

# **MONITORING AND EVALUATING AN EDUCATION / PARTICIPATION CAMPAIGN TO REDUCE LITTERING AND STORMWATER LITTER LOADS IN A SMALL COMMERCIAL SHOPPING DISTRICT IN MELBOURNE**

TECHNICAL REPORT  
Report **05/10**  
September 2005

**André Taylor / Tim Fletcher / Justin Lewis**



COOPERATIVE RESEARCH CENTRE FOR



**CATCHMENT HYDROLOGY**



Moreland City Council



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Bibliography.

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# **Monitoring and Evaluating an Education / Participation Campaign to Reduce Littering and Stormwater Litter Loads in a Small Commercial Shopping District in Melbourne**

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## **Preface**

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In 2001 the Cooperative Research Centre (CRC) for Catchment Hydrology formed a partnership with the Victorian Environment Protection Authority to undertake research into the use, value, cost and evaluation of non-structural best management practices to improve urban stormwater quality (non-structural BMPs). Such BMPs include education and participation programs.

As one of the products from this research, guidelines were developed for local government authorities to use titled “Non-structural Stormwater Quality Best Management Practices: Guidelines for Monitoring and Evaluation” (Taylor and Wong, 2003; available at [www.catchment.crc.org.au](http://www.catchment.crc.org.au)). These guidelines were trialled on three distinctly different stormwater projects in Victoria before being finalised.

This report presents the final evaluation results of one of the projects that was used to trial the monitoring and evaluation guidelines with the assistance of Moreland City Council. The trial involved an education / participation campaign that operated within the small commercial district of Snell Grove in Oak Park, Melbourne, Victoria. This campaign was implemented by Moreland City Council staff, while the evaluation was undertaken by CRC for Catchment Hydrology staff in cooperation with specialist social science consultants (Community Change Pty Ltd). The methodology used for the monitoring and evaluation project and the format of this report are consistent with the CRC for Catchment Hydrology’s guidelines.

It is hoped that this report will help others who are involved with the design, delivery and evaluation of education-based initiatives to minimise littering and stormwater pollution in commercial districts. The project had many highlights and some low lights, all of which have been documented in an independent manner to maximise the lessons learnt from the project.

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The Victorian Government is also acknowledged for providing the bulk of the funding for this project through the Environmental Protection Authority as part of the Victorian Stormwater Action Program (grant numbers 02030098 and 03040128).

Ingal Environmental are also thanked for kindly donating several 'Enviropod' side entry pit traps to the project to assist with the monitoring of litter loads in stormwater.

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## 1. Executive Summary

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This report presents the final evaluation results of a project that was used to trial draft guidelines titled “Non-structural Stormwater Quality Best Management Practices: Guidelines for Monitoring and Evaluation” (Taylor and Wong, 2003; available at [www.catchment.crc.org.au](http://www.catchment.crc.org.au)). The trial involved an eight month education / participation campaign that operated within the small commercial district of Snell Grove in Oak Park, Melbourne, Victoria. The methodology used for the monitoring and evaluation project and the format of this report is consistent with the CRC for Catchment Hydrology’s guidelines.

The education / participation campaign focused on 26 traders and to a lesser extent the general public using Snell Grove. Trader-related elements of the campaign included a brochure, one-to-one site visits / meetings with traders, a clean-up event, a newsletter / fact sheet, maintenance of infrastructure in the street (including bin-related infrastructure), posters in shop windows, windproof ash-trays and drain stencilling. Public-related elements of the campaign included posters in shop windows and the railway station, drain stencilling, brochures distributed by traders, and maintenance of the local environment (e.g. clean-up of dumped rubbish and improvement to local Council-managed infrastructure).

The project had four evaluation objectives. The first was to determine whether the anti-litter education / participation campaign that was run at Snell Grove in 2003 was fully implemented as set out in the project plan that was current immediately prior to the commencement of the campaign. The monitoring found that approximately 50% of the actions planned immediately before the beginning of the campaign were delivered on time. Approximately 30% were delivered later than expected. Approximately 20% of planned tasks were not done. Some important activities that would have provided positive feedback to traders and engaged non-trader groups in participatory education were not delivered. Overall however, it appears that the Council officers implemented the vast majority of the planned campaign actions (approximately 80%). This is a positive result.

The second evaluation objective was to determine whether levels of awareness, knowledge, attitudes and behaviour with respect to littering and stormwater management changed as a result of the campaign. The Clean Communities Assessment Tool (CCAT) was used as a monitoring tool for these styles of evaluation. The CCAT ‘summary ratings’ are a good indication of the overall effect of the education / participation campaign in terms of changes to awareness / knowledge, attitudes and behaviour. That is, it is most likely that there was a modest improvement in litter and stormwater management activities in the Snell Grove commercial district during the intervention period which was not fully sustained at the follow-up stage, approximately seven months after the campaign had finished (i.e. the 1 to 5 CCAT summary ratings at Snell Grove rose from 3.1 to 3.7 during the program, then fell to 3.5, while ratings for the control site varied between 3.1 and 3.3). The statistical significance of this result is unknown.

The campaign did not appear to be successful at improving the knowledge of the community with respect to littering and stormwater management. Of greater concern was the campaign’s inability to substantially improve the knowledge of traders in all but a few areas (e.g. two of 10 knowledge areas relating to best practice litter, waste and stormwater management) and to sustain any slight improvement of knowledge throughout the monitoring period. This is of concern, given the focus of the education / participation campaign was on the traders and relatively intensive, tailored, one-to-one educational strategies were employed.

The campaign did not substantially change the CCAT rating for community ‘attitudes and perceptions’. The community’s attitude towards littering, clean-up and litter prevention either did not substantially change or became generally more pessimistic over the monitoring period. The attitudes and perceptions of traders also became more pessimistic over the monitoring period. One positive result was that satisfaction of traders with Council’s litter management activities did substantially improve throughout the campaign, although this level of satisfaction was not fully sustained during the follow-up stage.

Self-reported actions of traders produced mixed results, with no areas of substantial improvement being noted. The accuracy of these self-reported actions was checked via audits and found to be relatively high.

Independent assessors inspected trading premises and rated the performance of traders in litter, waste and stormwater management as improving by approximately 10% from the baseline to the intervention monitoring stage (i.e. from 7.6 to 8.6 out of 10). This is a positive result.

Observations of people's littering and binning behaviour whilst using Snell Grove indicated that positive disposal behaviour may have slightly increased (by approximately 10%) during the intervention period which was sustained during the follow-up stage. Assuming this observation represents a real phenomenon, rather than a product of natural variation, it is most likely that the improvement is a result of improved bin-related infrastructure at Snell Grove. Other possible explanations are that people using Snell Grove became more aware of the presence of the evaluation team and/or the improvement to the amenity of the area (e.g. less illegal dumping, improved infrastructure) may have promoted positive disposal behaviour as reported in the literature.

The third evaluation objective was to determine whether loads of litter in stormwater draining from the commercial district of Snell Grove significantly decreased during and/or after the anti-litter education / participation campaign compared to pre-campaign litter loads (and if so, quantify the magnitude of change). When data from both the intervention and control sites are analysed together, the litter load monitoring results suggest that the education / participation campaign *probably* reduced litter loads at Snell Grove, despite increases in the total load of gross pollutants over time, due to other influences such as seasonal leaf-fall. However, the education / participation campaign's effect appears to be relatively weak resulting in subtle effects on stormwater quality, few of which are statistically significant.

In terms of quantifying the likely reduction in litter loads, at best the data indicate that the time-weighted average litter mass (kg/day) over the pre- to post-campaign monitoring stages at Snell Grove increased

by approximately 17%, while at the control site it increased by approximately 94%. Consequently the *relative* reduction in litter load at Snell Grove compared to the control site over these stages was approximately 77%. This result is however indicative only and is *not* statistically significant, as there is only a 66% chance that the difference in litter loads between the two sites over the three stages of the monitoring period is real, and not a function of random variation. It does however point to the value of examining the effects of such campaigns in more detail when future opportunities arise.

The fourth and final evaluation objective was to provide a broad evaluation on the overall success of the campaign, its strengths and weaknesses, and provide recommendations for future projects of a similar nature. With the benefit of hindsight, several strengths and weaknesses of the campaign were identified. Specific recommendations for future campaigns have been developed. Overall, it is suggested that the education / participation campaign for traders was acceptable, while the campaign for other members of the community was weak.

With respect to testing the Cooperative Research Centre for Catchment Hydrology's draft monitoring guidelines, the Snell Grove project proved to be a valuable trial. It allowed the evaluation team to improve the draft guidelines before they were finalised (e.g. by adding elements such as the need for a detailed project plan to coordinate activities run by the education and evaluation teams) and to examine the strengths and weaknesses of six of the seven different 'evaluation styles' covered by the guidelines. The seventh evaluation style was not trialled, as it would not have been practical given the nature of the education / participation campaign.

Substantial work was put into designing and implementing the Snell Grove education / participation campaign. While the results were not as positive as those involved would have liked, it is important to recognise that overall, the results *were positive*, particularly in respect to the most important indicators - behavioural change and litter load reductions. The education team, as well as supporting staff within Moreland City Council (e.g. maintenance staff) should therefore be commended for their efforts.

## 2. Background and Objectives

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### 2.1 Project Background

In 2001 the Cooperative Research Centre (CRC) for Catchment Hydrology received a grant from the Victorian Environment Protection Authority (as part of the Victorian Stormwater Action Program) to undertake research into the use, value, cost and evaluation of non-structural best management practices to improve urban stormwater quality (non-structural BMPs). Such BMPs include education and participation programs.

One of the products from this research was a set of guidelines for local government authorities to use titled “Non-structural Stormwater Quality Best Management Practices: Guidelines for Monitoring and Evaluation” (Taylor and Wong, 2003; available at [www.catchment.crc.org.au](http://www.catchment.crc.org.au)). These guidelines were trialled on three distinctly different stormwater quality improvement projects in Victoria before being finalised in 2003. One of the trial projects was the ‘Snell Grove Anti-litter Education / Participation Campaign’ in Oak Park, a suburb in the north-west of Melbourne, Victoria.

In 2002, the CRC for Catchment Hydrology formed a partnership with Moreland City Council, where Council staff agreed to design and implement the education / participation campaign in cooperation with staff from the ‘Moonee Ponds Creek Litter Initiative’, while the CRC for Catchment Hydrology would manage the monitoring and evaluation tasks, using CRC for Catchment Hydrology staff and specialist consultants.

Location maps of the Snell Grove commercial shopping district in Oak Park and Gaffney Street, Pascoe Vale (a similar small, commercial district that was used as a control site throughout the project) are provided in Figures 2.1 and 2.2, respectively. Note that monitoring activities occurred at both of these locations, but the evaluation / participation program *only* involved Snell Grove.

A detailed description and photographs of the Snell Grove and Gaffney Street commercial shopping districts can be found in a background evaluation report prepared for the project by Curnow and Spehr (2004). Curnow and Spehr’s report also includes a review of demographic features that are relevant to littering behaviour at Snell Grove, but are not summarised here.

Twenty-six trading premises exist in the small, commercial precinct of Snell Grove. These include take-away food shops, a tattoo parlour, a medical clinic, hairdressers, etc. The area is used by locals who travel there to shop and by pedestrians who move through the precinct on their way to and from the adjacent railway station. The precinct includes some street furniture, public litter bins, public recycling bins, cigarette butt bins and some basic landscaping. A selection of photos of the precinct are provided in Plates 2.1 to 2.6. More photographs are available in Curnow and Spehr (2004).

The design of the education / participation campaign drew upon:

- The experience of similar projects in Victoria and New South Wales. For example, the Education and Promotion Coordinator of the Moonee Ponds Creek Litter Initiative, who did the preliminary design of the campaign in 2002, visited New South Wales to gain a first-hand appreciation of the successes and challenges of similar projects interstate.
- Findings of an international literature review had just been written by the CRC for Catchment Hydrology (i.e. Taylor and Wong, 2002) that examined the performance of non-structural measures for stormwater quality improvement (including education and participation programs).
- Relevant information on people’s knowledge, attitudes and behaviour that was collected from the Snell Grove district by specialist community survey consultants during two baseline surveys.

Details of the education / participation campaign are provided in Section 2.2. In short, it aimed to:

- Successfully communicate litter and stormwater-related messages to two target groups: traders from the 26 shops along Snell Grove (the *primary* focus); and the public / community using the area along the Snell Grove shopping strip.
- Use one-to-one, intensive and participatory methods to engage traders (rather than just passive educational strategies).
- Raise levels of awareness and knowledge amongst traders and the broader community with respect to littering and stormwater management.
- Reduce the rates of littering and the load of litter in urban stormwater.

In accordance with the monitoring and evaluation methodology defined by Taylor and Wong (2003), a project plan<sup>1</sup> was prepared by the CRC for Catchment Hydrology in 2002 and updated throughout the project that outlined the proposed approach to the delivery of the education / participation campaign and all key monitoring, evaluation and reporting tasks. This plan included key tasks and milestones, so all partner organisations and individuals could synchronise their activities throughout the project. The seven updated versions of this plan also provided a ‘paper trail’ of how the project evolved over 2002 to 2004 that was useful to the evaluation team.

