LOW IMPACT DESIGN IN THE LONG BAY STRUCTURE PLAN; WHAT HAPPENED?

Jan Heijs, North Shore City Council and Dr. David Kettle, D and B Kettle Consulting Limited.

ABSTRACT (200 WORDS MAXIMUM)

Figure 1 : Long Bay Beach Environment

The Long Bay Structure Plan has gone through a very lengthy process. The Structure Plan is located in the North of North Shore city and has a number of unique features such as the landform, the high quality Vaughans Stream and the Marine Reserve. In an Environmental Court Ruling in 1996 Long Bay was allowed to be urbanised but under strict conditions. In addition the North Shore City Council is keen to protect and where possible enhance the existing natural environment. The vision of how Long Bay should be developed and how this should be expressed in the Structure Plan varied widely between that the main landowner and the City. Last year this case was presented at the Environment Court. This paper will summarise the key elements from the Structure Plan and discuss the major issues that were debated at court. Key areas that were disputed is the need to protect headwaters, the catchment wide approach verses branch by branch approach and to what extend Low impact Design should drive the footprint of the proposed development and the requirements that need to be hardwired in the Structure Plan.

All in all the process, although very interesting, was frustratingly long and prohibitively expensive. This raises question around the legal framework and possible implication for other similar cases in the country.

At the conference the court decision, hopefully available by then, will also be presented, and an updated paper including the court outcomes will be made available.

KEYWORDS

Low Impact Design, Structure Plan, RMA, Integrated Planning, Marine reserve, Stream protection, stormwater management

PRESENTER PROFILE

Jan Heijs is the manager of the Infrastructure Planning Team – Water of North Shore City Council. Jan has been responsible for the 3-waters component in the Long Bay Structure plan since 2001. Before his emigration from The Netherland in 1998, Jan was active in the area of land development and the effects on the quality of receiving waters.

1 INTRODUCTION

Figure 2: The Vaughans Stream

The Long Bay Structure Plan in North Shore City has been in the making for over 15 years. Last year this case came before the Environment Court as a result of a number of appeals. Stormwater management was an important component of this plan.

This paper summarises the key issues that were before the court. Unfortunately the court ruling was not yet available when this paper was submitted but is due any day. At the conference an updated paper shall be made available including the outcomes of the court hearing.

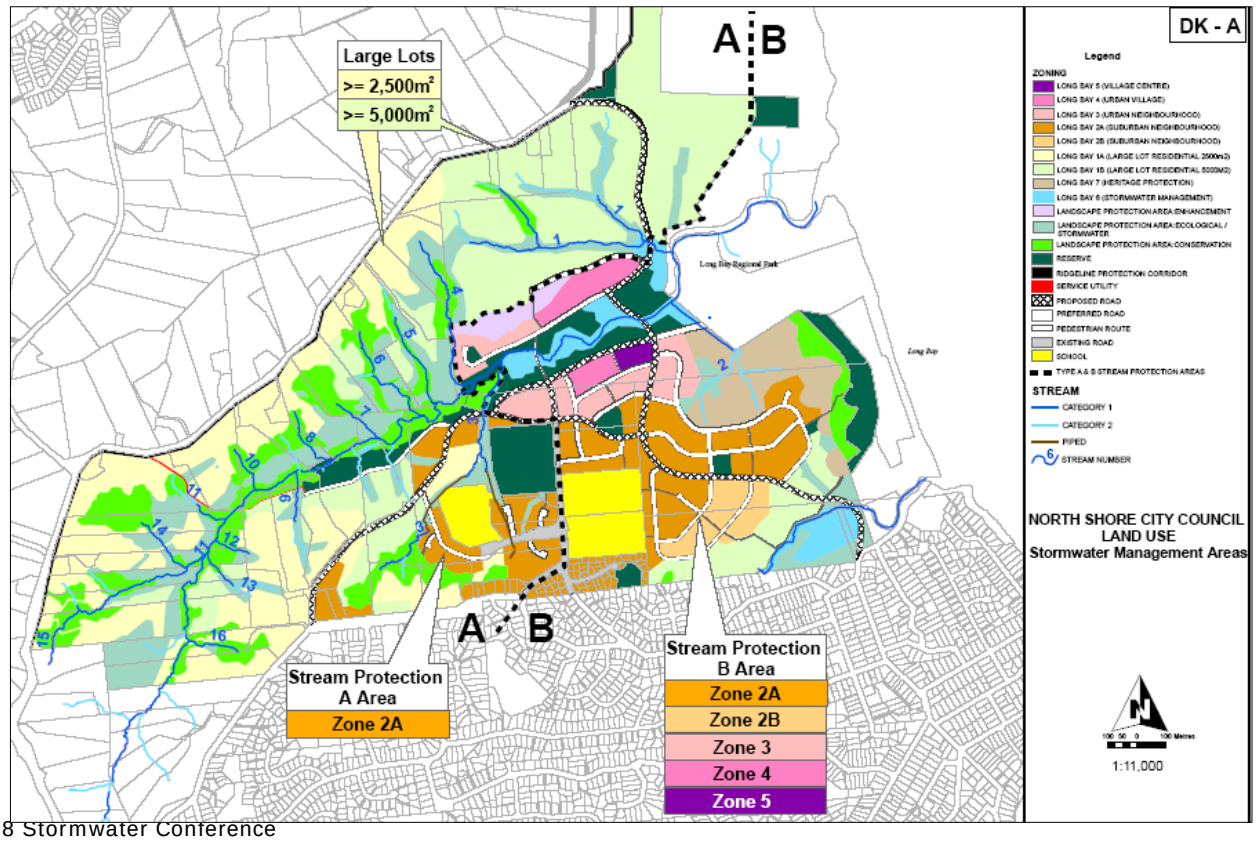
Observations in this paper are from the authors and are not necessarily shared by all parties or the court. This includes personal comments, which will at times be controversial. Hopefully this will be a trigger to review the way we go about the implementation of best practice at minimal cost to our ratepayers.

