Stop Auckland Sewage Overflows Coalition (SASOC)

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Submission to Auckland Council on 10 year plan and budget, and on Auckland Plan 2050

1.0 Introducing SASOC

SASOC is a coalition of community groups[1] spread around the western edge of the Waitemata harbour and within the central Auckland isthmus. It was formed to represent their general concern about water quality within the Auckland isthmus.[2] Although SASOC is focused on the central isthmus, it accepts the need for a holistic Auckland-wide solution to the city's water quality issues.

SASOC's specific areas of concern include the very old combined stormwater/wastewater pipe network, the role of stormwater in the overflows from that network, and the effects of stormwater run-off from roads and from other impermeable surfaces (the latter as a consequence of intensification of building within the isthmus).

2.0 What we are asking Council to do[3]

Auckland Plan 2050

2.1 Include provision in the Auckland Plan 2050 for a region-wide upgrade of the water infrastructure to be completed within the term of that plan, in accordance with a programme to be set in the next review of the 10 year plan (2021).

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[1] Refer attachment A.

[2] Refer attachment B for a summary of its purposes.

[3] Although SASOC's focus is on the effect of stormwater, this submission applies generally to both Auckland Council's stormwater department, Healthy Waters, and Watercare Services Limited, because the combined pipe network is used by both and ultimately the responsibility for both those organisations rests with Council.

2.2 Confirm (or establish) the adoption of asset management plans and practices in accordance with the Auditor-General's guidelines[4] and international standards[5] to future-proof Auckland's water infrastructure, so that:

- specific standards are set for water quality in Auckland's inland waterways and marine environments, together with criteria for measurement on a regular and effective basis; and
- there is transparent investment in maintenance (repair) and upgrade of existing infrastructure, and in development of new infrastructure by all entities having a role in this infrastructure (eg Auckland Council, Watercare Services Limited, Auckland Transport and New Zealand Transport Agency).

10 year plan and budget

2.3 Approve the proposed budget of $400 million for capital expenditure to upgrade Council's stormwater infrastructure (as part of the Western Isthmus Water Quality Programme (WIWQIP)), and "ring-fence" that sum by raising it through a targeted rate.

2.4 Approve an operating expense budget for Council's stormwater department "Healthy Waters" for its region-wide stormwater maintenance needs, of no less than its present expenditure, to ensure that the existing infrastructure is kept up to proper standard.

2.5 Bring forward the timing of the proposed expenditure on separation within WIWQIP, so that it is completed at the same time as Watercare Services Limited's Central Interceptor project.

2.6 Establish a budget of $3 million per year for monitoring and establishing an effective compliance regime for the stormwater network, as a separate budget from Healthy Waters' maintenance budget.

2.7 Approve a budget of $500,000 per year for three years for investigating and preparing a case to upgrade the whole of Auckland's water infrastructure, to the standard of a water-sensitive city, within the timeframe of the proposed Auckland Plan 2050.

3.0 Reasons for concerns

3.1 Extent of and nature of overflows

- The combined pipe network in the central Auckland isthmus is gravely in need of replacement or upgrading: it was constructed over 100 years ago to

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[4] "Asset management and long-term planning", Audit New Zealand, March 2017, particularly addressing the ten matters set out in Part 9.

[5] International Standard ISO 55000 (2014) and International Infrastructure Management Manual (2015).

service significantly lower and different demands; overflows from it discharge 2.2 million cubic metres of sewage/wastewater/trade waste/untreated stormwater into the environment annually (streams, aquifers, estuaries and harbours).
- Untreated stormwater from both combined and separate stormwater networks discharges directly into the Waitemata and Manukau Harbours – carrying heavy metals and other pollutants.

3.2 Effect on receiving waters[6]

- Unacceptable levels of sewage contamination[7]
- Unacceptable levels of heavy metal contamination (approximately 50% of stormwater is collected off roads, and is contaminated with pollutants from vehicles)
- Consequent degradation of the receiving waters: beaches regularly being unswimmable[8]; watercourses have become unsuitable for human use and recreation[9]; wildlife habitats in watercourses and harbours being destroyed[10], and excessive concentrations of fresh water diluting saltwater marine environments[11].

3.3 The history of prevarication

- The ageing and shortcomings of the combined pipe system have been known for decades.
- The concept of a central interceptor (to reduce overflows) first arose in 1989, but it was not pursued until the 2000s; provision was made for it in Auckland Council's 10 year plan and budget in 2012, but the implementation has been deferred as other Council projects have been given priority.
- Separation was identified as a need and was started in the central isthmus under the previous Auckland City Council (through Metrowater), but largely stopped with the creation of Auckland Council.
- Historically there has been little or no or inadequate financial provision for renewal of water infrastructure (and, until the last year, declining expenditure on existing infrastructure since Auckland Council was formed).