In addition to the project plan, two detailed monitoring and evaluation plans were prepared in accordance with the CRC for Catchment Hydrology’s monitoring and evaluation guidelines. One plan was prepared by the CRC for Catchment Hydrology for the monitoring activities they were delivering (i.e. monitoring BMP implementation and litter loads) and the other was prepared by specialist consultants, Community Change Pty Ltd for their work (i.e. monitoring changes to people’s awareness, attitudes, self-reported behaviour and actual behaviour). These plans ensured that the proposed approach to monitoring and evaluation was carefully scrutinised before implementation, as they were subject to peer review.

The draft CRC for Catchment Hydrology guidelines for monitoring and evaluation had to be completed in 2003 to meet a commitment associated with the funding grant. Accordingly, a year of experience with the Snell Grove project (as well as experience gained from two other trial projects) was used to finalise the CRC for Catchment Hydrology guidelines. Lessons learnt from the Snell Grove project were highly valuable to the finalisation of these guidelines. For example, the use of a detailed *project plan* to synchronise activities between those responsible for implementing elements of the education / participation campaign and those responsible for the monitoring tasks was found to be essential at Snell Grove and was incorporated within the final version of the CRC for Catchment Hydrology’s guidelines.

<sup>1</sup> Titled "Project Plan - Monitoring and Evaluating an Education / Participation Campaign to Reduce Stormwater Litter Loads in a Small Commercial Shopping District in Melbourne". Seven versions were used throughout 2002 to 2004, as the project plan was updated and refined.



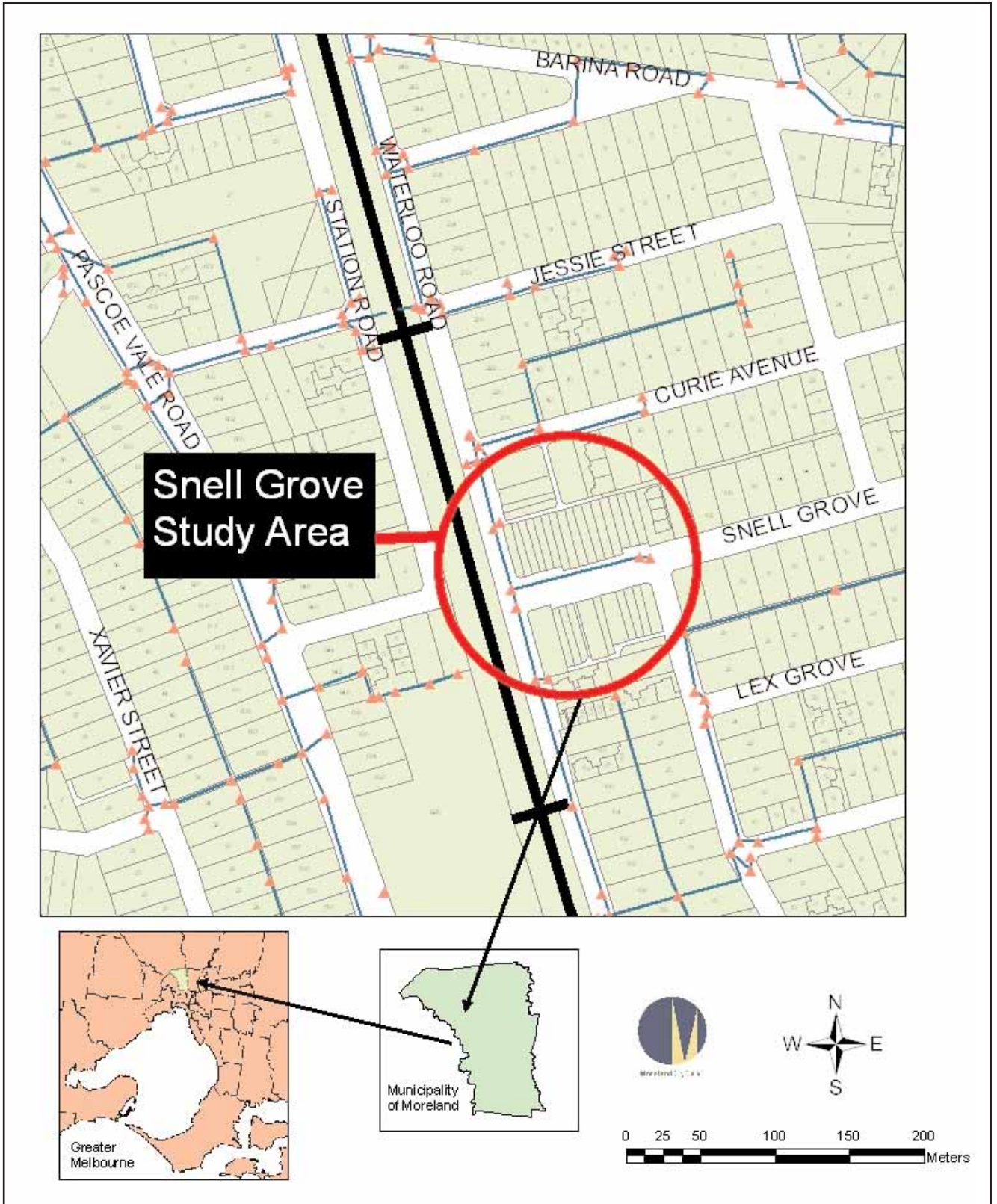


Figure 2.1 Location Map (Study Area): Snell Grove, Oak Park, Melbourne, Victoria



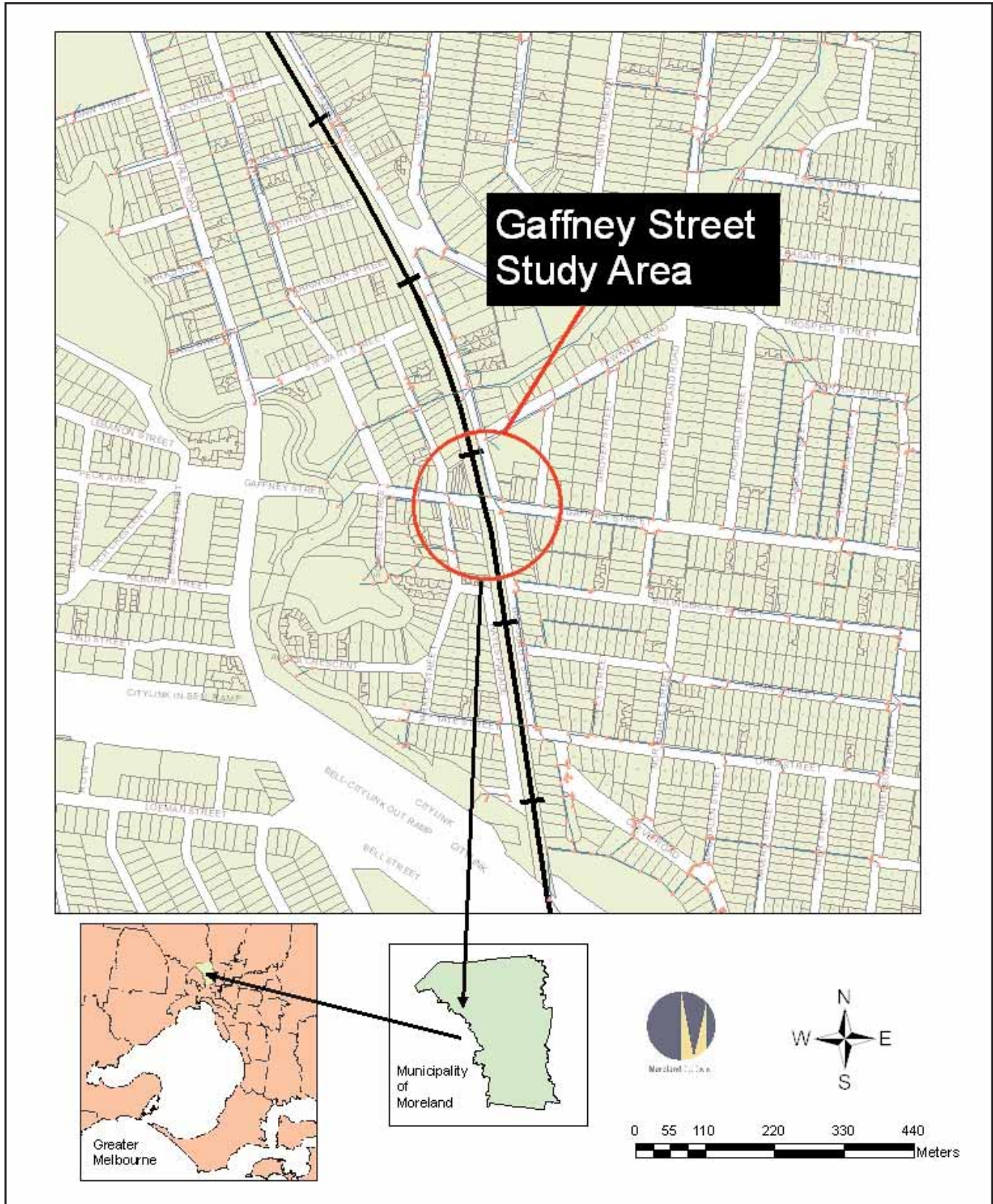


Figure 2.2 Location Map (Control Site): Gaffney Street, Pascoe Vale, Melbourne, Victoria





Plate 2.1 North Side of the Snell Grove Commercial District



Plate 2.4 Traders and Customers at Snell Grove\*



Plate 2.2 Litter in the Laneways Behind the Trading Premises



Plate 2.5 Litter on the Railway Easement Near an Entrance to the Stormwater System



Plate 2.3 Litter on the North Side of Snell Grove



Plate 2.6 Rubbish and Recycling Bin (With a Dumped Container of Waste Oil)\*

\* Source: Curnow and Spehr (2004).

## 2.2 Nature of the Education / Participation Campaign at Snell Grove

The stormwater 'best management practice' that was comprehensively monitored and evaluated was a three-stage education / participation campaign that targeted

traders and the public, in the commercial district of Snell Grove, Oak Park, Melbourne, Victoria. Table 2.1 summarises the key elements that were undertaken as part of this campaign<sup>2</sup>.

Table 2.1 Elements of the Snell Grove Education / Participation Campaign that were Delivered

Major Elements/Tasks	Date Undertaken
<b>Business Program for Traders - Stage I:</b>	
1. Review I (e.g. examination of litter).	April 2003.
2. Meeting (with key stakeholders).	April 2003.
3. Information flyer (for traders).	May 2003. (The effective start of the campaign)
4. Introductory visit.	June 2003.
5. Street signage erected (including educational messages).	July 2003.
6. Review II (of information gathered to date, and confirm campaign actions).	June 2003.
7. Clean up event (dependent on trader interest).	August 2003.
<b>Business Program for Traders - Stage II:</b>	
1. Site visit (work with each trader).	August 2003.
2. Newsletter / fact sheets.	July - August 2003.
3. Council liaison (i.e. communicate recommendations from traders to Council, e.g. need for new garbage bins).	July - August 2003.
4. Address issues (e.g. develop tools to help businesses with identified needs, replace damaged infrastructure in the precinct, including bin-related infrastructure, removal of weeds from landscaping, repair of leaky pipes, etc.).	August - September 2003.

<sup>2</sup> Note that some elements were planned but not fully delivered (see Chapter 3 for more details).



Table 2.1 Elements of the Snell Grove Education / Participation Campaign that were Delivered (Cont...)

Major Elements/Tasks	Date Undertaken
<b>Community Program:</b>	
1. Bin facility review.	May 2003. (Improvements to bin facilities were undertaken in late August 2003).
2. Street signage (include educational messages). In addition, posters were provided to traders for placement in shop windows promoting correct cigarette butt disposal (April 2004). Cafes were also provided with wind-proof ashtrays to trial in their outdoor dining areas.	June - July 2003.
3. Railway signage. ("No butts about it, this is litter" posters were placed at railway stations along the Broadmeadows and Upfield Lines. The Oak Park Station is on the Broadmeadows line.)	June - July 2003.
4. Clean up event (became an event for traders only after little interest from school groups).	August 2003.
5. Posters (placed in shop windows) and provision of personal ashtrays for traders to pass to shoppers.	June 2003 (posters). December 2003 (personal ashtrays and additional posters).
6. Drain stencilling.	August 2003.
7. Complete education program and respond to any continuing community expectations.	The majority of activities were completed in December 2003 (i.e. the effective end of the campaign). However, some additional actions were undertaken by Council to meet community expectations: <ul style="list-style-type: none"> <li>• Stormwater education posters, personal ashtrays and windproof ashtrays were also provided to two cafes in April 2004.</li> <li>• Cleanup and fencing of illegal dumping area adjacent to railway station was done in February 2004.</li> <li>• Council repaired footpaths, seats and cleaned-up graffiti in April 2004.*</li> </ul>

**Notes**

- The nature of the campaign and timing of its elements evolved over 2002 to 2004. For an examination and discussion of this evolution, see Sections 3.3 and 3.4.
- \* From an evaluator's perspective, these post-December initiatives should not have been done until the post-campaign monitoring work had been completed. However, it is understood that Council could not easily ignore requests by the community, especially when a relationship had been developed between Council and traders during the preceding year.