2 BACKGROUND TO THE LONG BAY STRUCTURE PLAN

2.1 THE LONG BAY STRUCTURE PLAN AREA

The Structure Plan area is the last large greenfield area left in North Shore City. The requirements in the current District Plan, related to other greenfield areas that have been and are being developed at the moment, have not been successful in protecting the

Figure 3 Long Bay Structure Plan area



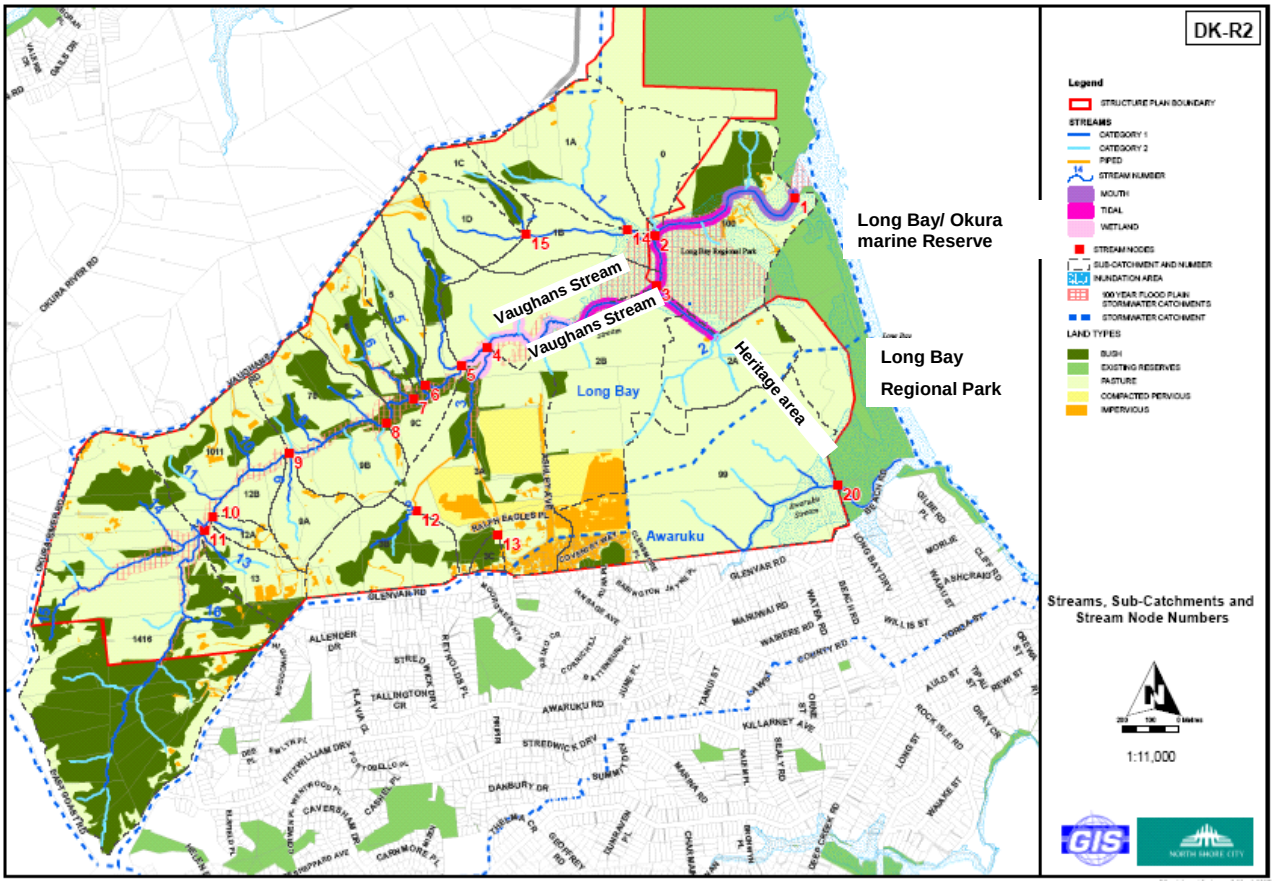
receiving water environment. Figure 3 shows the existing Long Bay Structure Plan area with the streams.

The Structure Plan aims to protect and where possible enhance the quality of the water and associated ecological resources in the streams and the coastal areas adjacent to Long Bay. This will require careful management of the land development process, as well as the subsequent urban activities. The Structure Plan is discharging into The Long Bay / Okura Marine Reserve that is of national and regional significance and protected under the Marine Reserves act.

It was recognised that complying with more general guidelines regarding stormwater management, such as ARC-guidelines and District Plan provisions for other parts of the City, is not sufficient to protect and enhance the very sensitive receiving water environments of Vaughans Stream and the Marine Reserve. Therefore a precautionary approach has been adopted, resulting in more stringent requirements.

In the upper part of the catchment, changes to hydrology (including low and high flows), increased release of sediments, the discharge of other contaminants and changes to stream banks from erosion need to be avoided. The main stream corridor and its tributaries need to be retained and enhanced.

Figure 4 Long Bay Structure Plan area with stream system



In the lower part of the catchment, the lower reaches of Vaughans Steam need to be enhanced for amenity and ecological reasons. Minimising changes in hydrology is also important in this area.

Minimising contaminants including sediments entering into the Marine Reserve has also been a key objective.

2.2 KEY ELEMENTS OF THE LONG BAY STRUCTURE PLAN

Some of the key elements and driving forces behind the Long Bay Structure Plan are:

- The Long Bay / Okura Marine Reserve
- The Vaughans stream being a typical North Shore stream, narrow at places with not much flow and large parts having very little or no flows during longer periods of dry weather. It has the highest values of any stream in the city and is an ARC reference point. The bottom part of the stream is tidal and has important Inanga spawning values.
- Steep topography in the upper parts of the catchment
- Large areas of native bush (dark green on Figure 2)
- Large areas of geotechnical instability
- A large area with heritage values (outside scope of this paper)
- Bordering on the Long Bay Regional Park, one of the most visited regional parks and beaches and calling for a good interface between the Regional Park and the Structure Plan area.

2.3 STRUCTURE PLAN STRATEGY

In the last few years a number of papers were presented at NZWWA conferences related to the Long Bay Structure Plan explaining the justification and process used to arrive at the stormwater management approaches used in the Plan. These papers provide detailed background behind the stormwater management options chosen for this structure plan (see references). This paper is summarizing the outcomes rather then providing the justification which was given in those papers.

2.3.1 LOW IMPACT DESIGN

The way Low Impact Design (LID) was applied in the structure plan was a combination of:

- Avoiding or minimising land modification and urbanisation of those parts of the catchment that have sensitive receiving environments.
- Concentrating urbanisation in areas where the effects are minimal or can better be managed

  As a result of the above two requirements, the urbanisation has concentrated towards the lower part of the catchment to avoid deletion or unwanted deterioration of the headwaters and upper part of the stream system.
- ‘Fit-for-purpose’ stormwater management requirements relative to receiving water environment and landuse. Stormwater management zones A and B were introduced to ensure that stormwater requirement are appropriate and justified.
- The use of on-site stormwater management practices such as rain tanks and bio-retention, to minimise changes to stormwater runoff from the site, including roads.