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[6] Refer to the submissions of St Lukes Environmental Protection Society Inc, Friends of Oakley Creek, Manukau Harbour Restoration Society Inc.

[7] An extraordinarily high e-coli reading of 195,000 (compared to the accepted swimmable level of 450) has been recorded in Kelmarna Stream, which feeds into Cox's Creek.

[8] As well as an appropriate public service, Council's Safeswim website is an indictment of previous inaction.

[9] Notwithstanding efforts to improve it over recent years, Cox's Creek remains an appalling example.

[10] For example, Meola Creek - see the submission of St Lukes Environmental Protection Society Inc.

[11] See the submission of the Manukau Harbour Restoration Society Inc.

3.4 Failure to provide for sustainability

- This submission would not be necessary if successive Councils had ensured sustainable funding for stormwater and wastewater infrastructure.
- The Local Government Act 2002 requires local authorities[12] to provide the highest priority to maintaining critical infrastructure. Successive Auckland Councils (legacy and present) have failed to do so.
- It is not possible to achieve operational sustainability without financial sustainability.
- Even if sustainability of assets cannot be achieved across the board at this point in time, Council should ensure sustainability for critical assets now.

Action needed:

- ➢ Commit to a comprehensive upgrade of all water infrastructure to the standard of a "water sensitive city" within a defined time frame (the term of Auckland Plan 2050). The problem must not be left for future generations.
- ➢ Start the rejuvenation now with the plan and budget proposed for this 10 year plan, put a plan in place for the remainder of the work for approval in the next review of the 10 year plan, and, pending that decision, both support the forward plans of Watercare Services for its infrastructure development and ensure that the general rates funding (capital and operational expenditure) for Council's stormwater department, Healthy Waters, remains at least at the current year's level ($110 million).
- ➢ Join all entities with a role in the provision of water infrastructure into the planning process.

4.0 Expanding upon the concerns[13]

4.1 *Stormwater – the principal culprit*

- It is an accepted fact that the root cause of the overflows is the volume of untreated stormwater entering the water networks.
- Currently much of the stormwater generated on the isthmus is discharged, without treatment, either directly into the environment (including aquifers) through obsolete discharge/disposal systems or into the combined pipe

[12] S 11A.

[13] SASOC has obtained the information in this submission from various sources, including meetings with officers of Watercare Services Ltd, Council officers within the Healthy Waters department and the Mayor's office, and meetings with members of Council's Environment Committee, Finance Committee and Planning Committee.

network[14]. This submission addresses elsewhere the problems that stormwater causes for the old combined pipe network[15].

- Stormwater contains heavy metals, hydrocarbons and other pollutants; the heavy metals, in particular, linger in the environment and extended exposure causes serious health issues.
- The very high volume of traffic on the isthmus means its roads give rise to a very high level of these pollutants.
- Much of the western isthmus has no stormwater reticulation apart from the combined pipe network.
- Comparatively little has been spent on stormwater upgrade in the central Auckland isthmus for many years.
- Funding received in consenting processes, specifically as development levies for storm/wastewater infrastructure upgrading, frequently has not been used for that purpose[16].
- Over the years since the formation of Auckland Council, Healthy Waters has suffered from a perennial inability to fund the infrastructure development required for treatment and safe disposal of stormwater: its funding has been less than that of the previous (combined) Councils, in addition to which its budgets appear to have been re-prioritised in favour of other expenditure.

Action needed:

- ➢ Specific plans to be prepared to bring Council's stormwater infrastructure up to "water sensitive city" standard[17]. These plans need to be specific, and not merely aspirational: identifying the current state of all existing infrastructure, assessing the work needed (including treatment), estimating the cost of replacing or refurbishing, assessing the criticality of the work and establishing a proposed priority for each item.
- ➢ Once prioritised, the plans should be made public to inform the public, Mayor and Councillors of long-term funding requirements for upgrading (either independently of or as part of the next 10 year review).
- ➢ In the interim, all funding for Healthy Waters expenditure (with the exception of development contributions) should be funded as a targeted rate or otherwise ring-fenced so that it cannot be used for any other purpose.

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[14] From which it overflows over 50 times per annum after only 5 mm of rain.

[15] Section 4.3.

[16] Confirmed in a meeting between SASOC and other water groups and the Chair of Council's Finance Committee on 19 September 2017.

[17] The same applies to Watercare Services' wastewater infrastructure. Watercare already has a very substantial forward plan for its separate infrastructure development. WIWQIP is the mechanism for starting to bring the combined network up to standard.

