes with an unavoidable increase in stormwater contaminants entering receiving freshwater and coastal environments, even with best practice contaminant treatment systems in place. This increase in contaminants conflicts with the NPS FM requirement to maintain or improve water quality.

To provide “headroom” in the sub-catchment/part FMU, it is proposed that a compensatory offset in the form of an FC will be collected by GWRC to cover the ***residual contaminants*** that cannot be practically covered by best practice contaminant treatment systems onsite. This will be transferred to the relevant water services entity to construct or upgrade a stormwater treatment system to serve existing urban development within the same sub-catchment/part FMU, such that the offset occurs in the same catchment as the greenfield development.

The FC will be collected from all greenfield developments requiring a regional stormwater consent (i.e. any development creating more than $1000m^2$ impervious area) within the sub-catchment/part FMU.

The purpose of this work is therefore to:

1. Estimate the total FCs to be collected if all current undeveloped urban and future urban zone is developed (split by whaitua).

2. Estimate the costs to a greenfield development for the FC offset.

3. Understand any other economic implication of the FC policy.

Information prepared by others to inform this report

- Estimating the contaminant impact from greenfield development (estimated by Stu Farrant of Morphum Environmental)
- Developing raw cost estimates for infrastructure upgrades (also provided by Stu Farrant of Morphum Environmental)
- Estimating the appropriate longer-term interest rate assumption (provided by GWRC)
- Determining the appropriate delivery period for the wetlands.

Scope and limitations

This report has been prepared by GHD for Greater Wellington Regional Council and may only be used and relied on by Greater Wellington Regional Council for the purpose agreed between GHD and Greater Wellington Regional Council.

GHD otherwise disclaims responsibility to any person other than Greater Wellington Regional Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD. GHD disclaims liability arising from any of the assumptions or information prepared by others being incorrect.

3. Estimating greenfield development

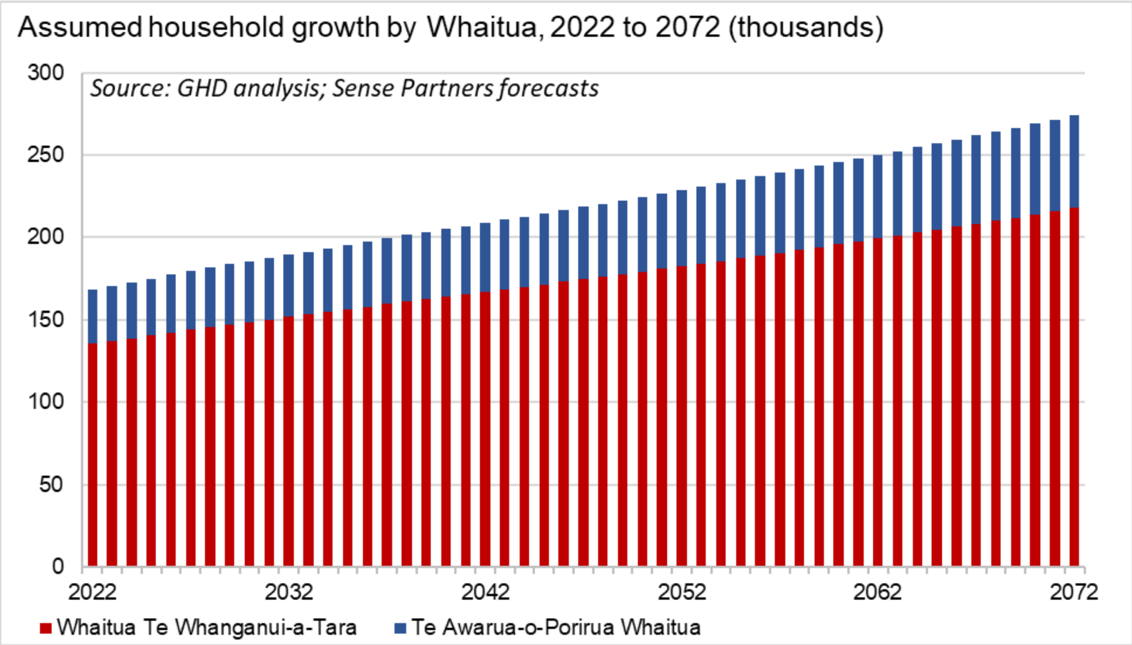
The first step to calculating financial contributions that would be needed, is to estimate the amount of greenfield development that may be expected to occur over the next several decades.