The objectives at the start of the campaign were to:

1. Implement a best practice education / participation campaign to raise awareness, promote positive behavioural change with respect to waste management, and reduce litter loads in the commercial district of Snell Grove, Oak Park, Melbourne from April to September 2003. [Primary objective]
2. Raise awareness and promote positive behavioural change with respect to littering and waste management in the Snell Grove *business community* (i.e. traders) immediately following and up to six months after the campaign. [Secondary objective]
3. Raise awareness and promote positive behavioural change with respect to littering in target audiences within the *broader community* (i.e. the public) immediately following and up to six months after the campaign. [Secondary objective]
4. Reduce litter loads in stormwater drainage from the commercial district immediately following and up to six months after the campaign. [Secondary objective]

This evaluation report contains a discussion on whether these objectives were achieved, as well as presenting secondary findings and lessons learnt from the project.

### **2.3 The Objectives of this Evaluation Project**

The objectives of this evaluation project were to:

- Determine whether the anti-litter education / participation campaign that was run within the commercial district of Snell Grove in 2003 was fully implemented as set out in the project plan that was current immediately prior to the commencement of the campaign (and if not, determine why not).
- Determine whether levels of awareness, knowledge, attitudes and behaviour with respect to littering and stormwater management changed as a result of the campaign.
- Determine whether loads of litter in stormwater draining from the commercial district of Snell

Grove significantly decreased during and/or after the anti-litter education / participation campaign compared to pre-campaign litter loads (and if so, quantify the magnitude of change).

- Provide a broad evaluation on the overall success of the campaign, its strengths and weaknesses, and provide recommendations for future projects of a similar nature.

### **2.4 The Styles of Evaluation Used for the Project**

The CRC for Catchment Hydrology's monitoring and evaluation guidelines for non-structural stormwater management measures includes a generic evaluation framework that has seven different styles of evaluation. These styles are explained in Appendix 1. Seven alternative styles of evaluation are applicable to non-structural BMPs as:

- People undertaking the evaluation may be seeking to monitor different aspects of the stormwater management measure's performance (e.g. whether an educational program has raised levels of awareness, changed behaviour and/or improved stormwater quality).
- There are a wide variety of non-structural measures for stormwater quality improvement, such as educational campaigns, town planning controls and enforcement instruments. Individual stormwater management measures typically suit some styles of evaluation, but not others. For example, litter-related education campaigns are often evaluated in Australia using direct observations of people's behaviour, as littering (or binning) is a relatively common event in public places and well-accepted monitoring methods have been developed (e.g. the 'Clean Communities Assessment Tool' that was used for the Snell Grove project).
- People undertaking the evaluation may have limited resources (e.g. time, expertise and money), so they may need to use a simple style of evaluation that provides limited information. Generally speaking, the complexity, cost and value of the results increase as one moves from evaluation style no. 1 to no. 7.

The six evaluation styles that we used for the Snell Grove education / participation campaign are outlined in Table 2.2. A large number of styles were deliberately chosen to test many dimensions of the CRC for Catchment Hydrology's draft monitoring and evaluation guidelines. As such, the campaign at Snell Grove is likely to be one of the most intensively evaluated non-structural BMPs in history.

## 2.5 Project Management

The Snell Grove project was steered by a Project Steering Group consisting of representatives from Moreland City Council, the CRC for Catchment Hydrology, the Victorian EPA, Melbourne Water, and consultants working on the monitoring and evaluation aspects (i.e. Community Change Pty Ltd). The CRC

Table 2.2 Evaluation Styles Used for the Snell Grove Education / Participation Campaign

Evaluation Style(s)*	Comments	Who Did It
1 - BMP implementation (i.e. was the campaign fully implemented as planned and what was the quality of implementation?).	Easily monitored and evaluated after implementation of the campaign using the project plan as an audit checklist.	CRC for Catchment Hydrology.
2, 3 & 4 - Changes in awareness / knowledge (no. 2), attitude (no. 3) and self-reported behaviour (no. 4) of the target audience(s) with respect to littering and litter prevention.	Monitored primarily using face-to-face survey instruments (targeting traders and the public) before, during and after the campaign.	Specialist consultants - Community Change Pty Ltd.
5 - Changes in people's actual behaviour with respect to littering and litter prevention.	Monitored primarily using: <ul style="list-style-type: none"> <li>• observations of littering / binning (targeting the public in public places), before, during and after the campaign as part of the 'Clean Communities Assessment Tool' (Curnow and Spehr, 2003); and</li> <li>• inspections of trading premises.</li> </ul>	Specialist consultants - Community Change Pty Ltd.
6 - Stormwater quality (i.e. litter loads entering stormwater).	Monitored using side entry pit litter baskets on Snell Grove (and also a control site at Gaffney Street, Pascoe Vale), which captured gross pollutants before, during and after the campaign.	CRC for Catchment Hydrology.

### Note:

- See Appendix 1 for a brief explanation of these styles. Note that evaluation style no. 7 was not trialled, as it was not practical given the nature of the education / participation campaign.

for Catchment Hydrology (i.e. André Taylor) chaired the group and managed the project until mid 2003 after which Moreland City Council assumed this role (i.e. project managers in 2003 and 2004 were Nancy Krause, Nic Drent, Cate Collins and Iona Theodoridis). The Steering Group initially met on a quarterly basis until late 2003, when the group met less frequently.

The change in project management in mid 2003 from the CRC for Catchment Hydrology to Council reflected the completion of the trial phase of the project (as the CRC for Catchment Hydrology's monitoring and evaluation guidelines had to be finalised by 30 June 2003). After mid 2003, the focus was on completion of the educational campaign and associated evaluation work.

The education / participation campaign was initially designed in 2002 by Jackie White, the former Education and Promotion Coordinator of the Moonee Ponds Creek Litter Initiative. Due to the uncertainty regarding ongoing funding for the Moonee Ponds Creek Litter Initiative, the responsibility for finalising the design of the education / participation campaign and its delivery moved to Moreland City Council. In 2003 the program was implemented by Iona Theodoridis (Environmental Education Officer, Moreland City Council) with assistance from Nicolette Vazloyi from the Moonee Ponds Creek - Keep It Clean Project (and later the Moonee Ponds Creek Coordination Committee).

The CRC for Catchment Hydrology and Moreland City Council contributed in-kind support to the project in the form of staff time. The Victorian government provided a cash contribution in the form of Victorian Stormwater Action Program grants. Some funds (\$10,000) were also made available to Council from the CRC for Catchment Hydrology's monitoring and evaluation budget in 2003 to help boost the potential impact of the education / participation campaign.

## **2.6 Statement of Independence**

This evaluation report has been prepared by the CRC for Catchment Hydrology. All forms of monitoring were undertaken by either the CRC for Catchment

Hydrology or independent consultants (i.e. Community Change Pty Ltd). Community Change were engaged and funded via the CRC for Catchment Hydrology.

Neither the CRC for Catchment Hydrology or Community Change were involved in designing or delivering the education / participation campaign at Snell Grove. This clear separation of roles between those responsible for delivering the campaign and those responsible for monitoring and evaluating its impact is seen as important to minimise bias, or the perception of bias, during evaluation and reporting activities.

### **3. Evaluation Style 1 - Monitoring Campaign Implementation**

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#### **3.1 Introduction**

This style of evaluation is the most straightforward as it simply aims to assess:

- whether the education / participation campaign was implemented as planned; and
- the quality of the campaign's design and implementation.

Two introductory points are relevant to this style of evaluation:

- Some flexibility during the implementation of the campaign is essential. Flexibility is needed to accommodate the needs of participants (e.g. traders) and to take advantage of opportunities that arise during the campaign. This point has been taken into consideration during the assessment.
- In terms of the quality of the campaign's design and implementation, this assessment can only evaluate the campaign program, the self-reported actions of Council staff who implemented the campaign, the tangible products that were delivered (e.g. posters, brochures), and feedback given to the evaluation team that interviewed traders (as reported in Curnow and Spehr, 2004).

The project objective that is relevant to this evaluation style is: "To implement a best practice education / participation campaign to raise awareness, promote positive behavioural change with respect to waste management, and reduce litter loads in the commercial district of Snell Grove, Oak Park, Melbourne from April to September 2003."

#### **3.2 Monitoring Method**

##### **3.2.1 Implementation of Actions**

The version of the project plan that was in existence at the start of the delivery of the education / participation campaign (i.e. version 5, dated 10 April 2003) has been used as an audit checklist, as it contains all key campaign-related actions and deadlines (i.e. the

monitoring parameters) that were intended to be delivered.

The CRC for Catchment Hydrology has compared this list of actions with those actually delivered to determine whether each action was delivered, what form it was delivered in, and when it was delivered. In addition, feedback from the education officer primarily responsible for delivering the campaign was considered in this assessment (e.g. reasons why certain elements were not delivered or were postponed).

The CRC for Catchment Hydrology has also sought verification of actions that can be independently checked (e.g. the existence of published educational products).

##### **3.2.2 Quality of Campaign Design and Implementation**

Assessment of this aspect was been done by:

- comparing what is known about the design of the campaign to 'best practice' guidance from the literature (e.g. as summarised in Taylor and Wong, 2002);
- assessing the quality of activities / products (e.g. brochures, posters, clean-up events); and
- interpreting feedback from traders on the campaign's design, implementation and effect that is documented in the technical report for evaluation styles 2, 3, 4 and 5 by Curnow and Spehr (2004).

#### **3.3 Key Results and Discussion**

##### **3.3.1 Implementation of Actions**

Table 3.1 summarises all of the key actions that were planned for the campaign at its beginning (April 2003) and those that were delivered.

The results in Table 3.1 indicate that:

- 50% of the actions planned immediately before the beginning of the campaign were delivered on time;
- 30% were delivered later than expected; and
- 20% of planned tasks were not done.

Table 3.1 Campaign Actions (Planned and Delivered)

Planned (@ April 2003)		Delivered		Supporting Information from Council
Actions	Timeframe	Actions	Timeframe	
<b>Business Program Stage I:</b>				(Focussed on 26 traders)
Review I (e.g. examination of litter).	April 2003	Review I (e.g. examination of litter).	April 2003	-
Meeting (with key stakeholders).	April 2003	Meeting (with key stakeholders).	April 2003	A meeting was held between Council and Community Change in May 2003 to fine-tune the approach, based on information obtained from the baseline survey.
Information flyer (for businesses).	April - May 2003	Information flyer (for businesses).	May - July 2003	An information flyer was provided to all traders.
Introductory visit.	May 2003	Introductory visit.	June 2003	Introductory visits were undertaken with all traders, except for Snell Grove Pizza and Take-Away, which was not open during visits. A letter and introductory flyer were sent to this business.
Review II (i.e. review of information gathered to date, and confirm campaign actions).	June 2003	Review II (i.e. review of information gathered to date, and confirm campaign actions).	June 2003	-
Clean-up event (dependent on trader interest).	June 2003	Clean-up event (dependent on trader interest).	August 2003	The clean-up event was held on Saturday 30 August 2003. Two traders, four Council staff and Nicolette Vaszolyi (Moonee Ponds Creek Keep it Clean Project / Moonee Ponds Creek Coordination Committee) participated in the clean-up.
Media (promote outcomes of clean-up event).	June 2003	Media (promote outcomes of clean-up event).	Not done.	Due to low trader attendance, the media article was not pursued. Council has advised that a media article might be prepared following completion of the final evaluation report.



Table 3.1 Campaign Actions (Planned and Delivered) (Cont...)

Planned (@ April 2003)		Delivered		Supporting Information from Council
Actions	Timeframe	Actions	Timeframe	
<b>Business Program Stage II:</b>				(Focussed on 26 traders)
Site visit (work with each business).	July 2003	Site visit (work with each business).	August 2003	Site visits were conducted with most traders (some did not want a site visit).
Newsletter / fact sheets.	July - August 2003	Newsletter / fact sheets.	July - August 2003	Written information on responsible stormwater practices were distributed to all of the traders.
Council liaison (i.e. communicate recommendations from businesses to Council).	July - August 2003	Council liaison (i.e. communicate recommendations from businesses to Council).	July - August 2003	Works done by Council in August in response to requests from traders included: <ul style="list-style-type: none"> <li>• replacement and relocation of five litter bins stands; and</li> <li>• repair of footpath and walk safe barrier.<sup>3</sup></li> </ul>
Address issues (e.g. develop tools to help businesses with identified needs).	August 2003	Address issues (e.g. develop tools to help businesses with identified needs).	August - September 2003	Feedback on infrastructure issues was addressed by Council (see point immediately above).
Recognition (develop positive reward incentive system, e.g. window sticker).	August 2003	Recognition (develop positive reward incentive system, e.g. window sticker).	Not done.	This was not undertaken as Council staff considered it difficult to monitor, audit and provide recognition on stormwater practices.
Media.	August - September 2003	Media.	Not done.	See previous comment on media.