- Funding of the Western Isthmus Water Quality Improvement Programme (WIWQIP) is to be given the highest priority level.

- Maintenance of existing stormwater infrastructure is another critical requirement. Healthy Waters has not been able to fund a compliance team within its current budget[18]. Compliance will strongly reduce inflows into the combined pipe network. A compliance team would also check street catch-pit cleaning contractors – another area of poor performance – and detect inaccurate connections (sewage to stormwater network and vice versa).
- As a consequence, Healthy Waters has been unable to check compliance with use of its infrastructure (eg incorrect/illegal connections) and maintenance of private infrastructure.

Action needed:

- Immediate increase of the proposed operating budget for Healthy Waters by $3 million annually for the establishment of a properly constituted and supported compliance team.
- All new connections to stormwater and wastewater networks to be made by skilled contractors, who are to provide a compliance certificate, and be checked and signed off by appropriately-qualified compliance inspectors.
- A register of stormwater infrastructure to be established, including a "warrant of fitness" type registration for stormwater infrastructure on private property.

4.2 *The central interceptor concept – dismissing the misconception*

- Watercare Services (which has responsibility for the management of both wastewater and stormwater flows in the combined pipe network) is about to embark on the construction of a major collector pipe, the central interceptor (CI), to take pressure off the combined pipe network.
- The CI is an important infrastructure project; it will improve the overflow problem significantly, but will not provide either a complete or a permanent solution.
- It will take a substantial amount but not all of the flow in the central isthmus catchments: it is estimated that it will reduce the volume of overflows in those catchments by 80%. However, that still leaves a substantial overflow problem in those catchment areas, and the overflows outside them eg the waterfront catchments.
- Moreover, it is only a temporary solution: as Auckland's population grows Watercare Services will need it for wastewater on its own.

[18] Compliance includes stormwater treatment/mitigation infrastructure on private land, for which maintenance is contractually required. This infrastructure is important to reduce environmental risks and stormwater inflows into the combined pipe network in particular.

4.3 *WIWQIP (the Western Isthmus Water Quality Improvement programme)*

- If water quality is to be improved significantly in the short term, it is essential that WIWQIP proceeds as planned. The overall cost of approximately $2 billion over 10 years is manageable: about $1.6 billion is to be funded by Watercare (with the majority of that sum already approved), leaving $400 million to be funded by Council direct.
- Pollutants in the combined pipe network include sewage, trade waste (various chemicals), heavy metals and general rubbish.
- WIWQIP, once completed, is expected to reduce combined pipe network overflows from 42 main outfalls, many of which overflow over 50 times annually, to just 10 main outfalls that are expected to overflow 2-6 times annually.
- Not only will the number of overflows be reduced but the volume released by each overflow will also reduce very substantially.
- WIWQIP is unique because it allows Council to use the CI (temporarily) for transmission of stormwater. (As mentioned previously, it is anticipated the CI will eventually need to be used for wastewater only.)
- This gives Council "breathing space" to complete the stormwater assets required in the combined pipe network areas.

4.4 *Separation in Auckland compared to other (older) cities*

- Combined sewer/stormwater network overflows are a world-wide problem in most older cities.
- Best practice is to have a dual system – one reticulation for stormwater and another for wastewater/sewage. No Local Authority would nowadays build a combined sewer system.
- One way of mitigating the current overflows is to separate into a dual system.
- Separation is not an option available to many other cities because they have already intensified. Separating then would require interference with foundations, basements etc. However, that is not true of all older cities – it depends on the circumstances of the city[19].
- A large majority of Auckland's high-rise buildings have been required to run separated wastewater and stormwater systems to their boundaries (part of building code requirements).
- Auckland with its traditional low rise residential areas and building setbacks allows relatively easy access to achieve separation on private land.

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[19] See attachment C - Report of the United States Environment Protection Agency, "Combined sewer overflow management fact sheet – Sewer separation"; September 1999.

4.5 *Sequencing of separation work – "picking the low-hanging fruit"*

- Removing stormwater from the combined pipe network not only reduces water transfer to Mangere but also reduces the number and volume of overflows.
- In terms of prioritising this work, it makes sense to focus first on work that will provide rapid improvement at the earliest opportunity – the metaphor of picking the lowest-hanging fruit.
- Roads and separation in coastal areas are logical targets for achieving rapid improvement of water quality.
- Roads in the central isthmus contributes over 50% of the stormwater entering the combined system. It makes eminent good sense to prioritise infrastructure that prevents stormwater both entering the system, or leaving it without treatment.
- Coastal suburbs in the central isthmus, in the main, are serviced by the combined pipe network. Separation in those suburbs will have two effects: first, only wastewater will have to be transmitted from there to Mangere for treatment (and this can be done using existing infrastructure); secondly, it is a relatively simple and economical process to take stormwater collected in those suburbs to the coast for discharge after relevant treatment. As most harbourside areas served by the combined pipe network have low traffic volumes (compared to arterial roads) the stormwater should only need relatively minimal treatment.
- Separation in inland areas is more expensive because of the infrastructure required to dispose of the stormwater safely, presumably to coastal discharge points.