Total growth in households by whaitua to 2072

As of 2022, Te Awarua-o-Porirua Whaitua is estimated to have around 33,200 households, and Whaitua Te Whanganui-a-Tara around 135,400 households. While the relationship between dwellings and households is not one to one, it provides a good estimate of the number of dwellings. Some dwellings include more than one household, while some dwellings are empty. Households therefore provide a fair proxy of the total number of households likely to be delivered.

Earlier work has identified the expected total growth in households in the two whaitua over the next 50 years. This growth is set out in Figure 1.

Figure 1 Expected growth in households across the whaitua



The number of households in Te Whanganui-a-Tara is expected to increase by about 82,000 over the next 50 years, and by about 23,000 in Te Awarua-o-Porirua. While there are plans for intensification across the region's urban council areas, some of this growth will be accommodated by greenfield development, which is the focus of this work.

Where greenfield residential growth is expected

GWRC was able to identify a number of greenfield areas that are already live-zoned, future urban zoned, or are potential additional areas for future development. On advice from GWRC, the analysis of potential greenfield development is limited to live zoned and expected future urban zoned areas rather than the less likely development areas. Should these less likely areas be advanced in future, the model can be re-run to incorporate the impact of adding in these areas on the scale of offset intervention needed and therefore cost.

Figure 2 Anticipated greenfield residential areas with build-out periods

GF Area name	Total Dwellings to be added	Start Year	End Year	Remarks
Porirua NGA (Already Planned)	2000	2022	2042	Part one of the Porirua NGA development - see part two below
Porirua NGA (New)	1500	2024	2053	
Kingsley Heights	250	2032	2037	
GF St Patricks	600	2029	2039	
GF Gabites	220	2025	2035	No longer includes Maymorn
GF Gillespies Block	1000	2034	2043	
Judgeford	450	2030	2041	No longer includes Upper WE Growth Corridor
Lincolnshire Farm	2000	2025	2061	
Upper Stebbings	500	2041	2055	
Wainuiomata North	1500	2053	2072	
Upper Hutt Southern Growth Area	1500	2053	2060	
GF Canon Point	400	2029	2041	
TOTAL	**11,920**			

Consequently, an estimated 6,450 new dwellings are assumed to be added to Te-Awarua-o-Porirua in greenfield areas by 2061, when the last area included as likely is expected to be built out. These 6,450 dwellings constitute about 37% of all dwellings expected to be added in the whaitua by 2061.

In Te Whanganui-a-Tara, an estimated 5,470 additional dwellings are expected to be added in greenfield areas out to 2072. These dwellings would constitute just 11% of dwellings expected to be added to the whaitua in that period, demonstrating the strong focus on intensification in existing brownfield areas.

Greenfield dwellings by typology

Smaller homes are likely to have a smaller residual contaminant role because of smaller roof surfaces, smaller impervious driveway surfaces and so on. Consequently, it is useful to understand the mix of housing typologies likely to be delivered. This also acts as a good cross-check on the credibility of the housing development numbers.

In terms of housing typology, we anticipate that the greenfield housing will be a mix of stand-alone homes and more dense housing. Given it is likely that individual developments would include a mix of typologies, but to provide some idea of the likely overall mix of housing, we undertook the following steps:

1. Sourced from GWRC or estimated the number of hectares of each development area.
2. Divided the estimate of the size of each development area by the expected number of dwellings for a gross m^2/dwelling measure.
3. Divided each development's gross m^2/dwelling measure by two to account for the fact that typically around 50% of a residential development's space is consumed by land required for roads, parks, floodplains and streams that are not built over, to yield a net m^2/dwelling measure.
4. Assumed a development with a net m^2/dwelling measure less than or equal to 300 m^2 would be predominantly townhouse type development, with developments with net m^2/dwelling measures greater than 300 m^2 assumed to be predominantly stand-alone homes.

This approach produced the estimates of townhouses and stand-alone homes in greenfield areas by whaitua in Figure 3.