<sup>3</sup> A review was undertaken by the CRC for Catchment Hydrology of all Council maintenance activities over the campaign period. No unusual maintenance activities were undertaken by Council other than the clean-up event in the laneways behind trader premises in August 2003 (note that litter from this area would not have entered the stormwater drainage network that the CRC for Catchment Hydrology was monitoring during the project). Normal maintenance activities that occurred during the campaign and could have affected litter-related activities at Snell Grove included collecting dumped rubbish (twice), cleaning footpaths (once) and repairing street furniture (once). The last two of these activities are included, even though they relate to general cleanliness and infrastructure, as they potentially help to improve the local community's pride in their street, which can lead to less littering (see Curnow and Spehr, 2004).

Table 3.1 Campaign Actions (Planned and Delivered) (Cont...)

Planned (@ April 2003)		Delivered		Supporting Information from Council
Actions	Timeframe	Actions	Timeframe	
<b>Community Program:</b>				(Focused on the community / public)
Bin facility review.	May 2003	Bin facility review.	May 2003	Improvements to bin facilities were undertaken in late August 2003 (see above).
-	-	Provision of ashtrays.	April - December 2003	Personal ashtrays for customer use were provided to two cafes, along with posters promoting correct cigarette butt disposal on 27 April 2004. In addition, the cafes were provided with wind-proof ashtrays to trial in their outdoor dining areas. Personal ashtrays were also provided to traders in December 2003, to pass on to shoppers.
Street signage (include educational messages).	June - July 2003	Posters in trader windows (include educational messages).	June - July 2003	Posters were provided to traders for placement in shop windows.
Railway signage.	June - July 2003	Posters at the railway station.	June - July 2003	“No butts about it, this is litter” posters were placed at railway stations along the Broadmeadows and Upfield Lines (the Oak Park Station is on the Broadmeadows line). This was done as part of the ‘Moonee Ponds Creek-Keep It Clean’ project.
Clean up event (as joint community / schools / trader event-dependent on interest).	June 2003	Clean up event (trader event only).	August 2003 (trader event only)	Held on Saturday 30 August 2003. Only two traders attended. There was no interest expressed from local schools in participating.



Table 3.1 Campaign Actions (Planned and Delivered) (Cont...)

Planned (@ April 2003)		Delivered		Supporting Information from Council
Actions	Timeframe	Actions	Timeframe	
<b>Community Program:</b>				(Focussed on the community / public)
Posters (developed by school children and placed in shop windows).	June 2003	Posters (placed in shop windows).	June 2003 (local school children were not involved)	Posters produced as part of another Victorian Stormwater Action Program funded project were provided for placement in shop windows.  In December 2003, additional copies of Council's stormwater education poster were supplied to traders to place in their shop windows.
Drain stencilling.	June 2003	Drain stencilling.	August 2003	Conducted as part of the clean-up event on Saturday 30 August 2003.
Complete education program.	September 2003	Complete education program.	December 2003	The majority of activities were completed by December 2003. However, some additional, minor actions were undertaken to meet community expectations: <ul style="list-style-type: none"> <li>• Additional stormwater education posters, personal ashtrays and windproof ashtrays were also provided to two cafes in April 2004.</li> <li>• Clean-up and fencing of illegal dumping area adjacent to railway station was done in February 2004.</li> <li>• Council repaired footpaths, seats and cleaned-up graffiti in April 2004.<sup>4</sup></li> </ul>

<sup>4</sup> It is acknowledged that these activities may have prolonged the effect of the campaign as they occurred in the "post-campaign" period. It is simply not practical however to ignore the requests of community stakeholders / ratepayers for the sake of an experiment.

Tasks that were not completed included promoting the outcomes of the clean-up event via the media, establishing and running a positive reward / incentive system for traders, street signage (although posters were used as a substitute), organising positive media on the activities undertaken by traders, and involving community members and school groups in the cleanup event. The comments in Table 3.1 provide some insight into why these tasks were not delivered.

Overall, it appears that the Council officers implemented the vast majority of the planned campaign actions (i.e. approximately 80%). This is a positive result.

It is noted that all three actions that were meant to operate as incentives for further improvement and to build morale (i.e. two media events and a positive reward system for traders who were making an effort to improve stormwater and litter management practices) were not undertaken. Even though results of the campaign were modest (see Sections 4.4 and 5.4), there were examples of positive outcomes that could have been promoted (e.g. the spontaneous clean-up activities by some traders before the official start of the campaign) and reward systems could have been implemented (e.g. recognition for displaying posters, distributing brochures, attending the clean-up event).

It is also noted that funds (\$10,000) were made available from the project's monitoring budget to help boost the impact of the campaign after the Steering Committee recognised early in the project that it may not have a large enough impact to produce outcomes that were recognisable via planned monitoring methods. It is understood that these funds were not spent. In retrospect, such funds could have been spent engaging a specialist to assist on the tasks that were not delivered.

### 3.3.2 Quality of Campaign Design and Implementation

A good attempt was made early in the design of the campaign to learn from similar experiences used elsewhere. The first education officer for the project

travelled to New South Wales to learn from similar projects, before designing the campaign.

In addition, the design of the monitoring program that sought to assess the knowledge, attitudes and behaviour of traders and the public allowed for baseline information to be collected to inform the final design of the campaign (i.e. a 'best practice' strategy). On 1 April 2003 staff from Community Change advised Council that the key issues that needed to be addressed in the education / participation campaign were the importance of:

- Council providing leadership and providing a presence in the district.
- Building on the current goodwill of traders.
- Allowing enough time to set up personal relationships with traders to facilitate change, rather than just providing written material.
- Being flexible to fit into business needs (e.g. timing the visits).
- Recognising current achievements and levels of knowledge.
- Providing a context for stormwater management within broader community initiatives (e.g. improving Council's maintenance activities in the area and addressing an illegal activity that was causing hostility amongst local traders<sup>5</sup>).

Suggested *strengths* of the campaign's design and implementation included:

- The campaign aimed to be participatory with traders (i.e. work with them on a one-to-one basis and involve them in activities).
- The campaign did not try to spend its resources (primarily staff time) over too wide an area (i.e. the chosen commercial district was deliberately small).
- The chosen study area was highly littered.
- The education products were generally of a good quality (see Appendix 3).

<sup>5</sup> This activity was a brothel, which was eventually closed on 8 December 2004 (i.e. after the campaign).

- Traders appreciated the face-to-face visits by Council staff (according to feedback from Community Change's on-ground evaluators, see Section 4.3.3).
- The campaign sought to address littering from traders and the general public, although the focus of activities was on the traders.
- The timing of the delivery of the campaign elements was well synchronised with a wide variety of evaluation activities via a project plan and Steering Group, until the end of the program where some miscommunication occurred between the evaluators and the educators on timing issues.
- Opportunities were taken to do additional tasks that were not in the original project plan (e.g. the provision of personal and windproof ashtrays).
- Council's maintenance department responded to calls from the traders to improve several aspects of the street environment (e.g. bin placement, bins, potholes, footpaths, safety barriers, street furniture, etc.).
- A good 'paper trail' was left by Council's education officer so that this assessment could determine when tasks were done.
- Council staff have demonstrated a strong cooperative spirit throughout the three-year project, and have been supportive of the very high level of evaluation undertaken for this project which has included putting their activities under close scrutiny.
- Greater coordination between public and trader education / participation (i.e. the final campaign was strongly focused on traders).
- Additional attempts to engage and develop partnerships with community groups (e.g. school groups) in some way, as all the non-trader based educational activities became 'passive' and non-participatory (e.g. posters, brochures, stencilling, etc.) and did not positively influence people's knowledge or attitudes (see Sections 4.3.3 and 4.3.4). Theory suggests a participatory approach is needed to facilitate change.
- The perceived failure of Council to promptly address an illegal activity that occurred in Snell Grove, seemed to be a barrier to the development of good relationships between some traders and Council staff.
- Incorporating enforcement activities into the campaign (as well as incentives), in retrospect, may have provided greater media opportunities and have influenced the general public. It is possible that awareness of the campaign not including an enforcement element (see Section 4.3.3) led to apathy.
- More face-to-face communication with some traders who recognised their value, and expressed the need for more (within certain times). Some traders remarked that they had seen more of the evaluators than the educators (Curnow and Spehr, 2004) despite a significant effort by Council staff to arrange suitable meeting times.

With the luxury of hindsight, increased knowledge about best practice educational campaigns, and knowledge of the impact of the campaign, it is now possible to suggest areas of improvement with respect to its design and implementation. These include:

- Greater emphasis on promoting achievements, however modest, and providing positive incentives (e.g. free promotion / advertising, reductions in Council's waste disposal fees, financial rewards, provision of free waste management equipment, etc.). The lack of these elements and the poor attendance of traders at the clean-up event may be causes for the pessimism of traders that developed through the campaign (see Section 4.3.4).
- Maintenance activities that help to build a sense of pride in the local community (e.g. maintenance of landscaping, footpaths, bins, street furniture, etc.) need to be considered as an integral part of the campaign. Preparation to deliver a quick response to these issues is needed to help build partnerships with traders.
- There is increasing evidence in the literature that ongoing, integrated, multifaceted programs are needed for sustainable outcomes (i.e. activities that include several levels of participatory education, enforcement, provision of bin-related infrastructure, enhancement of the local community environment, etc.). The Snell Grove

- campaign started as primarily an educational event and then evolved to include some infrastructure improvement elements in response to trader requests and comments.
- Substantial incentives for traders to be involved with the clean-up day (e.g. free waste disposal for all of their wastes and free publicity for their businesses) and scheduling the event at a time that is supported by the majority of traders.
- More substantial changes to the design of the campaign in response to the issues that were discovered by the monitoring team during the baseline period.
- The management of the project could have been more stable to avoid delays, miscommunication and inefficiencies. For example: the overall management of the project transferred from the CRC for Catchment Hydrology (André Taylor) to Moreland City Council in July 2003. Council's Project Manager appeared to change from three different people after this date (i.e. Nic Drent, Nancy Krause and Iona Theodoridis). In addition, the project had two lead education officers, initially Jackie White (during the planning stage) and then Iona Theodoridis. It is suggested that continuity of individuals leading such projects would help to smoothly coordinate the many elements of design, implementation and evaluation.

The survey work conducted as part of evaluation styles 3 and 4 (see Chapter 4) also provided some insight into why certain elements of the program (e.g. the clean-up event) were not as successful as hoped.

With respect to the clean-up event, most of the traders initially indicated they wanted and would be involved in a clean-up of litter and dumped rubbish as part of the education / participation program. However, only two traders joined Council staff to undertake the drain stencilling and clean-up event on Saturday morning, 30 August 2003 (Curnow and Spehr, 2004). Traders offered the following explanations for the lack of involvement:

- The clean-up was scheduled for their busiest time of the week (Saturday morning).
- Council put load limits on what could be collected from each business and consequently the clean-up would not remove all of their waste.
- There were problems with understanding when the activity was occurring, despite Council's promotional efforts (Curnow and Spehr, 2004).

With respect to the use of the educational posters in traders' windows, traders indicated a willingness to be involved with the display and distribution of such educational products at the start of the program. However, the evaluation team found that only one third of traders displayed the stormwater education poster during the intervention stage and there were only three posters left on display at follow-up (Curnow and Spehr, 2004). Reasons given by the traders for not widely displaying the posters were that the posters faded very quickly, fell down and were not replaced, or they had not received one (Curnow and Spehr, 2004).

Feedback from traders to the evaluation team about the Council-managed educational visits was generally positive, although some traders reported that they were already doing the right thing and should be recognised for their efforts (Curnow and Spehr, 2004). Some traders indicated that they had difficulty in finding time for visits and had consequently missed scheduled appointments (Curnow and Spehr, 2004).

In terms of on-the-ground outcomes, results from evaluation styles 2, 3, 4, 5 and 6 (see Chapters 4 and 5) collectively indicate the campaign produced mixed, but generally positive, modest results with respect to its objectives involving traders, the community and litter loads. Overall, the campaign appeared to be:

- unsuccessful at significantly influencing the knowledge or attitudes of traders or the public;
- modestly successful at influencing the behaviour of traders and the public; and
- modestly successful at reducing litter loads.

### 3.4 Conclusions from this Style of Evaluation

This style of evaluation on its own is of little value. It is needed to support more advanced styles of evaluation (e.g. monitoring litter loads and people's behaviour). Specifically, it is needed to confirm that planned actions were in fact delivered, when they were delivered, and identify potential issues (e.g. activities that were not done, or were a feature of the campaign) that may be causes for positive or negative outcomes. For example, the lack of positive feedback mechanisms that were delivered for traders during the campaign may have been a reason why their levels of optimism decreased during the campaign (see Section 4.3.4).

This style of evaluation has found that approximately 80% of the planned campaign activities were implemented within a reasonable timeframe. Some important activities that would have provided positive feedback to traders and engaged non-trader groups in participatory education were however not delivered.

With the benefit of hindsight, several strengths and weaknesses of the campaign have been identified. Overall, it is suggested that the education / participation campaign for traders was acceptable, while the campaign for other members of the community was weak.