Action needed:

- ➢ In the short term, collection and treatment of run-off from roads, and separation of the combined pipe network in coastal suburbs should be given priority in stormwater infrastructure redevelopment in the central isthmus.
- ➢ As roads contribute so much to the problem, Auckland Transport and New Zealand Transport Agency, as owners of the roads and associated infrastructure, should play and pay a part in stormwater collection and treatment.

4.6 *Looming issue – retrofitting Auckland's infrastructure – need for overall plan*

- Depreciation on sewer/stormwater assets is based on a life span of approximately 120 years. History has shown that this assessment of useful life is reasonably accurate.
- Currently the areas closest to the end-of-life timeline are the old Auckland suburbs. It is still affordable to retrofit this area through projects such as WIWQIP.

- Over the next 40 years very much larger parts of the Auckland urban area are going to fall into the 120 year category. The possible refitting cost involved is currently unknown.
- It is essential that Auckland asset management is improved (in keeping with the Auditor-General's recommendations) to ensure the ability to deal with these issues in the normal course of Council business. This will ensure that Healthy Waters has much needed certainty in its funding to enable it to keep assets up to the required standard.

  Action needed:

  - More funding will be required in future 10 year plans to meet the cost of retrofitting old or obsolete infrastructure. Council to commit to the funding required to meet this cost, in keeping with the plan to be developed as part of the action required under 4.1 above.
  - This funding is to be "ring-fenced" to ensure that the necessary work is done as planned, and the funding is not subject to changing priorities elsewhere.

4.7 *Council's current finances*

- We understand that Council financial team considers that it cannot, under the current plans, provide full depreciation on its assets until 2025.
- However, as a consequence of deliberate re-prioritisation, stormwater issues have been starved of funds for many years.
- The situation is now at crisis point. Further under-funding will cause very serious declines in water quality, particularly in central isthmus streams, estuaries, beaches and in the Waitemata and Manukau harbours.

  Action needed:

  - Council is to review and ensure compliance with the Auditor-General's recommendations for asset management for underground infrastructure.
  - In particular, Council to bring forward a full depreciation allowance for stormwater assets to 2018.

5.0 Support for submissions of other water groups

SASOC has been working with other community and environment groups with slightly different priorities, but looking to achieve common goals[20]. SASOC in general supports the submissions made by these groups:

- St Lukes Environmental Protection Society Inc.

[20] See attachment D – common goal of water groups.

- Friends of Oakley Creek.
- Manukau Harbour Restoration Society Inc.

6.0 Conclusion: Time to effect change

6.1 The untreated pollutants in the overflows are a very significant financial and reputational risk for Auckland Council, and hence, indirectly, for the public.

6.2 The problem has lain under-ground, literally and metaphorically, for too long.

6.3 Council's stormwater department, Healthy Waters, and Watercare Services Limited need Council's support in policy, as well as financially, to carry out the infrastructure development that is needed to bring our water quality up to the standard that we all expect – a world leader in clean water.

6.4 Strong leadership is needed from this Council – to approve the funding sought in this 10 year plan/budget, to do so in a way that the funds are ring-fenced for this purpose only, and to put in place a comprehensive overall plan to finish what this plan starts.

Signed on behalf of SASOC by
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28 March 2018

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ATTACHMENT A

Stop Auckland Sewage Overflows Coalition

List of members (as at 28 March 2018)

Auckland City Centre Residents' Group Inc.

Eden Park Neighbours' Association Inc.

Freemans Bay Residents Association Inc.

Gables Neighbourhood Group.

Grafton Residents' Association Inc.

Grey Lynn Residents Association Inc.

Herne Bay Residents Association Inc.

Mission Bay-Kohimaramara Residents Association Inc.

Orakei Community Association Inc.

Parnell Heritage Inc.

South Epsom Planning Group Inc.

Tamaki Drive Protection Society Inc.

The St Mary's Bay Association Inc.

The Whau River Catchment Trust.

Weona-Lemington Walkway

Westmere Heritage Protection Association.

Western Bays Community Group Inc.