Figure 3 Estimated greenfield dwellings to be added by typology

Dwellings	Townhouse	Stand-alone	TOTAL
Whaitua te Whanganui-a-Tara	2,100	3,370	5,470
Te Awarua-o-Porirua Whaitua	-	6,450	6,450
	2,100	**9,820**	**11,920**

Estimating the number of townhouses separately from the number of stand-alone homes allows us to consider the typically smaller impact of townhouses because of their smaller roof and other impervious surface cover. The number of dwellings can be converted into Equivalent Household Units (EHUs), variously called Household Unit Equivalents (HUEs) or Household Equivalent Units (HEUs) by different councils across New Zealand. This allows GWRC the flexibility to acknowledge that the impact of more compact dwellings is likely to be less per dwelling, so that smaller, more compact homes are not disadvantaged by having to contribute the same as larger homes across bigger footprints that produced more contaminants.

From dwellings to residential EHUs

We estimate that one townhouse has an impact that is 60% that of a stand-alone dwelling, or 40% less than a stand-alone dwelling. This is borne out by recent construction data. Townhouses in the four urban councils across Wellington region tend to be about 40% smaller than stand-alone homes (an average of $98m^2$ compared with 169 m^2 for stand-alone homes). They are likely to have a smaller footprint and less impervious surface coverage than a stand-alone home. Because they are smaller, they tend to have fewer occupants and therefore contribute less to the need for roading and other infrastructure that may cause run-off.

Figure 4 Estimated greenfield EHUs by typology

EHUs	Townhouse	Stand-alone	TOTAL
Whaitua Te Whanganui-a-Tara	1,260	3,370	4,630
Te Awarua-o-Porirua Whaitua	-	6,450	6,450
	1,260	**9,820**	**11,080**

Consequently, the implied number of residential EHUs is 11,080 in total, and in each of the two whaitua is:

- Te Awarua-o-Porirua: 6,450 (with growth overwhelmingly expected to be in stand-alone homes)
- Te Whanganui-a-Tara: 4,630 (where a significant amount of townhouse type development is expected).

Residential impervious surfaces

When the goal is to consider how residential and non-residential greenfield development affects residual contaminants, with a view to offsetting these contaminants, we need to think of dwellings in terms of their impervious surfaces. Assuming approximately 25% of land in greenfield areas is consumed for roading and pathways (a rule of thumb adopted elsewhere in the country)[1], yields the following mix of land use for primarily residential purposes.

Figure 5 Estimated impervious surfaces in greenfield residential areas

Residential growth (hectares)	Roofcover	Roading + Hardstand	Permeable surfaces	TOTAL
Whaitua Te Whanganui-a-Tara	46.6	138.6	283.7	**468.9**
Te Awarua-o-Porirua Whaitua	66.1	354.4	878.5	**1,299.0**
TOTAL	**112.6**	**493.0**	**1,162.2**	**1,767.9**

Across the two whaitua, an estimated 113 hectares of a land will receive roof cover, while a further 493 hectares of land will be required for roading and hard-stand areas (including driveways, pavements and impervious patios).

[1] See for instance the *Warkworth Structure Plan* of June 2019, which provides detailed estimates of the role of different elements of development in residential and non-residential areas. Warkworth was chosen because of its relatively low density and thus similarity to proposed greenfield development in the two whaitua, and due to its detailed level of analysis with regard to land use by zoning type.

When considering appropriate interventions, it is the residual contaminants from these surface types that will need to be offset.

Where greenfield non-residential growth is expected

The best available data from GWRC on likely non-residential development suggests the following pattern of non-residential development by whaitua.

Figure 6 Anticipated greenfield non-residential areas with build-out periods

GF Area name	Total Hectares	Start Year	End Year
Judgeford Flats	93	2025	2034
Lincolnshire Farm 1	10	2025	2034
Lincolnshire Farm 2	35	2035	2054
TOTAL	**138**		

All these areas fall within the Te Awarua-o-Porirua whaitua, with some development expected to begin in the 2024/25 financial year and some from the 2034/35 financial year.

Non-residential impervious surfaces

For non-residential areas, it was assumed that 55% of gross land area was available for development (again in line with other parts of the country), and 70% site cover on developable land. We assumed 60% of that site cover was roofing and 40% was carparking or other hard-stand uses.