Based on relevant information from the literature (e.g. Curnow and Crispijn, 2005 and Taylor and Wong, 2002), the benefit of hindsight, and knowledge about the on-the-ground outcomes produced from the campaign (i.e. from other styles of evaluation), the key conclusion for future campaigns that aim to minimise litter in commercial areas is: To get a substantial reduction in litter, significant resources (mainly human) are needed to make the campaign:

- ongoing;
- participatory (rather than using passive education strategies);
- balanced (i.e. target traders and the community with equal intensity);
- inspirational and motivational (e.g. by recognising positive achievements and rewarding such behaviour);
- self aware of its effect (i.e. using monitoring and evaluation mechanisms to provide feedback throughout the campaign on whether knowledge, attitudes and/or behaviour is changing as desired);
- tailored to accommodate known local characteristics (e.g. the social and physical environment); and
- multi-dimensional (i.e. include strong incentives / rewards, penalties, provision of high quality bin-related infrastructure and associated maintenance, provision of a high level of maintenance activities to improve people's pride in their local community, provision of regulatory services to stop illegal activities in the precinct, etc.) and complete (i.e. include all of these elements).

Given that a substantial effort was required on behalf of Council staff to run the campaign over eight months for a small commercial district involving 26 traders and increased levels of effort would be needed to enhance its design in future based on the comments made in this section, it is noted that Australian Councils would typically need to have substantial increases in their human resources to run best practice, non-structural, anti-litter campaigns on an on-going basis for all their commercial precincts. This may be a challenge to some Councils that are under pressure to keep staffing levels to a minimum, even if financial resources are available for such activities. The challenge may encourage such Councils to either:

- 'out-source' the education / liaison role to the private sector;
- pursue structural alternatives that require fewer human resources to establish and maintain (e.g. the use of gross pollutant traps with improved bin-related infrastructure); or
- use a *combination* of low cost structural measures (e.g. strategic use of gross pollutant traps and improved bin-related infrastructure), low cost methods of community engagement (e.g. regular, but not too frequent face-to-face visits by educators who have ready access to educational materials and products), and non-structural measures that are cost-neutral to Council (e.g. on-the-spot fines for littering).





## **4. Evaluation Styles 2, 3, 4 and 5 - Monitoring Awareness, Attitudes and Behaviour (Self-reported and Actual)**

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### **4.1 Introduction**

Chapter 4 is a summary of, and interpretation of data within, a detailed technical report by Community Change Pty Ltd (i.e. Curnow and Spehr, 2005, pp. 88). Community Change was commissioned by the CRC for Catchment Hydrology to undertake the ‘social survey’ styles of evaluation (i.e. styles 2, 3, 4 and 5). Some of the text describing the monitoring and evaluation design in this chapter has been taken directly from the Community Change report. In addition, verbatim recommendations from the Community Change report have been included in Appendix 4. To obtain a copy of the Community Change report, inquiries should be directed to the CRC for Catchment Hydrology or Moreland City Council.

Community Change’s role was to lead the monitoring and evaluation activities that examined changes to litter-related awareness, attitudes and behaviour (both self-reported and actual) of traders and the community in both the Snell Grove and Gaffney Street locations. Specifically, their evaluation objectives were to:

- Inform the development of the education campaign (led by Moreland City Council) by determining initial levels of awareness knowledge / attitudes and behaviour in relation to stormwater and litter loads. That is, by understanding baseline conditions the education team had the opportunity to tailor the design and implementation strategy for the education / participation campaign.
- Assess and report on changes in levels of awareness / knowledge, attitudes and behaviour in relation to stormwater litter loads by undertaking monitoring at the intervention and control sites before, during and after delivery of the education / participation campaign.
- Provide recommendations on the sustainability of outcomes and significant lessons from the educational campaign.

- Provide feedback to the CRC for Catchment Hydrology on the suitability of the draft monitoring guidelines that were trialled during the project.

During the period over which the monitoring was undertaken, a number of unusual events occurred in the Snell Grove commercial district that most likely affected the attitudes of some local traders and members of the broader community. Given attitudes, such as whether people feel a strong ‘sense of community’ in their area, have been linked with local littering behaviour (see Curnow, 2004), it is likely that some of these events influenced people’s behaviour with respect to littering, stormwater management and waste management. It is suggested the following events probably influenced people’s behaviour in the Snell Grove district during the monitoring period:

- An armed robbery of a trader.
- A murder of a young man in the street (subsequent tributes resulted in increased levels of littering and graffiti).
- The existence of an illegal brothel that continued to operate during most of the campaign (it was closed on 8 December 2004) and caused considerable frustration to many traders (this frustration was often directed, rightly or wrongly, towards Council).

Understanding that littering behaviour occurs within, and is therefore influenced by, a social and physical context is important, as the design of the monitoring methodology for evaluation styles 2, 3, 4 and 5 gathered data on the littering context, as well as what people said and did. For example, if an area is kept free of litter through high levels of maintenance, research has established that it is less likely to be associated with littering behaviour (i.e. the so-called ‘clean equals clean’ principle of litter management, see Curnow, 2004). This is why monitoring data was collected on community identity, community involvement, infrastructure (e.g. street furniture and landscaping), BIN infrastructure<sup>6</sup> and people’s attitudes towards the location, as well as more obvious parameters (e.g. specific knowledge, attitudes and behaviour).

## 4.2 Monitoring Method

A three stage 'pre-, during and post- intervention' assessment design with a control site was used to evaluate the education / participation campaign implemented with the two key target groups at Snell Grove - traders and the wider community. The assessment program was conducted from December 2002 to July 2004. It used a participatory approach with in-depth, one to one assessments conducted with traders and on-the-street surveys conducted with the

wider community in two separate locations - Snell Grove, Oak Park (the intervention location) and Gaffney Street, Pascoe Vale (the control site).

Education campaign effectiveness was assessed using the recently developed and validated Clean Communities Assessment Tool (CCAT), developed by Curnow and Spehr (2003) for assessing community litter and littering, within the framework of evaluation styles for monitoring non-structural interventions identified by Taylor and Wong (2003).

Table 4.1 CCAT Factors

Key Indicator	Factor	High (CCAT = 5)	Low (CCAT = 1)
<b>Summary CCAT</b>	Features combined in a summary rating	Area likely to be extremely clean, safe, well maintained and likely to encourage litter prevention	Area is highly littered and is likely to encourage litter accumulation
<b>Context</b>	Summarises community identity and involvement	Strong sense of pride, safety and ownership over the space	Poor sense of ownership and area is not clean
<b>Facilities</b>	Summarises results for bins and furniture	Extremely well maintained, litter free facilities that are easily used and well positioned	Inadequate facilities, poorly maintained
Infrastructure	Features and cleanliness of all furniture and landscaping	Furniture is extremely well maintained, clean and appropriate	Poorly maintained and surrounded by litter
BINrastructure	Features and cleanliness of all litter, recycling and butt bins	Bin number, design, position and maintenance is highly appropriate to the area and usage patterns	Inadequate number, configuration, positioning and/or servicing of bins
<b>Public Perceptions and Attitudes</b>	Attitudes towards the location and its management of litter	Area is perceived as extremely well looked after and serviced	Area is seen as inadequately maintained
Attitudes to Place	Attitudes on the area and expected actions	Strong expectations exist for people to do the right thing with used items	No expectations to do the right thing
Attitudes Towards Facilities	Perceptions of appropriateness of bins and furniture	Facilities are viewed as highly appropriate and meeting the needs of the community	The community sees a need to improve facilities

Source: Slightly modified from Curnow and Spehr (2004).

<sup>6</sup> A term used by Community Change Pty Ltd to describe bin-related infrastructure (e.g. the design, number, location and maintenance of litter, recycling and butt bins).



CCAT assessments provide 1 to 5 ratings that monitor three factors in a location that influence littering behaviour (see Table 4.1). These factors are the:

- ‘Context’ involving the sense of community and level of cleanness in a location.
- ‘Facilities’ involving infrastructure and BIN infrastructure.
- ‘Attitudes and perceptions’ of people using public spaces involving community views on the adequacy of facilities and attitudes toward the location being studied.

An explanation of how the CCAT supports evaluation styles 2, 3, 4 and 5 is given in Table 4.2.

The CCAT assessment also included observational techniques that generated a percentage score for the positive disposal behaviours occurring in public areas, as well as litter counts and surveys of dumped rubbish in the area.

Assessment procedures also gathered information on a range of environmental issues, respondent awareness, knowledge, attitudes and self-reported behaviour.

Table 4.2 Linkage Between the CCAT and the Styles of Evaluation Undertaken by Community Change

<b>Evaluation Style* (from Taylor and Wong, 2003)</b>	<b>CCAT Monitoring Method**</b>
<p><b>Style 2</b> Monitoring changes in people’s awareness and knowledge with respect to littering</p>	<p>CCAT ratings for ‘Context’ include assessment of the physical environment and survey questions. These contribute to an understanding of respondent awareness and knowledge of their local environment (including litter-related issues), their sense of community, safety and comfort, cleanliness of a location, the amount and type of littering, and local management systems.</p> <p>Awareness of these features creates the context for disposal behaviour and influences the likelihood that someone will litter or use a bin.</p>
<p><b>Style 3</b> Monitoring changes in people’s attitudes with respect to littering</p>	<p>CCAT ratings for ‘Attitudes and Perception’ (with some additional survey questions on specific, litter-related attitudes) provide insight into the community’s assessment of the adequacy of facilities and Council’s role in supporting litter prevention, managing the area and preventing pollution of stormwater.</p>
<p><b>Style 4</b> Monitoring changes in people’s self-reported littering behaviour</p>	<p>CCAT survey questions also detail the activities and actions people reported in preventing littering and reducing litter from entering the stormwater system.</p>
<p><b>Style 5</b> Monitoring changes in people’s actual littering behaviour</p>	<p>The CCAT outcome measure indicating the effectiveness of interventions and tracking change is the Actions Score. Actions Scores are based on observations of community behaviour taken over time in a location and provides a basis for tracking the effects of the education campaign on the disposal actions (i.e. littering or bin use) of people in Snell Grove.</p> <p>Assessments / audits of trader premises also provided insights into actual behaviour change.</p>

**Notes:**

Source: Modified from Curnow and Spehr (2004).

\* See Appendix 1 for a brief explanation of these styles.

\*\* The CCAT methodology also supported the project’s evaluation using style no. 1 (i.e. assessing whether the education / participation campaign had been implemented as planned and the quality of the campaign). The methodology indicated the quality of the intervention (i.e. its effect).

The survey instruments examined changes to awareness, knowledge and attitudes in relation to:

- The importance placed on environmental issues in the area, with a focus on preventing littering and improving stormwater quality.
- Stormwater, waste disposal and sewerage management systems.
- Council requirements for managing waste, preventing litter and protecting the quality of stormwater, particularly through reducing litter loads.
- Items and materials polluting stormwater in Snell Grove.
- Factors influencing littering, bin use and stormwater litter loads in Snell Grove.
- Illegal and domestic dumping.
- Council responsibilities and levels of satisfaction with Council's management of stormwater, waste and litter.
- Environmentally friendly and responsible actions for cleaning areas in and around Snell Grove.
- The use of fines and rewards to motivate community involvement in the prevention of litter.
- Reduced litter loads in stormwater.

In addition to the CCAT ratings, a total of 81 surveys were conducted with traders and 342 with community members in Snell Grove. In Pascoe Vale, 15 surveys were conducted with traders and 105 with community members.

When the data collection methodology and instruments were finalised, pilot testing was undertaken to ensure appropriate information was obtained in a practical, efficient and accurate manner.

The timeframe for the monitoring tasks undertaken using styles 2, 3, 4 and 5 is summarised in Table 4.3.

Data analysis for evaluation styles 2, 3, 4 and 5 included the generation of summary statistics and interpretation of trends observed in results when displayed in graphical form, but did not involve an analysis of whether any observed trends were

'statistically significant'. In other words, common sense and expert opinion were used to interpret whether observed / measured changes were 'practically significant'. As such, great care must be taken not to place too much weight on subtle changes observed during the monitoring activities for evaluation styles 2, 3, 4 and 5 (e.g. slight increases or decreases in awareness of traders throughout the monitoring period.).

Community Change designed their monitoring approach to deliver a 'moderate degree' of confidence in the results by using the following strategies:

- A separation between those involved in delivering the education campaign (Moreland City Council) and the independent evaluators.
- A consistent approach to monitoring that matched survey issues between sample groups (i.e. traders and the community) and was the same for the two locations.
- Using piloting (of survey instruments / techniques), an extended baseline and follow-up with a control site that matched the intervention site as closely as possible in view of project timelines and available resources.
- Analysing data using different styles of evaluation to give a more comprehensive understanding of key findings.
- Peer review of monitoring and evaluation plans and reports (e.g. by the CRC for Catchment Hydrology for Catchment Hydrology).
- Use of a validated rating instrument (the Clean Communities Assessment Tool) and in-depth personal interviews involving trained assessors who are able to build rapport with survey respondents (Curnow and Spehr, 2004).

## **4.3 Key Results and Discussion**

### **4.3.1 CCAT Ratings - Summary**

The summary CCAT 1 to 5 ratings for Snell Grove and the control site (Gaffney Street, Pascoe Vale) are shown in Figure 4.1. These results indicate the cumulative impact of the education campaign using evaluation styles 2, 3, 4 and 5.