Westhaven Marina Users Association Inc.

ATTACHMENT B

Stop Auckland Sewage Overflows Coalition

1 The Stop Auckland Sewage Overflows Coalition (SASOC) is a coalition of community organisations (currently numbering 18) situated in the central Auckland isthmus, extending around the Waitemata Harbour from Mission Bay in the east to Whau creek in the west, as well as adjacent inland areas.

2 SASOC's mission statement reads:

"To lobby for immediate upgrade of the drainage infrastructure of the central Auckland isthmus to stop untreated wastewater and stormwater discharges into the environment".

3 SASOC's purposes (as stated formally in its rules) include:

(a) To encourage, support and maintain the goal of achieving the highest water quality practically possible in the waters of the central and western bays of the Waitemata Harbour and generally in Auckland's harbours and watercourses.

(b) To promote objective investigation into options for and economic viability of improvements to Auckland's drainage infrastructure, particularly in the Western Bays and other areas that are served by combined stormwater and sewage systems.

4 The primary objective of the coalition can be summed up as improvement of the infrastructure in the Auckland isthmus in such a way that wastewater/sewage and stormwater from the combined pipe system is only released into the environment after appropriate treatment, and achieving this without further delay.

5 The co-convenors of the coalition are

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ATTACHMENT C

United States Environmental Protection Agency | Office of Water Washington, D.C. | EPA 832-F-99-041 September 1999

EPA

Combined Sewer Overflow Management Fact Sheet
Sewer Separation

DESCRIPTION

Sewer systems that convey both sanitary sewage and storm water through a single pipe are referred to as combined sewer systems (CSSs). In dry weather and during light to moderate rainfall, the CSS is able to convey all flows to the wastewater treatment facility. During periods of heavy rainfall, however, the capacity of the CSS may be exceeded, often causing untreated combined sewage and storm water to back up into basements and to overflow from manholes onto surface streets. Traditionally, CSS outfalls were designed to discharge directly into receiving waters during combined sewer overflows (CSOs). This was done to prevent the excessive combined flows from directly impacting public health via basement and street flooding.

In addition to flooding problems, CSOs can cause problems in receiving water bodies. CSOs can contain untreated domestic, industrial, and commercial wastes, as well as storm water runoff. Contaminants contributed by these sources include potentially high concentrations of suspended solids, biochemical oxygen demand (BOD), oils and grease, toxics, nutrients, floatables, pathogenic microorganisms, and other pollutants. CSO pollution has caused many receiving waters to exceed water quality standards, resulting in threats to public health, aquatic species, or aquatic habitat. CSO pollutants have impaired receiving water body uses and have contributed to restrictions on shellfish harvesting, occasional fish kills, and numerous beach closures. Potential odors and solids deposits in the receiving water body can also compromise aesthetics and limit recreational uses of the water body.

Many communities have studied and evaluated CSO control strategies that would effectively reduce, if not necessarily eliminate, CSOs and their associated health and ecological risks. One of the strategies often considered is sewer separation.

Sewer separation is the practice of separating the combined, single pipe system into separate sewers for sanitary and storm water flows. In a separate system, storm water is conveyed to a storm water outfall for discharge directly into the receiving water. Based on a comprehensive review of a community's sewer system, separating part or all of its combined systems into distinct storm and sanitary sewer systems may be feasible. Communities that elect for partial separation typically use other CSO controls in the areas that are not separated.

APPLICABILITY

Sewer separation can be considered wherever there is a CSS. However, an evaluation of the most appropriate CSO control should be performed prior to selecting sewer separation or any other measure. Sewer separation has often been the appropriate technology in areas where one or more of the following conditions exist:

- Most sewers are already separated;
- Siting constraints and costs prohibit the use of other structural measures;
- The uses and the assimilative capacities of receiving waters prohibit the use of other CSO controls;

- Other CSO strategies are not publicly acceptable;
- Additional infrastructure improvements, such as road repaving, are also required;
- The combined system is undersized;
- Elimination of CSOs is desired; and/or
- Other CSO measures are not able to achieve the community's goals.

Sewer separation has been used effectively in many communities. Most of the approximately 1,000 communities that are served by CSSs are located in the Northeast and the Great Lakes region. Complete or partial separation of CSSs has occurred in many of these areas, as well as in several locations in the West. Cities that have completely or partially separated CSSs include: Minneapolis, St. Paul, and South St. Paul, MN; the metro Detroit, MI, area; the metro Boston, MA, area; Salem and Portland, OR; the metro Seattle, WA, area; Lynchburg, VA; Bangor, ME; Hartford and Norwich, CT; and Remington, IN. Columbus, OH, has recently elected to separate its CSS as well.