2.3.2 MINIMAL EARTHWORKS

A minimal earthworks strategy was adopted for a variety of reasons:

- As a result of the Low Impact Design approach
- To preserve the current landform / preserve natural features of the plan area.
- To avoid areas of geotechnical difficulties.
- To minimise changes in hydrology as a result of earthworks and related compaction. More and more research outcomes show dramatic changes in hydrology in areas that have been modified even when these are not impervious.
- To reduce sediment loads being generated.
- To provide better opportunities to stage earthwork activities and total area exposed at any point in time
- To provide a better opportunity to protect branches and headwaters of the stream system

2.3.3 AT SOURCE TREATMENT AND TREATMENT TRAIN APPROACH

A combination of at source treatment and the treatment train approach was adopted:

- To provide at source treatment to protect local streams. When relying on bottom of the catchment devices, generally ponds or wetlands, any parts of the stream system within the catchment upstream of these 'bottom-of-the-cliff' devices would be lost.
- To maximise treatment removal through a series of at source and catchment devices such as rain gardens and wetlands. The treatment train approach means that the stormwater flows through more than one treatment technology before discharging into the environment. This is especially important with different pollutants, some of which are carried both in dissolved and particulate attached forms. In addition not relying on only one line of defense is also a good risk management technology to ensure adequate protection. In some cases their will be challenges to implement these methods on steep land. The practice notes provide guidance such as the use of a cascading design along steeper roads.

In general, tools that mimic nature at source have the highest likelihood of being successful.

2.3.4 MINIMISING STREAM LOSS AND THE IMPORTANCE OF HEADWATERS

Stream ecology is complex. We understand only part of this complexity and of this part we can only capture an even smaller part in quantitative assessments. Producing a few numbers (such as flows, velocities or contaminant loads) and concluding 'she'll be right' hasn't proven to be very successful in the past. For these reasons LID, minimising changes in hydrology and mimicking nature have a much bigger likelihood of success compared to more traditional 'engineered' fixes.

To maintain or enhance stream health, it is important that a combination of best practice discharge management (LID, treatment train, etc) as well as stream management (minimising stream loss, riparian margins, etc) is ensured.

Headwater streams are an important component of a stream system a large number of reasons. Some of them are:

- Headwater streams, even when intermittent, have ecological value in their own right.
- Headwater streams are the source of water and food (nutrients, bugs) for the downstream ecosystem.
- Headwater streams provide important hydrological functions such as groundwater recharge and discharge as well as storage and retention
- Research has proven a correlation between the loss of headwaters and the health of the receiving 'main' stream.
- Quantitatively, zero order streams represent the largest stream length of any stream order (Schueler, 2007)

Figure 5 The tidal area

A comprehensive stream health effects assessment was applied using a method called "Impervious Cover Model' (ICM) that calculated the cumulative **effective** impervious cover at any point in the stream system as a function of actual impervious areas, compacted areas and mitigation applied. The ICM uses empirical information and knowledge around stream systems to come up with a reliable predictor of stream health. This allowed us to see which parts of the stream system did not meet the stream health threshold. (See Appendix A for a detailed description of the ICM, the calculation of the effective imperviousness and what it showed for Long Bay)

2.3.5 MINIMISING DISCHARGES OF SEDIMENTS AND OTHER CONTAMINANTS

Contamination of the stream system and the Marine reserve should be minimised. It has proven difficult to quantify contamination loads and the effects on the environment. Again a precautionary approach was used because some of the effects can not be quantified while recognizing the sensitivity of the receiving environment. In addition to the Long Bay catchment treatment of the Awaruku catchment that is largely urbanised and also services a small part of the Long Bay Structure Plan area to further improve water quality in the marine reserve.

It was disappointing that NIWA who acted on behalf of ARC was not able to more confidently predict sediment/contaminant behavior and effects in the Marine Reserve.

2.3.6 PROVIDING CERTAINTY BY LEVEL OF PRESCRIPTION

The current North Shore District Plan provides policies, objectives and rules related to stormwater management. Despite these, North Shore City has experienced ongoing and exacerbated problems related to flooding and stream degradation.

In general applicants for resource consents, related to developments discharging into streams that have subsequently degraded, have argued that the incremental effect of their proposal will be 'less then minor, once mitigation was in place'. The cumulative effects on an application-by-application basis have clearly not been able to be quantified, argued or addressed, but collectively they have often resulted in significant adverse environmental effects.

It is also impractical if not impossible to require an individual applicant to consider cumulative effects over a whole catchment.

In addition developers, some more then others, regard the requirements that are meant to be minimum requirements, as a maximum and try to negotiate to do less.

Another frustrating result of the current District Plan is that, because of it's vagueness, it created a lot of uncertainty and a lengthy consent process. Outcomes often vary widely, depending on individual interpretation of all involved.

This necessitated addressing these issues at a structure plan level and catchment level and not leaving it to the individual consent applications by being more specific in the structure plan on the level of mitigation required and by providing "Practice Notes" showing how Structure Plan requirements can be met

The result will be that more certainty will be provided related to stormwater management requirements to both developers and council which will help speed up consent processes.

2.4 TIMELINE

2.4.1 KEY MILESTONES

The following list in table 1 shows the key milestones related to the stormwater management part of the structure plan process.