Table 4.3 Timing of Major Monitoring Tasks for Evaluation Styles 2, 3, 4 and 5

Major Monitoring Tasks	Completed By
Briefing with educators on impressions from initial site visits.	October 2002
<b><i>Baseline One - initial data collection period.</i></b>	December 2002 (Snell Grove)
Detailed briefing to educators on initial Baseline One results.	December 2002
<b><i>Baseline Two - second data collection period.</i></b>	February 2003 (Snell Grove) May 2003 (Gaffney Street)
Contribute to the refinement of the education campaign.	April 2003
Start of the education / participation campaign.	May 2003
<b><i>Assessment of completion of main elements of intervention with traders.</i></b>	September 2003 (Snell Grove)
Briefing to educators / steering group on assessment outcomes.	November 2003
Practical completion of the education / participation campaign.	December 2003 (although some minor actions extended into April 2004, see Table 2.1)
<b><i>Assessment of completed interventions with public.*</i></b>	March 2004 (Gaffney Street) May 2004 (Snell Grove)
<b><i>Trader follow-up.</i></b>	March 2004 (Gaffney Street) May 2004 (Snell Grove)
<b><i>Follow-up with public.</i></b>	July 2004 (Snell Grove and Gaffney Street)

**Note:**

Source: Modified from Curnow and Spehr (2004).

\* It is acknowledged that this activity should have occurred sooner (i.e. around December to January). The delay appears to be a result of miscommunication between the education team / project manager and the monitoring team regarding when the campaign officially finished.

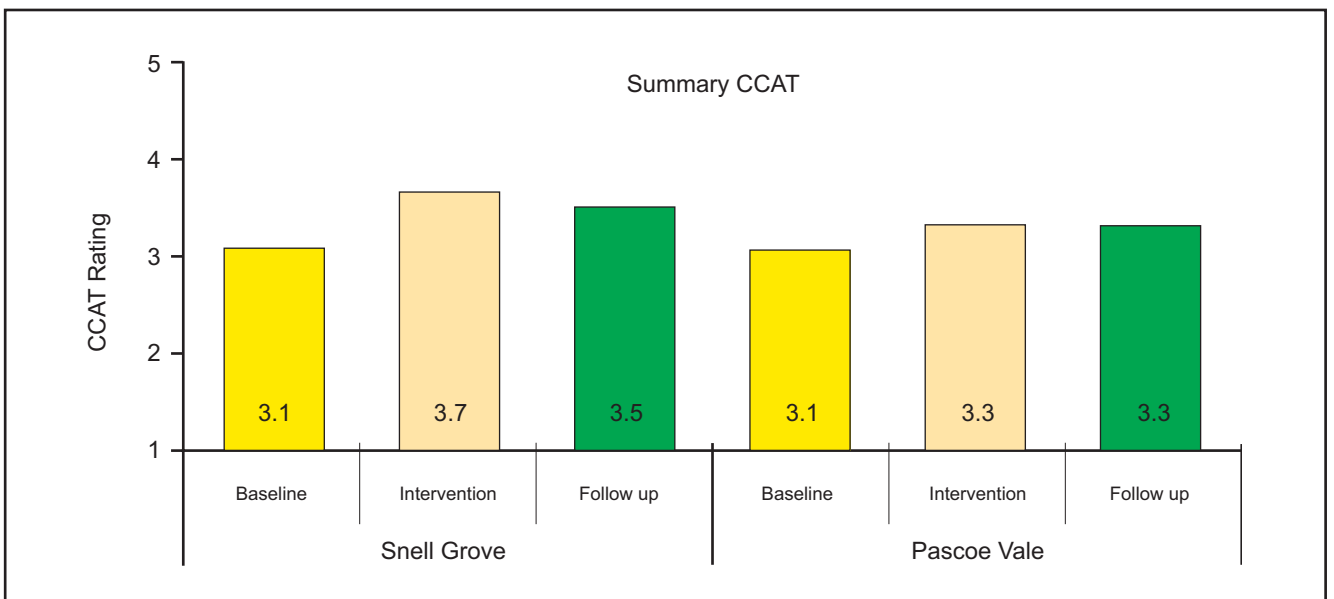


Figure 4.1 CCAT Summary Ratings for Snell Grove and the Control Site (Gaffney Street, Pascoe Vale)

Source: Curnow and Spehr (2004).

Community Change, as specialist in this form of evaluation, believe “the changes in CCAT summary rating were reflecting the changes to features of the location influenced by the interventions” (Curnow and Spehr, 2004, p. 32). That is, the increase and decrease in the CCAT summary rating at Snell Grove is likely to be a real phenomenon rather than natural variation in the data. Assuming this is the case, the education / participation campaign appears to have made a modest but positive effect during the intervention phase which may have declined slightly approximately seven months after the program. These results are consistent with the findings of the litter load monitoring work (i.e. evaluation style no. 6), as reported in Chapter 5.

**4.3.2 CCAT Ratings - Facilities (Location Features)**

The facility-related CCAT 1 to 5 ratings for Snell Grove and the control site are shown in Figure 4.2. These results reflect the adequacy of two types of features at each location: infrastructure and BINinfrastructure.

Assessment of infrastructure included examination of the state of Council-managed street furniture,

boundary markers / safety barriers, footpaths, roads and landscaping, as such features are likely to collectively influence how people feel about the place and their littering behaviour (Curnow, 2004).

Assessment of BINinfrastructure included examination of the location, number, design, physical state and maintenance of bins (e.g. litter, recycling and cigarette butt bins).

The ratings in Figure 4.2 show the most substantial improvement of any of the CCAT ratings during the intervention phase of the education / participation campaign at Snell Grove. This level of improvement however, was not fully sustained during the follow-up stage, returning to levels above baseline but similar to those at the control location.

Given these ratings, one could argue that the most significant factor that influenced the modest improvement to the CCAT summary ratings (see Figure 4.1) relate to improvements in the physical infrastructure that were implemented by Council during the campaign.

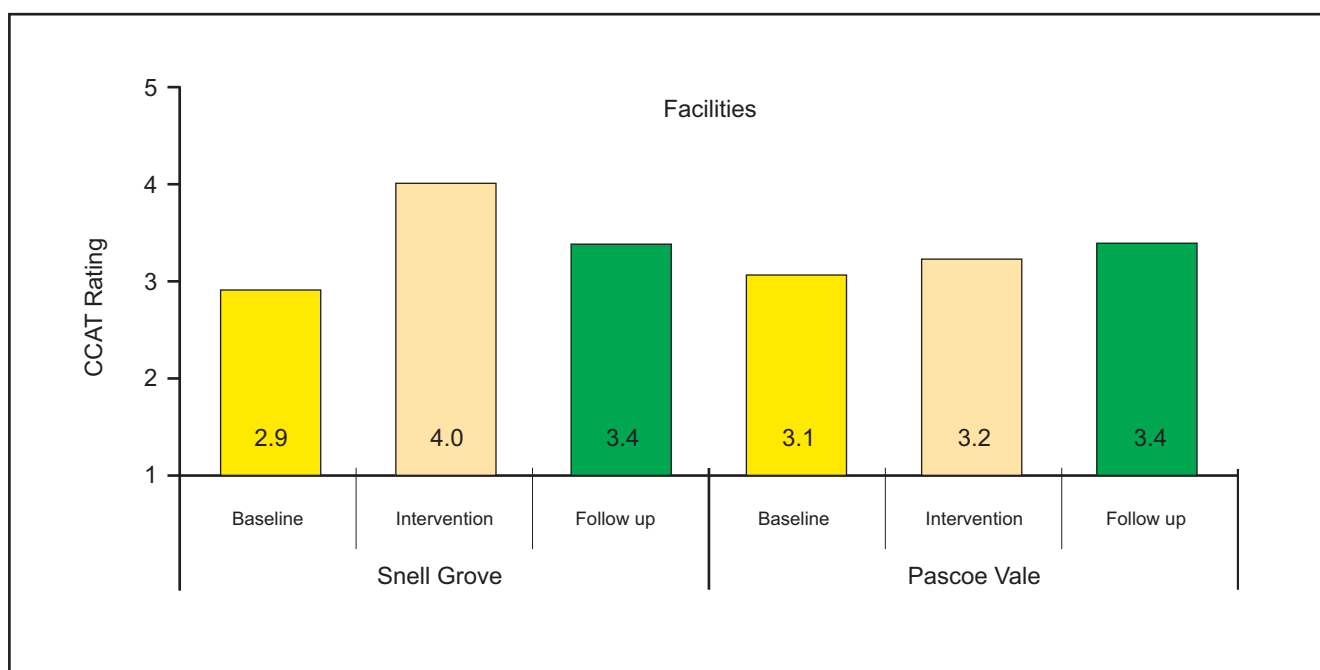


Figure 4.2 CCAT Facilities Ratings for Snell Grove and the Control Site

Source: Curnow and Spehr (2004).

**4.3.3 CCAT Ratings - Context, Community Awareness and Knowledge**

CCAT ratings for context considered a range of environmental (e.g. existence of litter, illegal dumping, graffiti), social (e.g. whether the respondents identified with the area and felt a sense of community), and awareness / knowledge factors.

Assessment included asking specific survey questions to measure levels of awareness and/or knowledge. Survey questions examined people’s awareness / knowledge of:

- Environmental issues in the area with a focus on littering and stormwater quality.
- Stormwater, waste disposal and sewerage management systems.
- Council requirements for managing waste, preventing litter and protecting the quality of stormwater.
- Items and materials polluting stormwater at Snell Grove.
- Factors influencing littering, bin use and litter loads at Snell Grove.
- Illegal and domestic dumping.

The context-related CCAT 1 to 5 ratings for Snell Grove and the control site are shown in Figure 4.3.

Figure 4.3 indicates that there were probably modest levels of improvement during the intervention phase at both Snell Grove and the control site. A possible explanation for improvement at the control site was the demolition of a building that was associated with littering. In addition, the evaluation team reported improved levels of ‘sense of community’ and ‘sense of safety’, as well as reduced illegal and domestic dumping at the control site (possibly as a result of the presence of evaluation staff).

A possible explanation for the relatively high context ratings during the follow-up period at Snell Grove was the ‘sense of community’ that was generated following a murder of a young man in the district prior to the follow-up monitoring period (see Curnow and Spehr, 2004 for a discussion of this tragedy).

Overall, it appears likely that there was slight improvement in context-related CCAT ratings for Snell Grove over the monitoring period, although given the explanation of the elevated ratings during the follow-up phase, it is unlikely that these levels will be maintained in the long term.

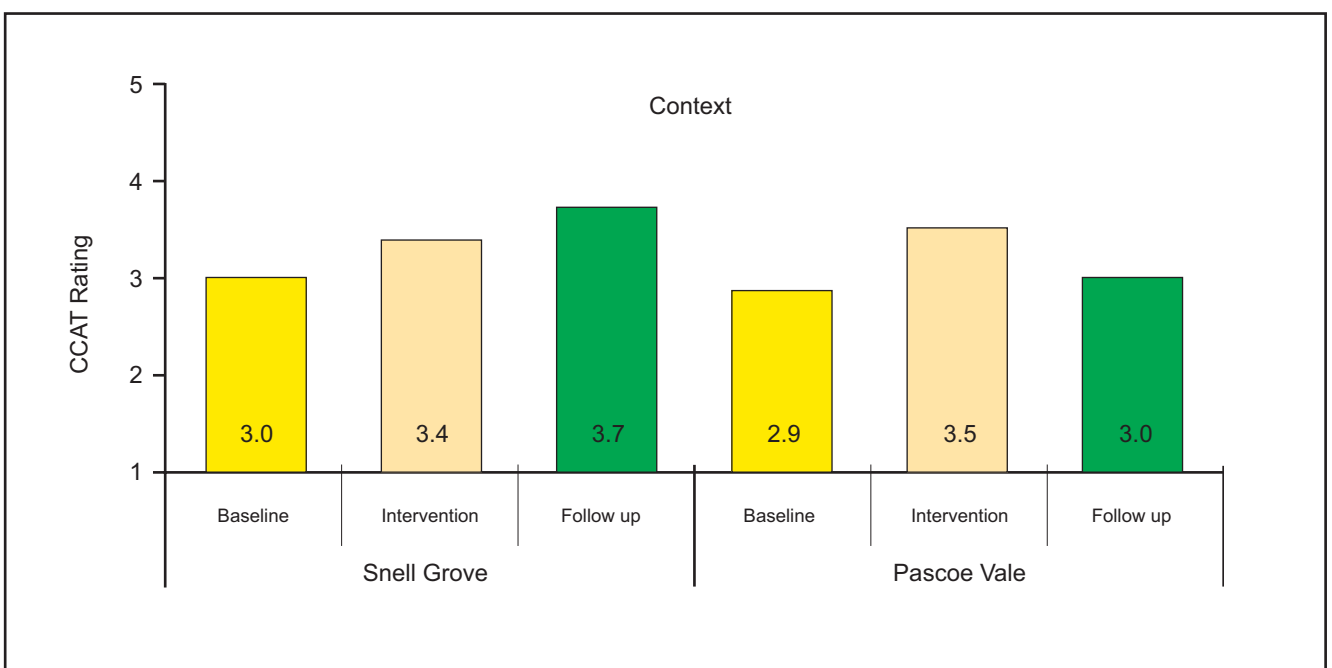


Figure 4.3 CCAT Context Ratings for Snell Grove and the Control Site

Source: Curnow and Spehr (2004).