Figure 7 Estimated impervious surfaces in non-residential areas by whaitua

Non-residential growth (hectares)	Roofcover	Roading + Hardstand	Permeable surfaces	TOTAL
Whaitua te Whanganui-a-Tara	-	-	-	**-**
Te Awarua-o-Porirua Whaitua	31.9	55.8	50.4	**138.0**
TOTAL	**31.9**	**55.8**	**50.4**	**138.0**

An estimated 32 hectares of total roof cover are expected to be needed within Te Awarua-o-Porirua, along with a further 56 hectares of hard-stand and roading.

4. Appropriate offsetting interventions and costs

With input from Morphum Environmental (see Appendix), it was possible to estimate the potential impact of expected greenfield development on residual contaminants. The assumption is that the bulk of contaminants from run-off would be dealt with onsite within greenfield developments (around 85%), but that ***residual*** contaminants would be offset by a centralised intervention in each whaitua. An appropriate way of offsetting residual contaminants not managed on-site is through centralised wetlands.

The likely size of wetland needed to offset the expected level of residual contaminants by full build-out is shown in Figure 8.

Figure 8 Estimated wetland area required to offset residual contaminants

	Offsetting wetland required for residual contaminants (hectares)		
Development type	**Whaitua te Whanganui-a-Tara**	**Te Awarua-o-Porirua Whaitua**	**TOTAL**
Residential	**1.7**	**3.8**	**5.5**
Non-residential	**0.0**	**0.8**	**0.8**
TOTAL	**1.7**	**4.6**	**6.2**

It is estimated that residential development in Te Whanganui-a-Tara would require around 1.7 hectares of wetlands to offset these residual contaminants. Te Awarua-o-Porirua would require 3.8 hectares. With new non-residential greenfield development only anticipated in Te Awarua-o-Porirua, an estimated 0.8 hectares are estimated to be required to offset residual contaminants there. The total impact is estimated at around 1.7 hectares for Te Whanganui-a-Tara and 4.6 hectares for Te Awarua-o-Porirua.

Costing these interventions

Wetlands are likely to use low-lying land where it would be more difficult to build anyway. This means that the land is likely to be significantly less expensive than prime building land, as its best alternative use may be relatively low productivity rural uses. While there is variation in the pricing for wetlands, a general pattern emerges that allows an estimation of the likely cost for establishing a wetland based on size.

Morphum Environmental provided an estimate of the cost per hectare for developing wetlands, which is included in the Appendix report. The largest component of the cost is from bulk earthworks, while topsoils, planting and other costs make up the rest of the typical cost of around $4 million per hectare.

This implies an offset cost per whaitua as follows:

- Te Awarua-o-Porirua: $18.3 million including the allowance for both residential and non-residential greenfield development
- Te Whanganui-a-Tara: $6.7 million for its expected greenfield residential development.

5. Implied financial contribution

For each whaitua, we have calculated an estimated FC:

- per residential EHU
- per 100m^2 of non-residential roofing or hardstand cover.

Further assumptions are:

- A 6.15% interest rate[2]
- There is a 5% cost escalation per year to allow for cost increases until construction of the wetlands[3]
- The wetlands in both whaitua are constructed from 2037 to 2039, an assumption agreed with GWRC
- All works are debt-funded, such that any FCs that are collected before construction of the offset intervention reduce overall council debt thus saving interest costs on other debts
- The expected delivery timeframes for each greenfield area as provided by GWRC determines when FCs are collected.

Residential FCs

Based on the assumptions about interest rates and the expected period of delivery of new dwellings across the two whaitua, the estimated cost per EHU is set out in Figure 9.

Figure 9 Estimated FC per residential EHU

Residential FCs per EHU	$ excl GST
Whaitua te Whanganui-a-Tara	$ 4,240
Te Awarua-o-Porirua Whaitua	$ 4,599

The estimated FC per EHU is $4,240 to $4,599 depending on the whaitua. We recommend that ***this FC be charged on new dwellings with an anticipated footprint (site coverage) of more than 55m^2***, excluding any hardstand (i.e. dwellings likely to be more than 100m^2 in total floor area, but double storeyed). While the modelling has assumed hardstand areas on these properties (patios, driveways and so on) for the purpose of estimating contaminant load, often information on patio surface areas and the like is not provided in building consent applications, which is why a dwelling site coverage estimate is used instead.