Table 1; Structure Plan milestones related to stormwater management

year	milestone
2000	concept structure plan released for discussion,
2001	notification of policy and objectives (Variation #64),
2002	agreement on 4 main water management objectives by the Long Bay Steering Group
2002	Option Analyses considering a range of options from traditional to sustainable water management across the 3 waters.
2002	ground truthing of preferred options including feasibility and cost implications
2002	Peer Review
2002	Developer symposium
2003	Hydraulic modelling
2004	Ecological assessment
2004	Structure Plan notification (variation 66)
2005	Development of Long Bay Practice notes
2004/05	Development of Structure Plan text
2005	Structure Plan hearings
2007	Environment Court hearings
2008	Interim decision (pending)

During the appeal process at the Environment Court we have called Tom Schueler, director of the Center or Watershed protection in the USA, as an expert witness to support the proposed stormwater management approach

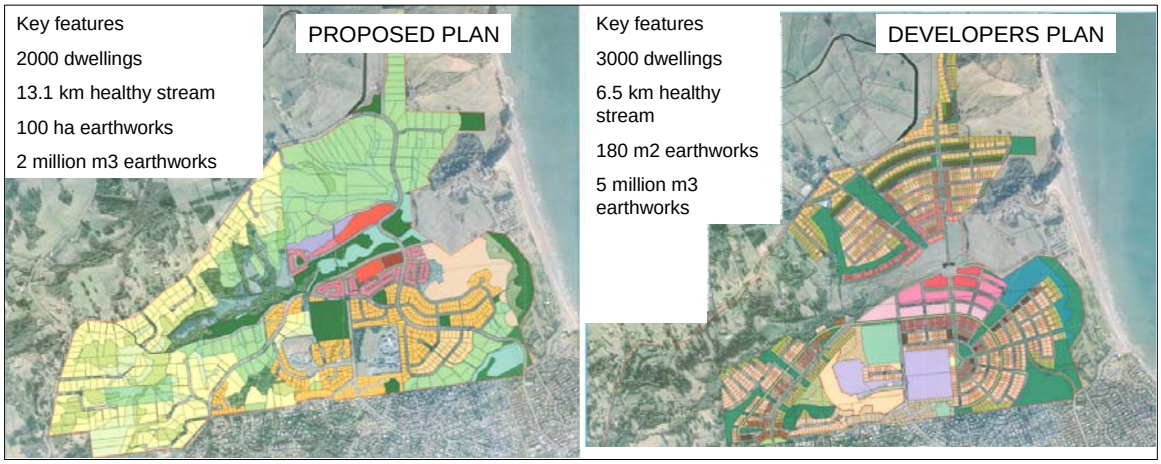
3 ISSUES THAT WERE DISPUTED

In this chapter I have picked a number of key issues that were disputed related to stormwater management. I have tried to summarise the points of difference through my eyes. This is not necessarily the interpretation of others involved in the process.

In terms of appeals related to stormwater management, there was only one appellant, the major landowner and developer hereafter referred to as "Developer" , which appealed against North Shore City Council, hereafter referred to as "NSCC". The Auckland Regional Council was supporting the council at large and the other appellants were either supporting or silent on stormwater management issues.

3.1 WORKING WITH NATURE AND THE COMMUNITY OR NOT?

Figure 6 The two Structure plans compared



3.1.1 DEVELOPER

The design objective was more by what the developer thought the anticipated needs of the future residents would be in terms of the "target market" and the views of the Hauraki Gulf, rather than looking after the existing values and how these are experienced by existing and future community. The developer only agreed to the Low Impact Design approach in areas where they did not own the land.

Another driver was that, in the view of the developer, it was not viable to work with the current landform and its geotechnical constraints and therefore opted for a big fix. This effectively resulted in a constant slope between the ridges to the North and South of the plan area and the bottom of the catchment where the main stem of the stream is located. The proposed landform looks like a large amphitheatre where current landform is lost as well as many branches of the stream system within the proposed urbanised areas.

3.1.2 NSCC

One of the Long Bay Structure Plan objectives is to preserve the natural environment including the land form as well as achieving a high degree of liveability and amenity for future residents. This objective was based on outcomes of years of consultation and on conditions imposed through the 1996 Environment Court process where Long Bay was, conditionally, allowed to be urbanised.

Using the Low Impact design approach is a direct result of this objective, amongst others such as the proposed zoning.

3.1.3 COURT OUTCOME

To be advised

3.2 CATCHMENT WIDE APPROACH VS BRANCH BY BRANCH APPROACH

3.2.1 DEVELOPER

The developer focused its assessment on the value of individual branches of the stream system. Streams that were intermittent or had 'low' ecological values were proposed to be deleted. The effects of doing so were considered acceptable.

The assessment only covered a few, quantifiable parameters such as a 10 year storm or flows during the driest month of the year.

3.2.2 NSCC

Comprehensive research, planning and assessments were undertaken to improve NSCC's understanding behind stream ecosystems and what is needed to protect these and applying these to the Long Bay catchment using catchment wide assessments.

Table 2 shows the result of one of these assessments, where the amount of streams that is lost is reported, comparing the Developers proposal against the notified NSCC Structure Plan. According to this assessment 57% of the streams will be lost under the developers proposal and 14% under NSCC's proposal.

Table 2: Implications on stream health when comparing the two proposals

Stream Length Distribution	NSCC		LandCo	
	km	%	km	%
Kept (High and Moderate Quality)				
- Category 1	9.5	94%	5.5	55%
- Category 2	3.6	77%	1.0	21%
Lost (Non-supporting and Eliminated)				
- Category 1	0.6	6%	4.6	45%
- Category 2	1.1	23%	3.7	79%
- Piped (existing Long Bay Primary)	0.6		0.6	
Note: Above percentages are given as a percent of Category 1 (Total 10.1 km) and Category 2 (Total of 4.7km) length of streams.				
subtotal Kept	13.1	86%	6.5	43%
subtotal Lost	2.3	14%	8.9	57%
total	15.4	100%	15.4	100%
Note: Above percentages are given as a percent of total length of streams (15.4 km).				

The developers approach of picking off small components of a complex process such as a 10-year storm or looking at flows during the driest month of the year, demonstrated a lack of understanding or recognition of this complex process that influences stream health including changes in the hydrological response, stream functions and the contribution of headwaters to the health of the stream system.

In response to the developers view, the NSCC witnesses argued that the developers approach could be classified as 'death by a thousand cuts'

3.2.3 COURT OUTCOME

To be advised.

3.3 VALUE OF HEADWATERS

3.3.1 DEVELOPER

All parties largely agreed on actual observations related to the local streams.

The witnesses on behalf of the developer however went to great length to classify as much stream length as possible as 'category 2' streams (intermittent) according to the ARC classification. These streams have a different status under the proposed Regional Air Land and Water plan (ALW-plan) and are much easier to be deleted.

So the developers view was that these category 2 streams had no value and could be deleted without compromising the quality of the receiving category 1 streams in the catchment.

3.3.2 NSCC

As explained under section 3.2 it is councils view that these headwaters have significant values, even when on a branch by branch level, these values don't appear to be very high.

The fact that this is not recognised in the ALW plan is a problem. During the appeal process against the ALW plan, ARC expressed that they wish to fix this deficiency but not in response to appeals, but as a separate plan change. ARC witnesses were very supportive of the approach sought by NSCC and emphasized the importance of headwaters and their function in a stream system.