One of the largest sewer separation projects occurred in Minneapolis, St. Paul, and South St. Paul, MN. The project involved pipe separation in more than 21,000 acres of drainage area. By December 1996, 189 miles of storm sewers and 11.9 miles of sanitary sewers had been installed. This program was needed to reduce the number of overflows that were estimated to occur an average of once every three days (*American City and County*, 1996). Overflows have been significantly reduced by this separation project.

ADVANTAGES AND DISADVANTAGES

Positive impacts resulting from sewer separation include: reduction or elimination of basement and street flooding; reduction or elimination of sanitary discharges to receiving waters; decreased impacts to aquatic species and habitat; decreased contact risk with pathogens and bacteria from domestic sewage in the receiving water; and relief from CSO regulations. In addition, incidental infrastructure work (e.g., road repaving and the repair or replacement of miscellaneous utilities, such as water and cable lines) could be conducted more cost effectively if it were to coincide with sewer separation. For example, as a result of the CSO program in the City of St. Paul, MN, streets were paved and handicap ramps were added to sidewalks, gas and water mains were installed, gas services were renewed or replaced, lead water service connections were replaced, and street lights were installed.

Separating CSSs may contribute to improvements to water quality due to the reduction or elimination of sanitary discharges to receiving water bodies. However, the increased storm water discharges resulting from sewer separation could decrease the positive impacts of the separation unless storm water discharges are mitigated. Without mitigation, increased loads of storm water pollutants, including heavy metals, sediments, and nutrients, may run off into local water bodies. For example, in Atlanta, GA, sewer separation was predicted to increase pollution to local creeks (AMSA, 1994) as polluted storm water previously reaching the treatment plants now is discharged directly into receiving waters. However, in many cases, separating sewers reduces pollution to receiving waters, as described above for St. Paul, MN. A second example of successfully reducing pollution to receiving water bodies has occurred in Juneau, AK. It has been reported that in Juneau, where there is in excess of 70 inches of precipitation a year, the storm water concentrations conveyed through the recently separated storm water sewers are rather dilute. This has also been attributed to large quantities of clean groundwater that infiltrate into the storm sewer, relatively clean activities within the watershed, and several non-point source pollution control programs within the City (City of Juneau, 1997). Existing and future storm water impacts to the receiving water body should be evaluated prior to implementing sewer separation.

Negative impacts associated with sewer separation include extensive construction and construction related impacts (e.g., noise, dust, erosion), disruption to residents and businesses, possible disruptions in sewer service, and the need for storm water controls or best management practices.

In addition, complete separation of sanitary and storm water flows can be hard to accomplish whether the combined sewer is converted to a storm sewer or to a sanitary sewer. Complete separation of a CSS would involve disconnection of all storm water drainage structures, sump pumps, and roof and footer drains. Disconnection of footer drains is often not cost effective. Some communities have offered financial incentives to homeowners and businesses for voluntarily disconnecting some of these storm water sources from sanitary sewers. Many communities have also passed ordinances requiring the disconnection. Despite these provisions, there is still potential for some storm water flows to remain connected to sanitary sewers. Likewise, complete disconnection of sanitary flows from a converted storm water sewer may be difficult to accomplish, but is usually more successful than eliminating all storm flow connections from connected sanitary sewers.

KEY PROGRAM COMPONENTS

Decisions for a CSO control strategy should be made on a site-by-site basis utilizing drainage area data, receiving water use and water quality data, and sewer system data. Sewer system information can be obtained from review of sewer plans, television inspection, and flooding records. Communities may consider performing house to house inventories of house connections to the combined system (i.e., sanitary and roof drains). This was successfully done in parts of the metropolitan Boston area. Modeling and Geographical Information Systems (GIS) may be useful data analysis and prediction tools.

Using these data, communities should determine what CSO controls, or combination of controls, will meet performance goals established by the community. Other factors, such as cost effectiveness, natural and urban topography and soil types, siting constraints, location of current and future utilities, land use and cover, existing sewer capacity, layout, and condition, pump and treatment plant capacities, and requirement for other infrastructure work in the same area, should be considered before finalizing project plans. For example, sewer separation was selected in Minneapolis, South St. Paul, and St. Paul, MN, due to local needs for eliminating sewage backups into basements, reducing street flooding, and reconstructing aging portions of the sewer system (MWCC, 1984).

Sewer separation can be accomplished through installing new storm or sanitary sewers to be used in conjunction with the existing sewer. Economics, capacity, condition, and layout of the combined sewer are the typical factors used in deciding the existing line's post-separation use.