**Litter Counts**

As part of the CCAT ratings for context, litter counts were done at both locations (see Figure 4.4). This form of monitoring found that tobacco products as well as cigarette butts and packaging, were the most commonly found littered item throughout all stages of monitoring (i.e. approximately 45% to 70% of all littered items at Snell Grove). The proportion of items found littered in the intervention and control sites were similar.

**Illegal Dumping**

As part of the CCAT ratings for ‘context’, illegal dumping was also monitored at Snell Grove. The level of illegal dumping was monitored in an area alongside the railway line north of the commercial precinct and in an area immediately adjacent to the railway station / subway at the bottom of the hill (see Illustration 1 in Curnow and Spehr, 2004 for exact locations). Changes in the amount of material observed at the two illegal dumping monitoring areas are shown in Figure 4.5.

Figure 4.5 indicates there may have been a reduction in legal dumping in and around Snell Grove over the monitoring period, particularly at follow-up.

Near the end of the intervention stage (April 2004), the evaluation team noted a concerted effort to keep the area north of the precinct clean by fencing it off. Areas near the subway also appeared to have been cleaned-up by the railway authorities. The evaluation team also noted inconsistency in the clean-up responses to illegal dumping in and around the Snell Grove railway station, with some areas being cleaned-up and other areas being left in a highly littered state throughout the project.

One unusual observation from the monitoring team was that after pre-campaign (baseline) assessment visits, and with no prompting or assistance from Council, some residents and traders cleaned up part of the Snell Grove precinct (see Plates 4.1 and 4.2). This spontaneous action would have affected the baseline CCAT ratings, and highlights the possibility that the presence of the evaluation team may influence people’s behaviour. This risk emphasises the importance of having a control site for such evaluations.

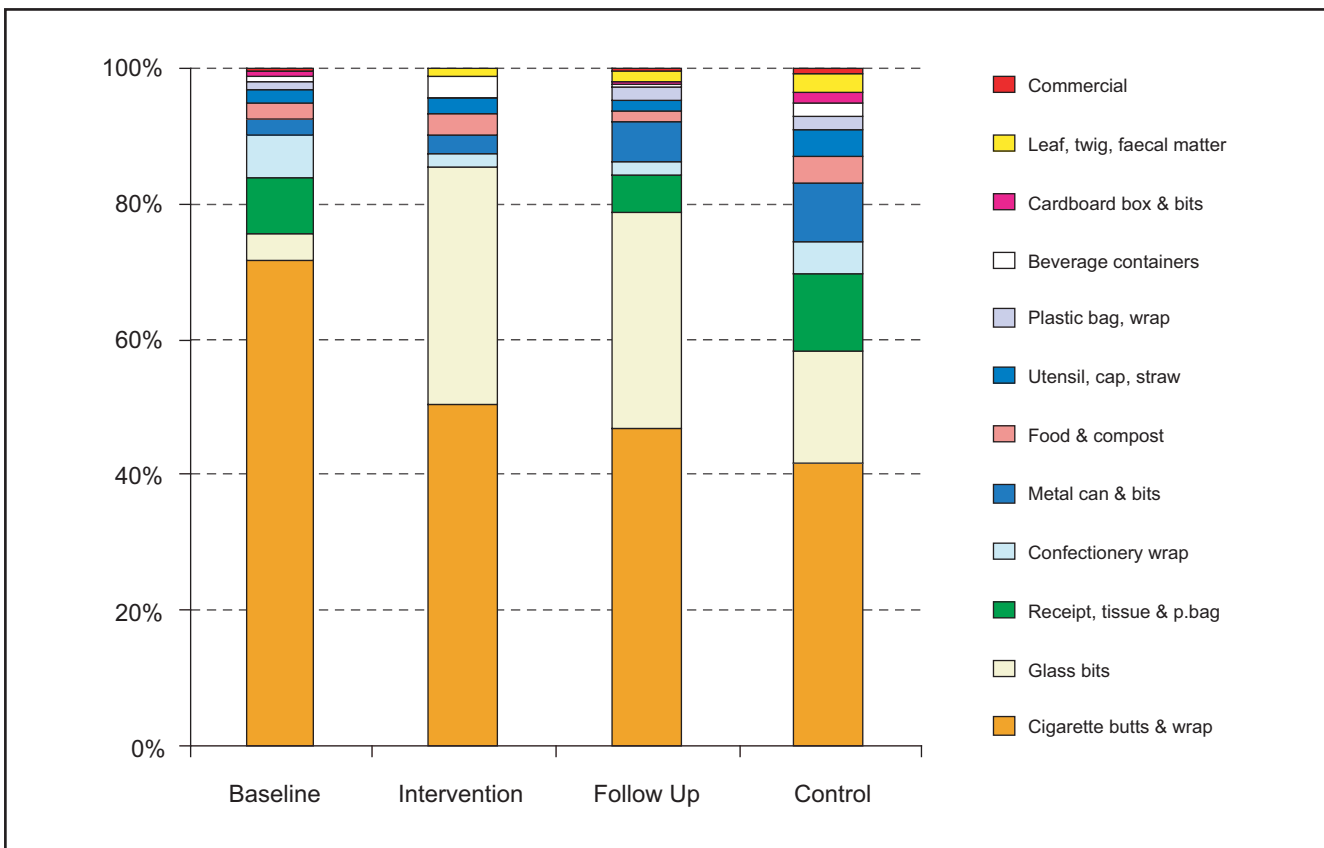


Figure 4.4 Composition of Littered Items at Snell Grove and the Control Site (by Item)

Source: Curnow and Spehr (2004).



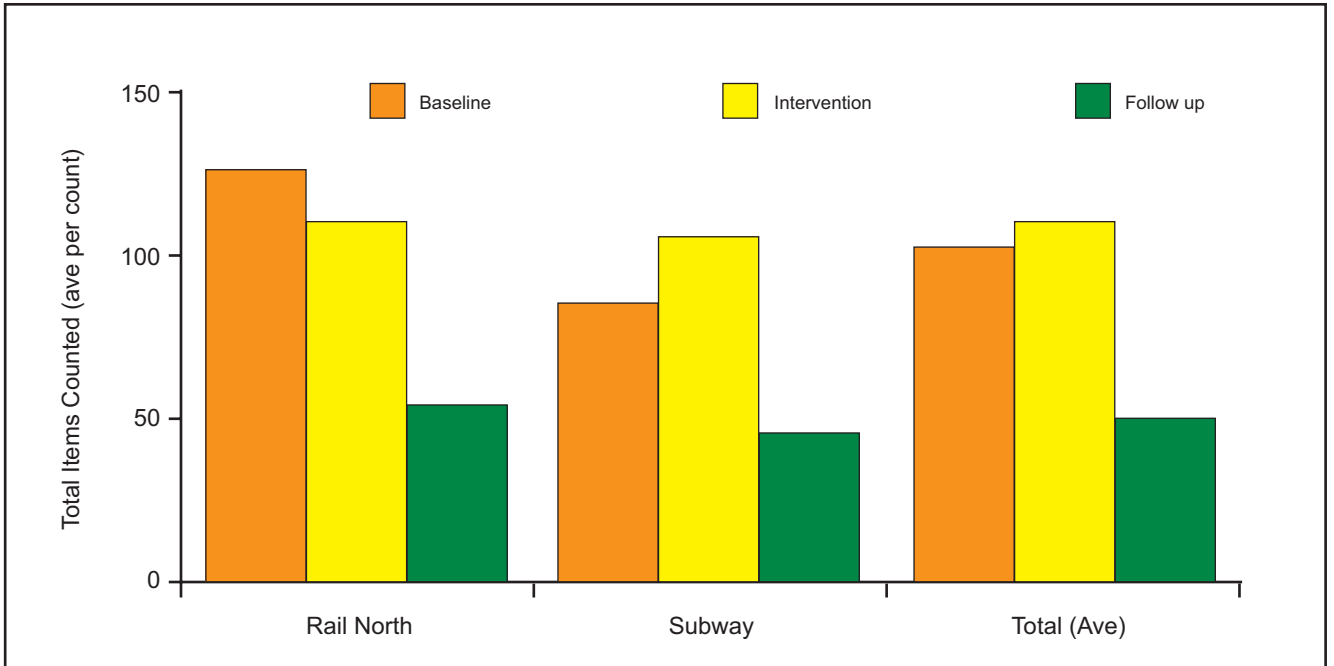


Figure 4.5 Total Count of Items in Two Legal Dumping Areas (Snell Grove)

Source: Curnow and Spehr (2004).



Plate 4.1 Dumped Material in the Laneways Behind the Traders' Premises at Snell Grove (Observed During the First Baseline Survey)



Plate 4.2 Cleaned Laneways Behind the Traders' Premises at Snell Grove (Observed During the Second Baseline Survey)

Source: Curnow and Spehr (2004).

**Graffiti**

One of the elements of the CCAT ratings for ‘context’ is the amount of graffiti present and how long it remains in an area. The evaluation team reported that the mourning that followed the murder of a young man at Snell Grove appeared to lead to higher levels of graffiti (see Plate 4.3) late in the intervention stage and at the follow-up stage.

Council made a decision to leave the graffiti in place for a short period and then removed it from the footpath but not from surrounding buildings which were privately owned.

**Identifying with the Area**

Traders and members of the community using both commercial districts were asked about whether each location represented a clear and identifiable precinct with an attached sense of community, whether they felt themselves to be part of that community, and their level of involvement or identification with the area. These results are presented in Figure 4.6.

Community Change, with experience in this form of monitoring, concluded that traders in both Snell Grove and the control site reported a “strong sense of community of which they felt part” (p. 47) throughout all stages of monitoring.



Plate 4.3 Messages of Mourning Following the Death of a Young Man at Snell Grove During the Monitoring Period

Source: Moreland City Council (2005).

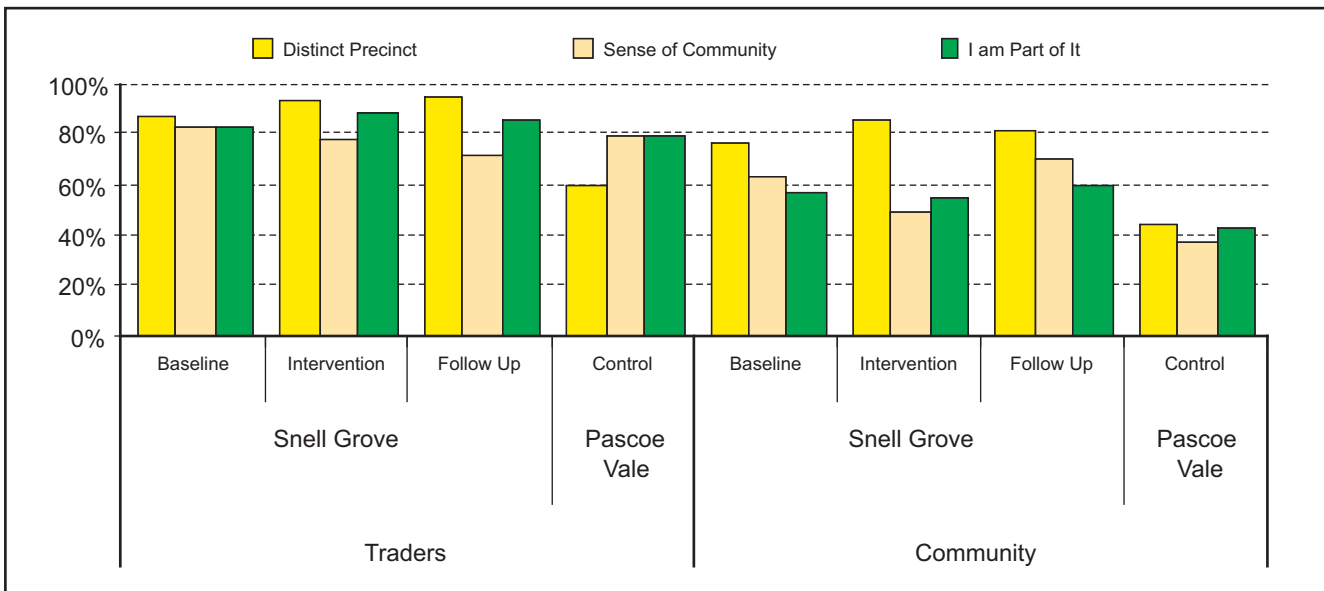


Figure 4.6 Respondents' Sense of Community

Source: Curnow and Spehr (2004).



The percentage of respondents who felt ‘a sense of community’ appeared to decline throughout the monitoring period for both traders and the community, with the exception of the follow-up period where there was an increase in the community. This increase may be associated with the tragedy that occurred at Snell Grove, bringing the community together at a time of loss.

**Explanation for Littering**

As part of the survey, respondents were asked about the most likely reasons for littering. Results are shown in Figure 4.7.