The only area where the developer agreed with the proposed LID approach was in the part of the Structure Plan that was outside their holdings. It is hard not to conclude that ownership consideration have influenced their assessments rather than the existing environment or potential environmental effects.

3.3.3 COURT OUTCOME

to be advised

3.4 LOW IMPACT DESIGN

3.4.1 DEVELOPER

Some of the witnesses on behalf of the developer agreed with the principles of Low Impact Design and Treatment at Source. However the alternative text for the Structure Plan did not include these as requirements in the text but relies predominantly on a traditional stormwater management approach and leaves the need for further requirements such as LID to the individual resource consent processes.

3.4.2 NSCC

So there was no disagreement, or was there? Was it merely a smokescreen or was this a genuine philosophy?

More importantly there is a major concern because there is no certainty that the current landowner/developer will remain in control of the land they currently own. They might sell all or parts of it to others. In addition there are already many more landowners in the structure plan who also need their effects to be managed by the structure plan.

3.4.3 COURT OUTCOME

to be advised

3.5 DON'T LEAVE IT TO THE CONSENT STAGE

3.5.1 DEVELOPER

The developer stated that the Structure Plan was too prescriptive. It was better to leave it to individual consent process to identify the appropriate level of mitigation in sufficient detail. The structure plan was at too high a level to be able to do so.

They also argued that the prescriptiveness doesn't allow for better management practices (BPO) to be implemented over time.

3.5.2 NSCC

There is no doubt that the proposed structure plan is more prescriptive than the current District Plan for reasons explained in section 2.3.6. It requires in a general sense the use of LID, at source treatment and a treatment train approach.

The level of mitigation varies per zone (fit for purpose). In most cases it is up to the developer to determine how this level of mitigation can be achieved. The practice notes intend to provide assistance in how this can be done. The only prescribed management device is the use of rain tanks because these satisfy multiple objectives including water demand management.

Also the appropriate level of mitigation can only be determined at a catchment level. So we know now what is required to protect the stream and should express that in the plan requirements.

During cross examination the counsel of the developer asked questions around what best practice is and what the likelihood is of that changing in the future trying to challenge the 'inflexibility' of the proposed plan.

In response one observation that was made on behalf of NSCC was that requirements in the USA also become increasingly prescriptive in requiring best management practices in the how, what, where and when they are designed. . Within the provided mitigation requirement that are prescribed in the Structure Plan, there is enough scope to include better practices e.g. in designing bio-retention devices.

3.5.3 COURT OUTCOME

to be advised

3.6 SEDIMENT GENERATION AND EFFECTS ON MARINE RESERVE

3.6.1 DEVELOPER

Witnesses on behalf of the developer calculated sediment loads based on literature and using proposed best management practices (incl flocculation) and attempted to quantify sediment deposition in the receiving marine environment.

They also challenged the so-called 'less is better' approach they believed council and ARC defended.

3.6.2 NSCC

The developer used theoretical treatment efficiencies to calculate loads from the earth worked areas. They excluded human error and assumed 100% of the earth worked sites can be treated. Base on experience in the Auckland region a 97% efficiency is overly optimistic and is more likely to be on the order of 80%.

Another more personal problem is the use of some of the literature values. According to literature the loads coming from undeveloped land are relatively high. Being a local resident and watching the stream almost every day, including during and after heavy storms, the discharge from the Vaughans Stream 'looks' very clear. Certainly compared to other North Shore streams including those from catchments that have been urbanised many years ago with high percentages of impervious.

A third issue is the effects on the environment. Discharges enter into a Marine reserve. The sensitivity to sediment deposition was argued. It is very difficult if not impossible to calculate deposition layers, given the high energy coast, although the developer made an honest attempt. So what is the best approach if you cannot reliably calculate? NSCC adopted the precautionary approach finding a balance between many objectives including but not limited to the protection of the marine reserve and the appropriate level of urbanisation.

The developers earthworks plan shows 5 million m^3 and NSCC's plan shows 2 million m^3 to be moved as shown in table 3. It is hard to believe that in terms of effects this will hardly make any difference.

Table 3 : key datareleted to Earthworks

	NSCC	Developer
Earthworks area	~100 ha	~180 ha
Earthworks Volume	~ 2 million m^3	~ 5 million m^3
Period of earthworks	5 – 7 years	7 – 12 years

There is also a risk equation of opening large areas of land to earthworks and calculating the probability if significant storm events and their effects compared to smaller areas to be opened consecutively, but with exposure over a longer time period.

3.6.3 COURT OUTCOME

to be advised

4 THE FRUSTRATING PROCESS

4.1 BIG BOY VS SMALL BOY; MONEY TALKS!

Planning processes are time consuming and expensive. Costs incurred by council have to be funded by the ratepayer.

From a developers point of view there is a very low level of risk. Squeezing a few more sites out of a process pays for all the legal fees quite comfortably. A 600 m^2 section of land in Long Bay, with some sea view, could be expected to sell for $300,000 to $500,000.

North Shore City spent approximately 1.5 million dollars on the technical work related to the 3-waters management throughout the structure plan process. This excludes legal fees and fees outside stormwater management area such as land use planning, geotechnical advice, transport, archaeology, etc.

At an individual consent level, outside Long Bay, NSCC often backs off from taking a case to the Environment Court for a variety of reasons such as:

- the 'vagueness' of the current District Plan rules, policies and objectives
- the related uncertainty of likelihood of success, despite clear evidence that the proposal will cause adverse effects and
- the costs and time related to support a court appeal process.

NSCC is one of the bigger councils in New Zealand and much better able to financially support lengthy and complicated processes. Imagine a small District Council would have to go through a similar process and find funding to do so.

Observations overseas show that land-use planning process can be much more community outcome (not effects) based and lots more efficient. One example is the way 'speculation' is avoided by valuing the land against 'past landuse' in stead of against 'potential landuse'. In this case the financial incentive to take cases to court reduces significantly.

I personally question whether the RMA provides a sustainable framework to ensure appropriate land use planning in New Zealand for many reasons but very importantly including affordability reasons.

4.2 REPETITION AND INFORMATION OVERLOAD

Preparing the court hearing took about 1 year. The amount of evidence was overwhelming. The amount of lawyers was incredible. Just looking at the hearing we are talking about 2 weeks in July/August and 2 weeks in October with 2 lawyers representing NSCC, 4 lawyers were representing the developer, more lawyers representing other parties and many planners and expert witnesses. The court room was full most of the time with the professionals and leaving very little space for the interested community.