An advantage of converting the combined sewer to a sanitary sewer (referred to as a converted sanitary sewer in this document) is that all sanitary flows are already connected to the converted sanitary sewer. Using the existing combined sewer as the sanitary sewer and installing a new storm sewer would likely require that any overflow weirs, gates, or other regulating devices remaining in the converted sanitary system be bulkheaded or otherwise disabled to eliminate the potential for sewage to overflow. In addition, storm water drainage structures, sump pumps, and roof drains must be disconnected from the converted sanitary system and connected to the new storm water sewer. This will provide more capacity in the converted sanitary sewer and will reduce the possibility of overflows. Building footer drains, however, are often left connected to the existing combined system and do consume some of the converted sanitary sewer capacity. Rehabilitation or relining of the converted sanitary system, storage tanks, and/or equalization basins may be required if infiltration is a significant problem due to cracks or inadequate construction materials (e.g., brick sewers). In some cases, such as in Juneau, AK, the existing combined sewer may be in such poor condition that new sanitary sewers, as well as new storm sewers, are constructed.

There are some circumstances that may make the conversion of the combined sewer to a storm sewer (referred to as a converted storm sewer in this document) more appropriate. For instance, combined sewers that have a large diameter and have little slope (less than 3 percent) would not have the flushing velocity required of a sanitary sewer. In cases such as this, the existing CSS may be more appropriately converted to a storm sewer, provided that the sewer has sufficient capacity for safe conveyance of the local design storm. A smaller sewer should be appropriately designed, sized, and constructed to convey the sanitary flows. Storm, roof, and footer drains, as well as catchbasins could remain connected to the converted storm sewer. Sanitary connections, however, would need to be disconnected and conveyed to the new sanitary line. Any remaining sanitary lines connected to the converted storm sewer will cause direct discharges of sanitary flows to the receiving water body. Post-separation sampling and monitoring of the converted storm sewer is typically required to confirm that all sanitary flows have been removed from the converted storm sewer and redirected into the sanitary sewer. Conversion of the combined sewer to a storm sewer would also require that the interceptor connection at the regulating device (e.g., weir or gate) be plugged, and may potentially require modifications to prevent water from stagnating upstream of the regulator.

Consideration should be given to coordinating sewer separation with improvements to other utilities, as this enhances the cost-effectiveness of both/all projects and minimizes disruption to the public.

IMPLEMENTATION

Sewer separation reduces and often eliminates untreated sanitary discharges from discharging into receiving water bodies, and therefore positively impacts receiving water quality. Sewer separation, however, greatly increases untreated storm water discharges to the receiving water body. In a CSS, at least some of the storm water flows are treated at the treatment plant. The performance achieved with sewer separation will vary depending on the existing storm water pollutant loading and the existing sanitary pollutant loading. For example, a study performed for North Dorchester Bay, MA, estimated that the overall fecal coliform removal potentially achieved by sewer separation was only 45 percent (Metcalf & Eddy, 1994). This was attributed to the increase in storm water discharges to the receiving water body, and the corresponding increase in non-point runoff pollutants.

Actual fecal coliform removal rates have been determined for several sites where sewer separation has been implemented. Water quality monitoring data collected in St. Paul and Minneapolis from 1976 to 1996 indicated a fecal coliform concentration reduction of 70 percent. One of the four sites where data was collected reduced fecal coliform concentrations from an average of 500 organisms per 100 mL to 150 organisms per 100 mL. At another site, fecal coliforms were reduced from 489 organisms per 100 mL to 143 organisms per 100 mL (Richman, 1996). This reduction has been attributed to sewer separation and to the reduction in the number of overflows occurring every year.

Sewer separation may also result in other related improvements to water quality. In stretches of the Mississippi, water quality improvements attributed to sewer separation projects have resulted in the return of the pollution-sensitive Hexagenia mayfly after a 30 year absence; the return of Bald Eagles to the area; and the recovery of fish populations and diversity from 3 species to over 25 species (Cities of Minneapolis, et. al., 1996).

Monitoring the performance of CSO control strategies at the Rouge River Demonstration Program has been underway since the summer of 1997. Part of the monitoring program will identify the effectiveness of sewer separation in terms of improvements to water quality. Instream monitoring is also occurring in Portland, OR. The supplemental data will add to the performance data collected in Minnesota (70 percent fecal coliform reduction) and estimated for Massachusetts (45 percent fecal coliform reduction).