Dwellings with ***a site coverage of the dwelling of less than or equal to 55m^2*** cover at construction would be ***charged at 0.6 of these FC rates*** in line with development contributions policies used in New Zealand where smaller properties that place less demand on the network (or in this case produce fewer contaminants) pay less. This equates to $2,544 in Te Whanganui-a-Tara and $2,759 in Te Awarua-o-Porirua.

Non-residential FCs

Non-residential FCs are for Te Awarua-o-Porirua only as at this point no non-residential development is expected in greenfield areas in Te Whanganui-a-Tara. Should future changes require development of greenfield business land in Te Whanganui-a-Tara, we recommend a similar starting point for FCs based on roofing or hardstand cover. The assumption is that the impact of roofing on one hand, and roading and hardstand on the other is similar, and therefore the FC for 100 m^2 of cover of is the same regardless of whether the impermeable cover is roofing or hardstand.

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[2] This is GWRC's latest indicative fixed term borrowing rate for a 2037 time-horizon, the date at which wetland construction is assumed to begin.

[3] We would note that construction cost increases have been significantly higher than 5% in recent years, even before COVID-19, but this estimate is based on a longer-term average view of construction cost escalation that makes some allowance for the higher cost growth environment today, but also for a potential lower cost growth in future across the period until construction is completed.

We would note that unlike residential development, larger scale industrial and business developments tend to have a lot more detail on their intended hardstand areas as well as building footprint at the consent stage, which is why a more direct FC per 100 m^2 of hardstand or roofing can be used for non-residential development.

Estimates for non-residential development FCs by coverage type are shown in Figure 10.

Figure 10 Estimated FC per 100m2 of non-residential development by coverage type

Non-residential FC per 100m2 hardstand or roofing	$ excl GST
Te Awarua-o-Porirua Whaitua	$ 858

The estimated FC per 100m^2 of hardstand or roofing is $858.

Comparing residential and non-residential FCs

Non-residential FCs appear to be significantly lower than for residential FCs. There are at least four reasons for this.

1. The density of development expected across most of the ***residential*** greenfield areas is particularly low, such that only around 9% of these greenfield areas would consist of roofing or on-site hardstand areas. Roading required to access these properties creates a large impervious surface (assumed to be 25% of the total surface area of the greenfield areas), the cost of which needs to be shared across the relatively small footprint of houses enabled by that development.

   In contrast, business and industrial (***non-residential***) land is expected to be more intensively developed, with a roofing and on-site hardstand coverage of around 38% compared to 9% for residential development. This 38% of land needs to contribute toward the roading run-off impacts it creates but using the same 25% roading assumption for non-residential greenfield areas, the cost of additional roading impacts borne by the non-residential areas works out lower because of the more intensive level of development. That said, the sheer scale of industrial developments (where buildings could have roof coverage of up to 10,000m^2 each for instance) means that overall, the FCs per hectare of land developed in non-residential areas will be higher.

2. The assumed timeframes over which residential development is delivered is longer, meaning further interest costs need to be borne to pay for the share of FCs attributable to residential development.

3. Taken with reason (2) above, most of the non-residential development is expected to be in the next decade, in advance of the wetland being developed. As a result, a large proportion of the FCs for non-residential contaminants are collected in advance of the cost of constructing the wetland. Because these earlier revenue streams can be used in the interim to offset GWRC interest costs, the overall cost to be borne by non-residential development diminishes.

4. One full EHU of residential development assumes around 150m^2 of roof and hardstand per residential dwelling, compared with the 100m^2 unit of payment for non-residential FCs.

Crucially, if assumptions on the intensity of development in residential greenfield areas change, it would be worth reviewing the FCs calculations as a more intensive development pattern could lead to significantly lower FCs per EHU even though the total wetland area required to service this higher intensity of development could rise.

6. Implications of proposed financial contributions

The basic economic principle of user pays states that when consumers of a good or service pay the full cost of what they consume, society allocates its limited resources most appropriately.

This somewhat complicated explanation simply means that when an inaccurate price is charged for something (either too much or too little), perverse outcomes occur. For example, by not requiring development to fully pay for its own demands on the stormwater network or to offset its impacts on the environment, we incentivise development to happen in a way that is not cognisant of those impacts. By not capturing the ***negative externalities*** of that development (impacts on water quality beyond the footprint of the development), poorer development outcomes are encouraged. This is poor resource allocation because by not pricing accurately, we send the wrong signals to the market about the societal impacts of development choices.