There was a lot of repetition in the evidence.

But what do you do if you get overwhelmed with amount of evidence and number of witnesses from the opposition? Do you play ball or do you rely on just one council officer providing evidence. Council considered the risk to be outnumbered and outgunned too large and decided to play ball. As a result it called in many expert witnesses including from overseas to state what in my mind is 'accepted international' best practice.

It will be interesting to see whether or not the court will make a comment on this aspect of the process.

4.3 RE-ARGUING BEST PRACTICE

Why do we need to argue before court the need to implement best international practice in stormwater management on a case by case basis? What is the possibility of similar arguments being debated NZ-wide during many hearings to come? As indicated in section 4.1 there is to much financial incentive or short term gain for developers to argue the use of more traditional, 'cheaper' solutions. Sure, local circumstances always differ, giving an opportunity to argue for a number of different site specific solutions, but we should not have to re-argue best practice principles. New Zealand wants to be seen as a first world country but in terms of sustainability it is well behind many developed countries such as Germany, USA and dare I say the Netherlands.

Maybe there is a role for Central Government and if that is not possible Regional Councils to come up with policy statements, that simply requires to implement LID, treatment at source and to give effect to that requirement in their District Plans.

4.4 INCLUDING COMMUNITY INPUT THROUGHTOUT THE ENTIRE PROCESS

This also raises an interesting question about how to best work with the community to develop the final outcome both at a planning level as well as on the ground.

The NSCC option was developed through extensive community consultation whereas the option proposed by the developer had little or no community consultation.

If the final decision is determined by the Environment Court after reviewing the evidence presented during the hearing, predominantly from the developer and NSCC, how can the community voice still be included? It certainly looks as if the community has no longer a voice once an appeal process has been entered into, except for the few that are prepared to be a formal submitter

Then during the actual development process the community is often left out again. Many 'non-complying' applications go through without public notification. The result as we have seen in the Albany basin is that the outcome is certainly a lot different to what was envisaged through the District Plan process and the consultation around it. If the outcome was better, which is I suppose the intend of the RMA, then nobody would complain. But many are complaining and some of the results in the Albany basin fuels the dissatisfaction of the community and also many professionals.

I have my doubts whether the RMA, which is effects based, is capable of delivering on expectations embodied in a District Plan, or expressed in Community Outcomes (LGA). As a council, representing the community, and required by the LGA, it is the outcomes, how the city will look and feel, including its water environment, that we are trying to deliver on.

4.5 CAUCUSSING

One part of the mandated pre-environment court hearing process is the requirement for all parties to undergo a 'caucussing' process. In caucusing all parties represented at the environment court hearing have to agree on what they 'agree on' and what they 'do not agree on' in each of the different areas of expertise. The idea of this is so that the court can then more readily focus on what the expert witnesses don't agree on, rather than wasting a lot of time on what people already agree on.

While this is a good idea, it could be even more beneficial if it could be carried out at the start of the structure planning process, say 5 or 10 years previous. This would enable a more effective planning process as time and money could be spent focusing on the areas of contention with more likelihood of coming to a mutually beneficial solution. The main problem with caucusing at the end of the process is that there is very little hope of it helping to inform the structure plan design as all parties are very loathe to change the proposed solution at the end of the process with all the invested time and money already spent.

5 CONCLUSIONS

The Long Bay Structure Plan is the first plan where Landuse planning and catchment planning were developed simultaneously. The steep upper catchment, the valuable existing landform, the healthy Vaughans stream and the Marine reserve provided boundary conditions in the Structure Plan process, making all of those 'worth protecting'.

This lead to a structure plan requiring the use of Low Impact Design, at source stormwater management and a treatment train approach. A comprehensive assessment of existing and proposed development scenarios was undertaken to support an appropriate level of mitigation and to enable a comparison between the proposed Structure plan and the alternative structure plan proposed by the developer. The developer opposed the proposed Structure Plan aiming for a fully reshaped landform allowing for many more dwellings, while sacrificing many of the above values.

You cannot half protect a stream. The decision on a branch-by-branch or a consent-by-consent basis will almost certainly lead to an unsatisfactory result. Instead, an integrated and precautionary approach using international best practice is warranted to ensure successful protection of the Vaughans stream system and the Marine Reserve

Was it worth it?

When the court agrees at large with the proposed stormwater management and stream protection components of the plan the answer would be 'Yes' and the spending of the $1.5 million and all those years of planning will be worth while. It would hopefully set a benchmark for future developments in New Zealand.

If the court disagrees, it would put NZ back at least 10 years compared to international best practice. A strong evaluation not only by North Shore but also on a Regional and National level would be required to see what the way forward is.

In any case I believe the legal planning framework is up for –yet another- review to see how we can simplify these processes while meeting community expectations and sustainability principles. In the end of the day it is our community who we do represent.

ACKNOWLEDGEMENTS

We would like to thank the Long Bay Structure Plan team for all the input over the years to come to what we believe is a very robust Structure Plan that will hopefully be endorsed by the Environment Court.

REFERENCES

Jan Heijs and Dean Kimpton, "Integrated Infrastructure Development And Planning In Long Bay"; NZWWA conference 2003

David Kettle, Tilaka Diyagama, Meritec Ltd. "Dose Higher Density Offer Better Hydrological Neutrality?", NZWWA and SIA 2002 Stormwater Conference, 27-28 June 2002, Hamilton, NZ.

David Kettle, Meritec Ltd; Jan Heijs, North Shore City Council. "Urban Stormwater Controls Using 15% Effective Imperviousness to Protect Stream Haelth?", The 3rd South Pacific Conference on Stormwater and Aquatic Resource Protection, 14-16 May 2003, Auckland, NZ.

David Kettle, Tilaka Diyagama, Nathan Shaw, Maunsell Ltd; Jan Heijs, North Shore City Council; Geoff Wilson, H2Q Ltd. "Modelling of Low-Impact Initiatives", NZWWA Stormwater 2004 Conference, 6-7 May 2004, Rotorua, NZ

Tom Schueler, Statement of Evidence and Statement of Rebuttal Evidence; Long Bay Structure Plan appeal process at the Environment Court 2007;

David Kettle, Statement of Evidence and Statement of Rebuttal Evidence; Long Bay Structure Plan appeal process at the Environment Court 2007;

Jan Heijs, Statement of Evidence and Statement of Rebuttal Evidence; Long Bay Structure Plan appeal process at the Environment Court 2007;

Earl Shaver, Statement of Evidence and Statement of Rebuttal Evidence; Long Bay Structure Plan appeal process at the Environment Court 2007;

North Shore City Council, “Long Bay Structure Plan, variation 66 and plan change 6”; Feb’2007 version

J. Heijs, C.J. Stumbles, J. Hodges; “can we really protect our streams?”, NZWWA Stormwater Conference , May 2005

David Kettle, Jan Heijs, “3-Waters Alternative Infrastructure Decision Making Process, Long Bay, North Shore City”, NZWWA 44th Annual Conference & Expo, September 2002, Christchurch, NZ.