OPERATIONS AND MAINTENANCE

The Operations and Maintenance (O&M requirements of separated sewers are generally the same as those of other sewer systems. Maintenance must be conducted on pump stations (including routinely cleaning wet wells, testing for adequate pumping capacity, and exercising pumps and stand-by generators), sewer lines, and catchbasins and grit chambers. Catchbasins and grit chambers located in the sanitary or storm sewer system will require routine cleaning to prevent accumulation of sediment. Jet spray cleaning, pumping, and vacuuming are common methods for cleaning catchbasins and grit chambers.

In addition, all sewer lines, and in particular sewers that were previously combined, need to be monitored to verify hydraulic capacity and to identify infiltration and inflow. Basement or street flooding is a likely indication of hydraulic capacity or gradient problems in the sewer and may require major repairs. Excessive infiltration into a converted sanitary sewer may require rehabilitation of the sewer system. Methods for assessing the condition of the sewers include modeling, smoke testing, and television inspection. Monitoring will identify cracked and collapsed sewers that will need to be repaired. In addition, monitoring can identify the location and cause of sewer blockages. To prevent blockages, lodged debris, sediment, and grit must be removed on a regular basis.

Post-separation monitoring and sampling may be required to ensure that no sanitary flows are still connected to the storm sewer and being directly discharged to the receiving water body. Alternatively, simple dye studies can be employed to verify separation.

COSTS

Separation costs vary considerably due to the location and layout of existing sewers; the location of other utilities that will have to be avoided during construction; other infrastructure work that may be required; land uses and costs; and the construction method used (e.g., open cut verses microtunneling). Communities that have other infrastructure requirements (such as road repairs) in addition to sewer separation may find that upgrading the facilities simultaneously can result in a much lower cost relative to upgrading them independently. Construction occurring in existing right-of-ways would probably not require land acquisition, and thus would not add to the project cost. Project costs could increase depending on the land use. For example, project construction occurring in an industrial area that contained hazardous materials or wastes would likely increase the project cost. Methods of construction, such as the need to tunnel or bore versus open cutting, can also add to the cost. Project costs could also increase if sanitary equalization basins are required as part of the separation project or if storm water best management practices are required to control the increased storm water discharges to the receiving water body. .

Actual construction costs are available from the St. Paul sewer separation project. For that project, sewer separation costs ranged from $8,350/acre to$40,060/acre, with an average cost of $15,400/acre (all costs are in 1984 dollars). Estimates from the City of Portland and Detroit are $18,000/acre and $67,800/acre, respectively.

The Rouge River project has also generated good cost data for sewer separation. Costs were approximately $377,000 for separating approximately 600 meters of pipe on a small residential street (CSO Area 42, Windsor Avenue), which included costs for removing existing pavement, laying a new sewer line, and re-paving and re-sodding. A second project (CSO Area uing cost $1.3 million to separate approximately 2,600 meters of pipe. All costs are presented in 1995 dollars.

The cost of operation and maintenance (O&M) of the separated sewer system is difficult to predict. Factors contributing to the O&M costs include the age and the condition of the previously combined sewer, the length and diameter of the sewers, the frequency and the amount of sand and grit removed, and the size of drainage areas.

Sewer separation can reduce treatment and O&M costs at the receiving treatment plant by potentially eliminating storm water flows to the plant. Energy costs for transporting flows to the treatment plant could also be reduced due to the reduced flow volume.

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ATTACHMENT D

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Auckland Water Groups

Over-arching goal and steps for achieving it (for consultation meetings):

Goal:

Clean water in our harbours and beaches, watercourses and aquifers.

Means of achieving this goal:

Develop coherent, complementary and separate stormwater and wastewater systems, within a framework of financial sustainability.

Specific steps to be taken to achieve this goal:

1. Reduce stormwater flows into drainage networks, so that discharges are eliminated or, at least, substantially reduced. This includes removing stormwater from sewers and treating the stormwater locally, wherever practical. This will result in less water to treat, and consequently fewer contaminants to dispose of in the wastewater treatment.
2. Spread the load on stormwater reduction and discharge measures across the catchments in the Auckland isthmus – by identifying local projects appropriate to the area.
3. Treat wastewater/sewage to the highest possible standard and stormwater to the highest practicable standard for the ultimate receiving environment.
4. Develop programmes for recycling water as a renewable natural resource, and preserving/maintaining the natural state of water in our harbours watercourses and aquifers (to be implemented as part of steps 2 and 3).
5. Engage with mana whenua and community groups throughout the Auckland isthmus to help restore wild life, so that waters become populated again by fish and birds and can be used safely by humans (recreation and kaimoana).
6. Implement financial policies and practices to provide and protect the funds needed to ensure the future sustainability of the stormwater and wastewater systems (such as prudent asset management, depreciation and creation of reserves).
7. Design, build and monitor the systems so as to ensure their long-term practical sustainability.

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