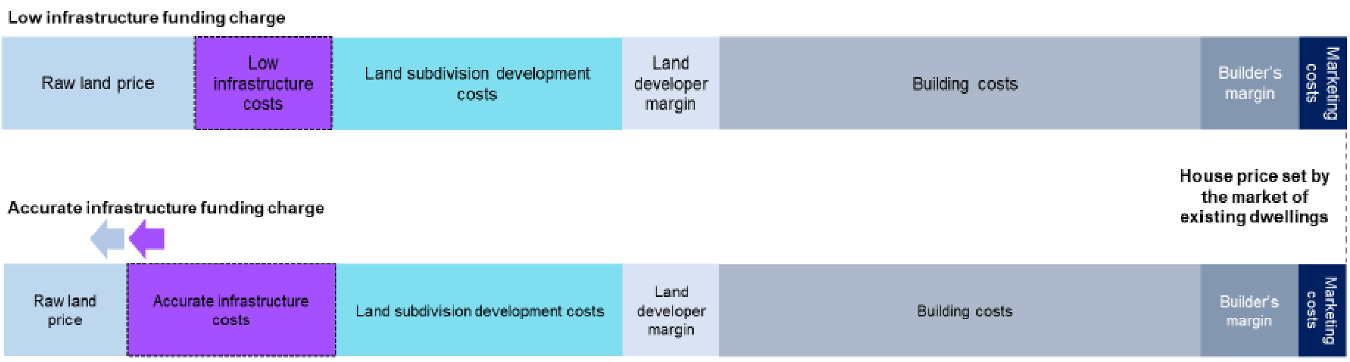
Offsetting negative externalities does not raise property prices

It is a commonly held but inaccurate belief that charging more accurately for infrastructure (including infrastructure such as wetlands to offset negative externalities) will raise property prices.

The inaccuracy of this view is demonstrated both by theory and by case studies. We begin by considering the theory. When a new dwelling is built, it enters a market of, in the case of the two whaitua, tens of thousands of existing homes. New homes delivered into this market have to compete on price with these tens of thousands of homes, and especially with other recently constructed homes. As a consequence, developers are what economics calls “price-takers”. No individual developer sets the price of a home. If they charge too much, people will simply buy somewhere else.

In determining development feasibility, therefore, the developer has to consider the price at which the developed homes will sell at the end of the project; a price set by the market. The developer then works backwards to ensure they make a profit and cover all the other inputs required to go from empty or under-used land to a new completed development. This process requires the developer to calculate infrastructure costs (including development contributions, any requirement for extra on-site infrastructure, or FCs). What is left after covering profit and all the inputs, is a residual value the developer can pay for the undeveloped or under-developed “raw land”. This process of working out the feasibility of the project is demonstrated in the top bar in Figure 11.

Figure 11 How development pricing changes when infrastructure costs rise



If the cost of meeting the infrastructure and offset requirements (e.g. through FCs) of the land rises, as shown in the second bar in Figure 11, the developer will be very limited in their ability to pass on those costs. Instead, developers will have to pay less for “raw land” if the development is to maximise its commercial viability. All things being equal, property prices are unaffected and raw land prices fall.

The empirical evidence from overseas and in New Zealand supports this theoretical description. The international evidence on this trend for infrastructure costs to pass up the chain to land prices rather than down to house prices is instructive. Work done in Auckland Council's Chief Economist Unit summarising the findings of international studies shows that in almost all cases, the vast majority of costs were passed up the chain.[4]

In New Zealand, the Auckland experience is invaluable in demonstrating that the true costs of infrastructure are internalised rather than passed on into higher house prices. In its independent role, the Chief Economist Unit at Auckland Council evaluated whether that city's Rural Urban Boundary (RUB) constrained access to developable land and thus artificially inflated land prices inside the boundary, a common accusation against growth boundaries.[5]

A key finding of this study of over 30,000 property sales was that once the true cost of infrastructure is factored into land values, it appears that land prices outside the RUB were inflated. This is likely because of speculation on land purchases just outside the boundary, where developers believe that at some point in future, development will be allowed with an ongoing subsidy from the general ratepayer. In other words, developers are offering a price for raw land based on what they think they will have to pay for infrastructure. If a clear signal is sent that development will need to pay more for infrastructure (including on-site stormwater management), raw land prices will fall, rather than house prices rising.