APPENDIX A

THE IMPERVIOUS COVER MODEL AND THE CALCULATION OF EFFECTIVE IMPERVIOUSNESS

For the Long Bay Structure Plan the 'effective imperviousness' of the two different proposals from the Developer and North Shore City were estimated using the 'Impervious Cover Model' (ICM) presented by Thomas Schueler, Director of Practice at the Center for Watershed Protection, Maryland, USA. The methodology used for Long Bay is described below under the following headings:

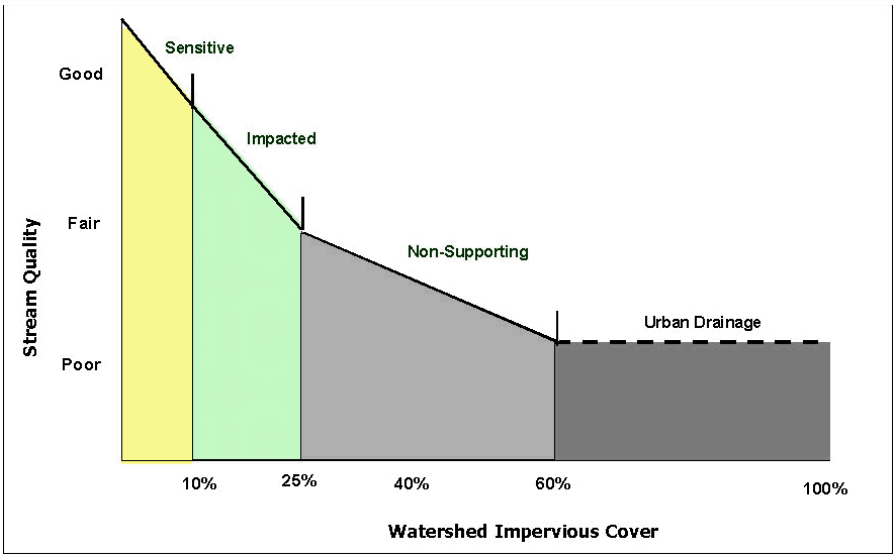
- **The Impervious Cover Model (ICM)** – the theory and background to the stream quality threshold values versus imperviousness of the catchment given in the ICM.
- **Calculating the 'Effective Imperviousness'** – calculating the effective imperviousness taking into account different stormwater treatment systems.
- **The results** when comparing the Developers land use and stormwater treatment versus the NSCC proposal.

THE IMPERVIOUS COVER MODEL

The Impervious Cover Model (ICM) was developed by the Center for Watershed Protection in the 1990s and has since then been continuously tested and verified in the United States of America and other countries, including regions with steep hill-slopes and impermeable soils such as found in the Long Bay catchment. The ICM is widely used to classify and manage streams, diagnose and forecast future stream health as a result of land development, support water shed or catchment zoning decisions and as a regulatory tool to ensure cumulative impacts are factored into watershed planning decisions.

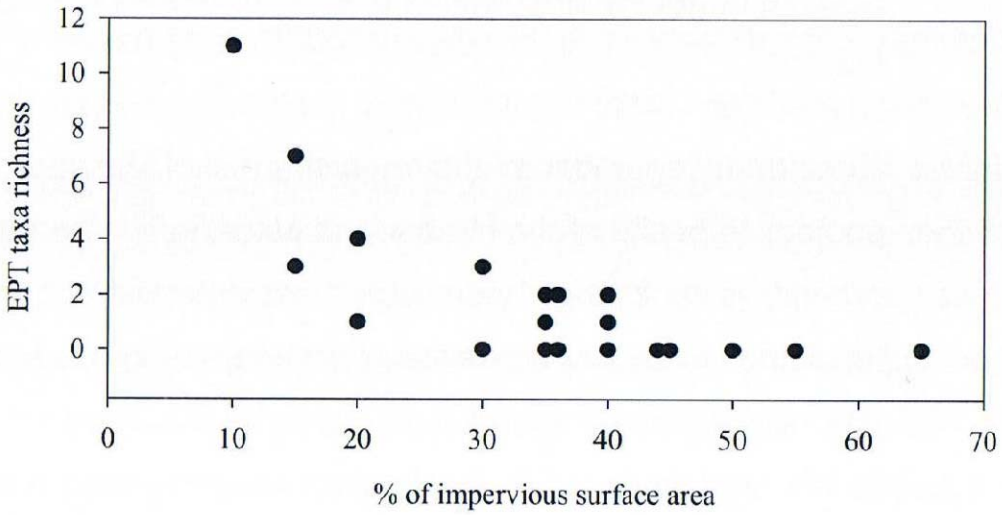
The uniqueness of the ICM is the condensation of numerous sets of stream health data into one, relatively simple, relationship between stream quality and watershed impervious cover, Figure A-1.

Figure A-1 The Impervious Cover Model (ICM)



This general shape of a sharp decline up to 10 and 25% imperviousness with a flattening off is the same as that found for typical Auckland Streams. In the Long Bay evidence given by Dr Stephanie Parkyn, Manager of the River Ecosytems group at NIWA, she presented a similar shape plot for the taxa richness of sensitive EPT taxa versus % of impervious surface area for 35 Auckland streams, Figure A-2.

Figure A-2: EPT taxa richness vs % impervious surface area



Another example of this rapid decline in stream health is also found in Auckland's Air, Land and Water Plan (ALW Plan) stream reach types 2, 3 and 4. The ALW Plan defines these three reach types as:

(a) < 10% impervious surface is Type 2: High value low disturbance

(b) Between 10 and 25% imperviousness is Type 3: Moderately disturbed natural channel

(c) > 25% imperviousness is Type 4: Highly disturbed natural channel.