The implication for the whaitua is that as the need to offset contaminant impacts through infrastructure such as wetlands is signalled, raw land prices will adjust to reflect the true cost of infrastructure to service new developments.

Developers who have overpaid for land

The scale of the FCs (at estimated costs up to $4,599 in this analysis) is small relative to the overall price of delivering a dwelling into the market. June median residential property prices in Porirua were $840,000, and in Wellington City they were $881,000.[6]

Nevertheless, the introduction of the requirement to offset residual contaminants through off-site infrastructure funded by FCs will have an impact on those developers who have paid a price for land that does not reflect the cost of mitigating their environmental impacts. At the margins, the policy will make some developments infeasible, especially in the current market of falling land values.

Developers who have overpaid, and where development was sufficiently marginal that this additional cost renders the project infeasible, will have to make a choice. They may:

- Resell the land (potentially at a lower price than they paid if they bought the land since prices began to fall in early 2022) to someone who will be able to make the development work with full knowledge of the need to pay FCs to offset residual contaminant loads.
- Hold onto the land until land prices rise again across the region such that the development becomes feasible again.
- Rework their proposed development perhaps to allow for a greater number of smaller dwellings that pay less in FCs per unit.

In the case of developers finding development infeasible, this will mean a slowdown in development while the market adjusts to the more accurate costs of ensuring negative externalities are covered by development. It is also worth noting that the impact of proposed FCs would be tiny compared to the wider impact of falling land prices due to higher interest rates seen across New Zealand, which is the primary driver of changes in developer activity.

Regardless of the potential impact of the FCs on rendering some development infeasible at this point, this fact does not justify ignoring these residual contaminants being offset; perpetuating the current state because some developers have overpaid or because of cyclical weakness in the housing market will only exacerbate the environmental challenge. There will always be some developers who overpay for land and struggle to make the development commercially viable.

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[4] See Harshal Chitale, *Unshackling growth Growth paying for itself*. 2018. https://www.aucklandcouncil.govt.nz/about-auckland-council/business-in-auckland/docsoccasionalpapers/unshackling-growth%20-%20April%202018.pdf

[5] See Shane Martin and David Norman, *An evidence based approach: Does the Rural Urban Boundary impose a price premium on land inside it?* 2020. https://www.aucklandcouncil.govt.nz/about-auckland-council/business-in-auckland/Reports/does-the-rub-impose-a-price-premium-on-land-inside-it-20-Feb-2020.pdf

[6] See REINZ, *Monthly Property Report*, 13 July 2023. https://www.reinz.co.nz/libraryviewer?ResourceID=580

7. Appendix

See the attached memorandum from Morphum Environmental setting out the approach to estimating the offset requirements and the estimated cost per hectare of wetland.

Memorandum

Date:	5/10/2023
To:	David Norman (GHD)
From:	Stu Farrant (Morphum)
CC:	Mary O'Callahan (GHD); Karen Ingliss (4Sight)

Subject: Water quality offsetting basis of recommendations

This memo provides high level context around the basis of calculations to inform the proposed financial offsetting for residual contaminants from urban development. The scale of offset treatment required for residual contaminant loads is based on a number of assumptions and generalisations (to reflect the variability between different land developments) but is considered to provide a fair and reasonable average area required to provide additional water quality treatment.

Development assumptions (in terms of total development area and imperviousness) are based on the summary data provided by GHD. This was separated for the Te Whanganui a Tara and Te Awarua o Porirua Whaitua catchments. These are included in Table 1 below.

Table 1; Assumed future development areas (provided by GHD)

Residential growth (hectares)	Roof cover	Roading + Hardstand	Permeable surfaces	TOTAL
Whaitua Te Whanganui-a-Tara	46.6	138.6	283.7	**468.9**
Te Awarua-o-Porirua Whaitua	66.1	354.4	878.5	**1,299.0**
TOTAL	**112.6**	**493**	**1,162.20**	**1,767.9**
Share of total	**6%**	**28%**	**66%**	**100%**

The following steps summarise the sizing methodology used to calculate proposed offset treatment areas;

1. Development treatment of SW is assumed to be provided via a constructed wetland. It is noted that whilst in reality there is an expectation that a range of water sensitive design measures including wetlands and bioretention could be used, for the purposes of these calculations a single device type was assumed. It is also noted that constructed wetlands require approximately twice the footprint of a bioretention but have a CAPEX and OPEX cost of less than half that of bioretention meaning that the use of the constructed wetlands as a

proxy is considered reasonable given that land values are not currently factored in the calculations.