Tom Schueler's evidence also presented different threshold values for freshwater and tidal reaches. Within the last five years researchers have examined whether the ICM applied to tidal conditions, such as the lower section of Vaughans Stream in the Long Bay catchment. The conclusion drawn from this recent science is that the ICM does apply to tidally influenced streams, but that threshold values for biological response appears to be higher (20 to 30% impervious cover) than freshwater streams, presumably due to their greater tidal mixing and inputs from near-shore ecosystems.

Therefore, for the Long Bay catchment the following terminology was used:

Freshwater

(d) < 10% imperviousness: High Quality

(e) Between 10 and 25% imperviousness: Moderate Quality

(f) > 25% imperviousness: Non-supporting

Tidal

(a) < 20% imperviousness: High Quality

(b) Between 20 and 30% imperviousness: Moderate Quality

(c) > 30% imperviousness: Non-supporting

Non-supporting is described as "no longer supporting their designated uses in terms of hydrology, channel stability habitat, water quality or biological diversity".

CALCULATING THE EFFECTIVE IMPERVIOUSNESS

Extensive research carried out by the Center for Watershed Protection over the last 10 years has resulted in the following estimates of effective imperviousness for different stormwater systems:

Using on-site stormwater measures (such as rainwater tanks, permeable paving and bio-retention): Reduce the gross impervious surfaces down to an effective impervious of 5%. For example, a 20% impervious surface is reduced to an effective imperviousness of 5%.

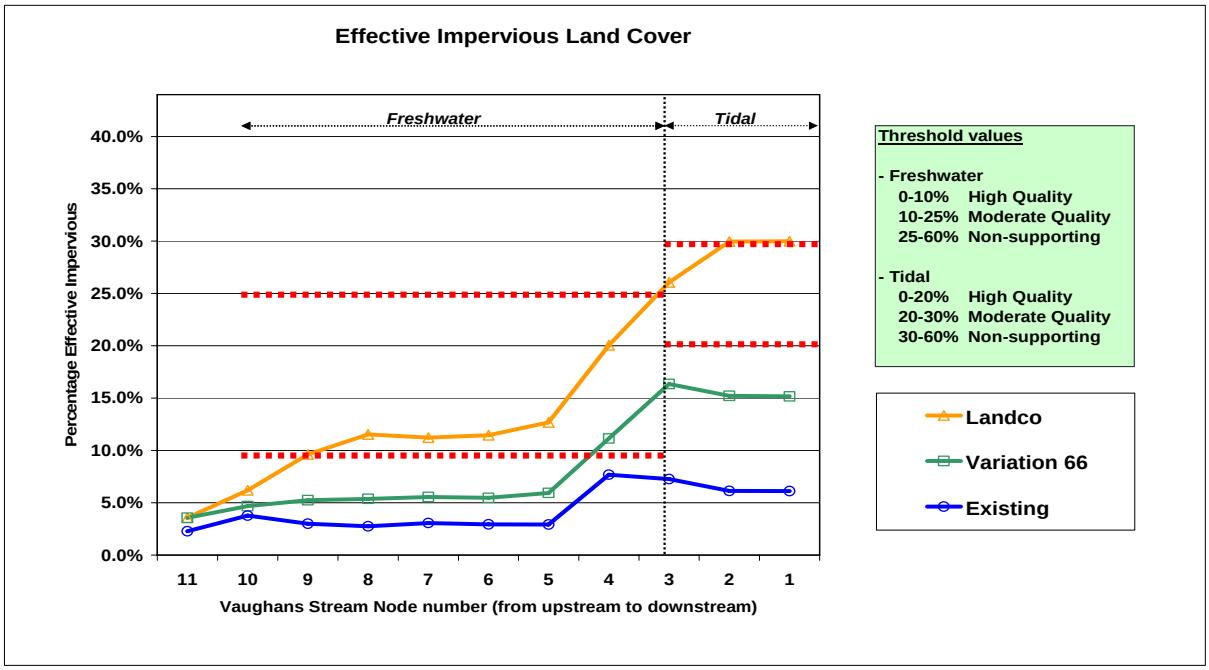
Wetlands/Ponds: Reduce the gross impervious surfaces by 10%. For example, an impervious surface of 20% is reduced to an effective imperviousness of 10% (20% minus 10%). As presented in Tom Schueler's Long Bay evidence, he states that while ponds can be designed to manage flooding and contaminant levels, an increasing number of studies are showing that due to temperature and flow volume effects, wetlands/ponds are only showing an equivalent 5 to 10% reduction in effective imperviousness when comparing total stream health characteristics.

Compacted Soils: Increasing evidence, both locally and overseas, is showing the effect of compacted soils due to earth working activities is to significantly reduce the amount of infiltration when compared to pasture conditions. For Long Bay the effect of compacted soils was taken to be equivalent to an area that is 50% impervious. The compacted areas of soils for the developer and NSCC structure plan proposals was taken as the aerial extent of the earthwork contour plans.

THE RESULTS

Combining the above Impervious Cover Model (ICM) and the calculation of the effective imperviousness for the Developer (Landco) and NSCC (Variation 66) structure plans results in the following, Figure A-3:

Figure A-3: Effective Imperviousness versus Stream Node Number



In summary, the above figure shows that the effective imperviousness of the Developer (Landco) structure plan is approximately twice that of NSCC (Variation 66).

The above figure shows:

- For the freshwater sections, Nodes 11 to 5, the NSCC effective imperviousness is below the critical 10% threshold at 5 to 6% (a 'high quality') stream, whereas Landco is above the 10% threshold at around 12% (a 'moderate quality' stream).

- For the tidal reaches, Nodes 3 to 1, the NSCC effective imperviousness is below the critical 20% threshold at 15 to 16% (a 'high quality' tidal stream), compared to Landco at 30%, at the breakpoint between a 'moderate quality' and 'non-supporting' tidal stream.

A summary of the stream lengths for the Developer (Landco) and NSCC under the four stream quality categories is presented in the bar chart below, Figure A-4.

The total length of streams is approximately 18km. The bar chart below shows:

- The NSCC plan has retained more than twice the length of 'high quality' streams, 13km versus 6km.

- This leads to NSCC having 2/3 of 'moderate quality', 1/4 of 'non-supporting', and 1/3 of 'eliminated' stream categories compared to the Developer (Landco) plan.

An ‘eliminated’ stream category is a stream that has been lost due to earth working of the natural stream channel. The developer plan had a greater area of major earth working activities and hence more of the natural stream channels are lost.

Figure A-4 Distribution of Stream Length under Four Stream Quality Categories