2. Wetland sizing is based on the required treatment footprint relative to the contributing impervious area only to reflect the intent to only treat urban landcover (roofs, roads and hardstand) with unpaved areas assumed to be a mix of gardens or undeveloped vegetation. Table 16 of the Wellington Water Sensitive Design Technical Guidelines (2019) was used to estimate a required wetland size of 5.1% of the contributing impervious catchment. This figure is for a 95% impervious catchment and is therefore slightly conservative when applied against the full (100%) impervious landcover. This sizing relationship was developed for the guidelines based on continuous simulation modelling which used real historical local rainfall (including for Whenua Tapu and Kelburn) rain gauges at 5 minute timesteps with treatment devices sized to pass 85-90% of the mean annual stormwater volume through the respective treatment devices. This is known to ensure that the full water quality volume and flowrate are treated.
3. Treatment effectiveness is based on performance reported in Table 4 in the Wellington Guidelines which was based on industry standards documented in other guidelines including the NZTA Highways design guidelines. Table 4 provides removal effectiveness (in terms of load reduction for metals) of 90% for bioretention and 80% for wetlands. To allow for flexibility with how water quality may be provided within future development, a removal effectiveness of 85% load reduction was applied (i.e. average of performance for wetlands and bioretention). This therefore results in 15% residual loads which are considered impractical to remove through upsizing devices or other measures due to diminishing returns and the reality that some load remains in large rainfall events which bypass devices.
4. Offset financial contributions are therefore based on the residual 15% contaminant load and applying the same sizing ratio as above. Table 2 provides a summary of the calculated residual treatment areas separated for roofs and Roads/Hardstand. It is considered that the combination of 'best practice' measures (in accordance with Wellington Water Sensitive Design Guidelines) included in the developments and the residual treatment areas in Table 2 would be equivalent to 100% load reduction for metals (and other urban contaminants).

Table 2; Calculated offset wetland sizes

Te Whanganui a Tara Residential	**Roof**	**Road/Hardstand**
Required best practice wetland area (ha)	2.38	7.07
Required offset wetland for residual load (ha)	0.42	1.25
Te Awarua o Porirua Residential	**Roof**	**Road/Hardstand**
Required best practice wetland area (ha)	3.37	18.07
Required offset wetland for residual load (ha)	0.59	3.19

5. The cost of stormwater management devices can vary significantly depending on site specific considerations. In particular, aspects such as contaminated soil, retaining or complex pipe works can increase costs and therefore need to be understood in early business case planning. Costs have also been identified as being particularly high in New Zealand (and in particular Wellington) compared to other comparable markets (such as Australia) which may be reflective on the lack of track record in the local contracting market. There are also a range of ancillary costs related to co-benefits such as landscape amenity, pathway connections and

structures which are not directly related to the treatment of stormwater quality but clearly recognised to provide benefits.

For the purpose of estimating the costs which are reasonable to include in offset contribution, the assumption of wetlands without significant complexity and excluding ancillary works unrelated to water treatment is applied. Based on this, an estimate of $4M/ha is suggested. This correlates with a number of recent constructed wetland projects when costs associated with non water quality aspects are removed. This cost estimate aligns with the following contributing cost components for key works;

- $300,000 Lump Sum cost for hydraulic structures (inlets, outlet and weirs etc) and bypass works
- $200,000 Lump Sum cost for enabling works and contractor overheads

• Bulk Earthworks (Based on average 1.5 m depth)	$225/m2
• Topsoils/ base prep	$50/m2
• Wetland lining (based on GCL)	$25/m2
• Planting (procurement and planting)	$50/m2

OPEX costs have not been considered at this stage.

Stu Farrant

Water Sensitive Design Lead
Morphum Environmental Ltd
Phone: 021 578904
Email: stu.farrant@morphum.com