The responses from traders and the community consistently demonstrate that locals believe laziness is

the most likely reason for littering. The data displayed in Figure 4.7 indicate a possible decrease in the proportion of respondents who suggested laziness (to look for a bin) and lack of awareness (of littering) as reasons for littering. If this trend is real and not simply a product of random variation, it may be due to improvement in BIN infrastructure and the existence of awareness-raising messages (e.g. drain stencils, posters and brochures).

**Preferred Communication Methods**

Traders were asked what communication method they preferred when being informed and educated about litter prevention and stormwater management. The results are shown in Figure 4.8.

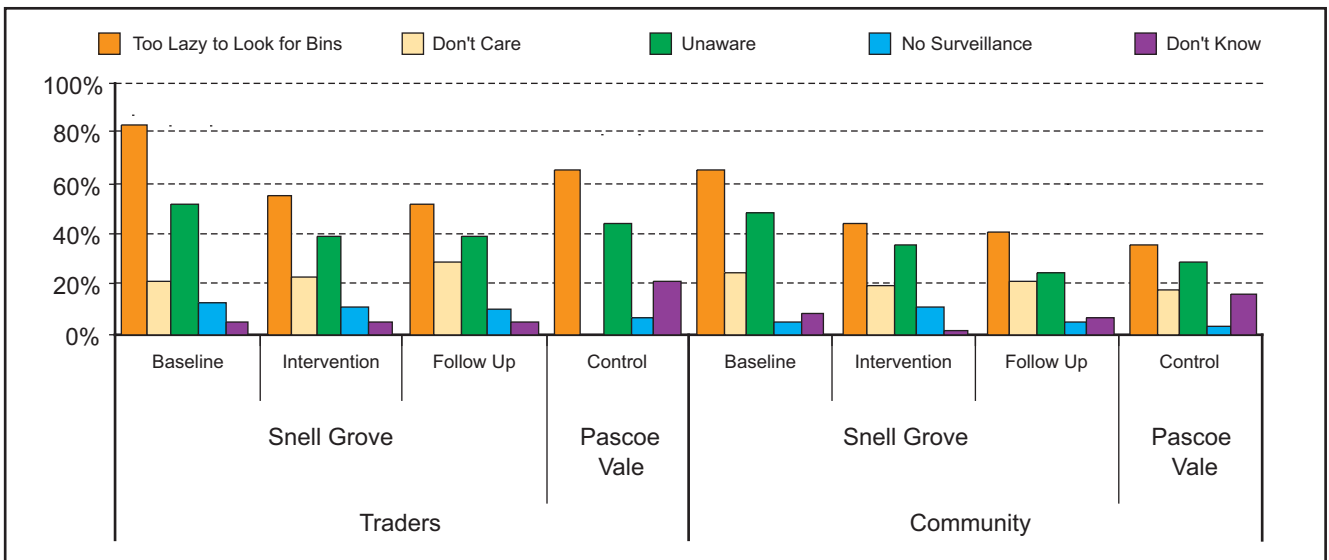


Figure 4.7 Respondents' Views on Why People Litter in the Area

Source: Curnow and Spehr (2004).



Figure 4.8 Traders' Preferred Communication Methods

Source: Curnow and Spehr (2004).

The results in Figure 4.8 appear to indicate a shift in preference away from brochures and mail-outs to face-to-face visits by educators.

Qualitative findings by the evaluation team indicate that there were scheduling difficulties associated with face-to-face visits, despite significant effort on behalf of Council staff and the traders. This resulted in some traders being disappointed about the amount of personal contact they had with educators. Comments included:

- “I found the talk from Council informative”.
- That they had seen more of the evaluation team than the education team.
- “The education visits were great, although I would like to have had more at convenient times”.
- “The contact from Council was OK, but there has been a lot of talk but not much action”.
- “The talk from Council was good but not particularly motivating”.

The above comment relating to motivation, combined with the knowledge that traders generally became less optimistic about the likely effect of litter management strategies during the campaign (see Section 4.3.4 and the lack of positive feedback mechanisms in the education / participation campaign (see Section 3.3), highlights a potential point for improvement in future

campaigns. That is, campaigns should aim to deliver their educational messages in a motivational and inspirational way with positive outcomes being recognised and rewarded, regardless of their magnitude.

***Support for a Clean Local Environment***

Over all stages of the monitoring period, more than 85% of traders and the community supported the concept that the area should be a litter-free, environmentally friendly place.

Respondents also indicated how littered they perceived the commercial district to be over the week that they were being interviewed. The results are shown in Figure 4.9.

The data in Figure 4.9 indicate a subtle improvement may have occurred during the intervention phase. If this trend is real and not simply a product of random variation, it may be in response to improved litter management. Care is needed here however, as rainfall could have also influenced how littered the streets appeared during any given week. The results from observations of people’s littering behaviour (evaluation style no. 5) in Section 4.3.6 and the project’s litter load monitoring (i.e. evaluation style no. 6) in Chapter 5 are more informative with respect to likely changes in people’s littering behaviour over the monitoring period.

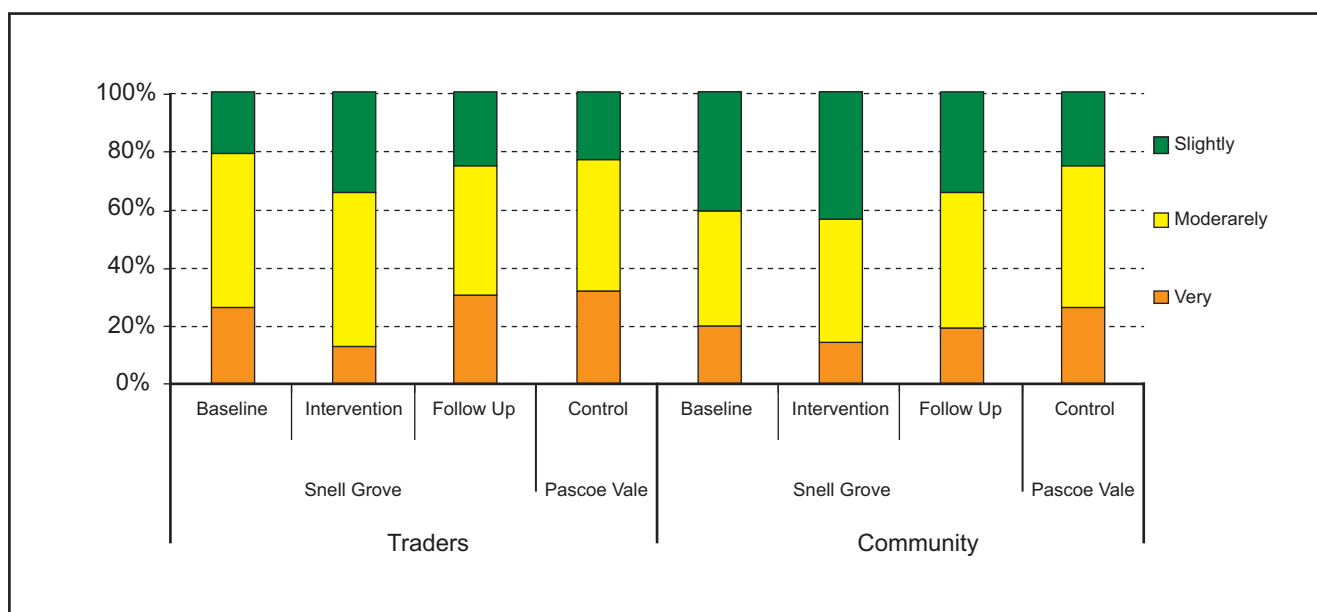


Figure 4.9 Perceptions on the Severity of Littering

Source: Curnow and Spehr (2004).

**Awareness and Knowledge**

Respondents were asked a range of questions to test whether their basic understanding of stormwater, litter management and waste management had improved as a result of the campaign.

Figure 4.10 summarises the results from a question that asked respondents to describe what happened to water when it rained at the location. Most incorrect responses confused the sewerage system with the stormwater system.

The results plotted in Figure 4.10 indicate that there may have been:

- a very slight increase in the proportion of traders with correct knowledge of the fate of stormwater (a positive result), that was not sustained at follow-up; and
- a slight decrease in the proportion of the community with correct knowledge of the fate of stormwater (a negative result), that was not fully sustained at follow-up.

What is more certain however, is that the education / participation campaign did not make a significant and sustained improvement in the awareness of traders or the community with respect to the fate of stormwater.

Respondents were also asked about whether stormwater was treated before it entered local waterways. Figure 4.11 summarises the results. Note that stormwater is not normally treated at Snell Grove (Oak Park) or Gaffney Street (Pascoe Vale), but some respondents at either location may have seen the temporary side entry pit traps being installed and/or cleaned as a part of litter load monitoring conducted by the CRC for Catchment Hydrology during the monitoring period (see Chapter 5).

The results plotted in Figure 4.11 indicate that there may have been a decrease in the proportion of traders and the community with correct knowledge of stormwater treatment during the intervention phase (a negative result). Assuming this trend is real and not simply a function of random variation, it may have been due to observations involving the temporary side entry pit traps and/or ineffective education.

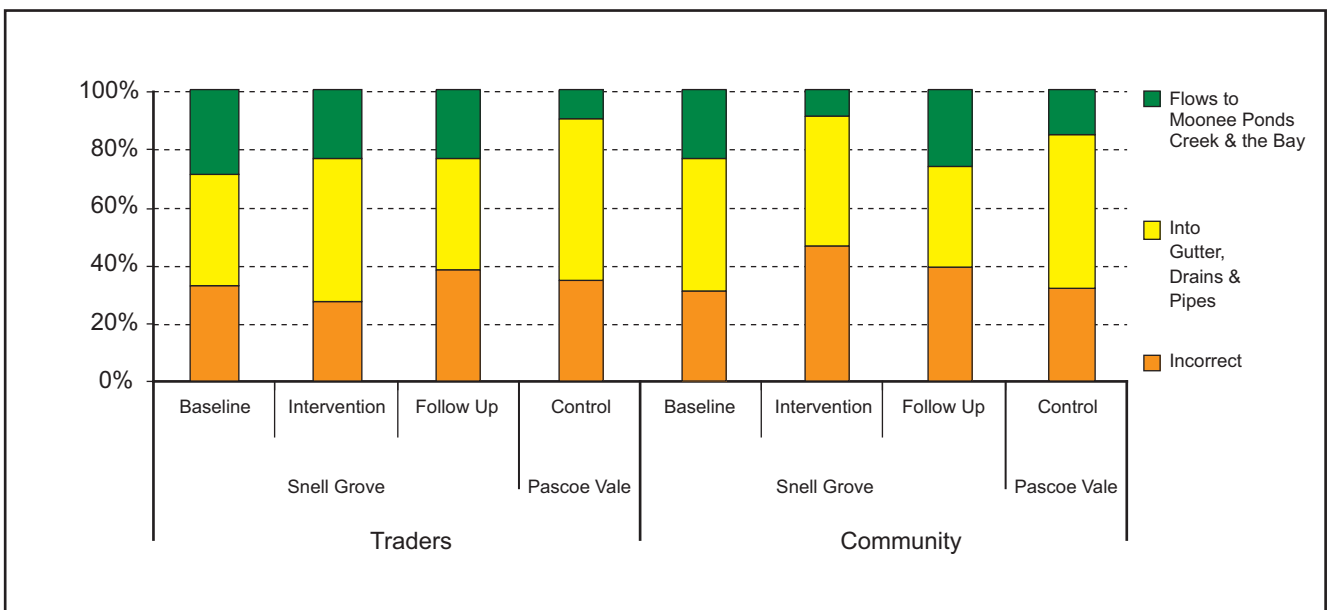


Figure 4.10 Basic Knowledge of Stormwater Fate (i.e. Where it Goes)

Source: Curnow and Spehr (2004).

The large increase in ‘unsure’ responses by traders during the intervention phase (approximately a 50% increase) indicates the one-to-one educational visits may have created confusion on this issue.

What is clear however, is that the education / participation campaign did not make a significant and sustained improvement in the awareness of traders or the community with respect to knowledge that stormwater is typically untreated before being discharged to waterways.

Respondents were also asked questions about what pollutes stormwater in the area, and where litter tends to accumulate. Figure 4.12 summarises the results.

Compared to the control location, traders at Snell Grove appear to have elevated levels of knowledge on these issues, even during the baseline monitoring period. In addition, there may have been a slight increase in the proportion of knowledgeable traders at Snell Grove during the intervention phase (a positive result), that was not sustained at follow-up.

In contrast to traders, there appears to have been a slight to moderate decrease in the proportion of community respondents at Snell Grove that were knowledgeable on these issues during the intervention phase (a negative result), that was not fully sustained at follow-up.

The knowledge of traders with respect to waste management and stormwater pollution prevention was assessed in more detail at both Snell Grove and the control site. Specifically, respondents were asked to identify actions that would be considered poor practice and people should be fined for doing. The results are summarised in Table 4.4.

Of the 10 knowledge areas in Table 4.4, only two (i.e. no. 8<sup>7</sup> and 10) were associated with clear and strong knowledge improvement (i.e. there was at least a 10% improvement in the number of traders identifying poor practice compared to baseline and control levels). One knowledge area (i.e. no. 1) was associated with a significant decrease in knowledge (i.e. there was at least a 10% decrease in the number of traders identifying poor practice compared to baseline and control levels).

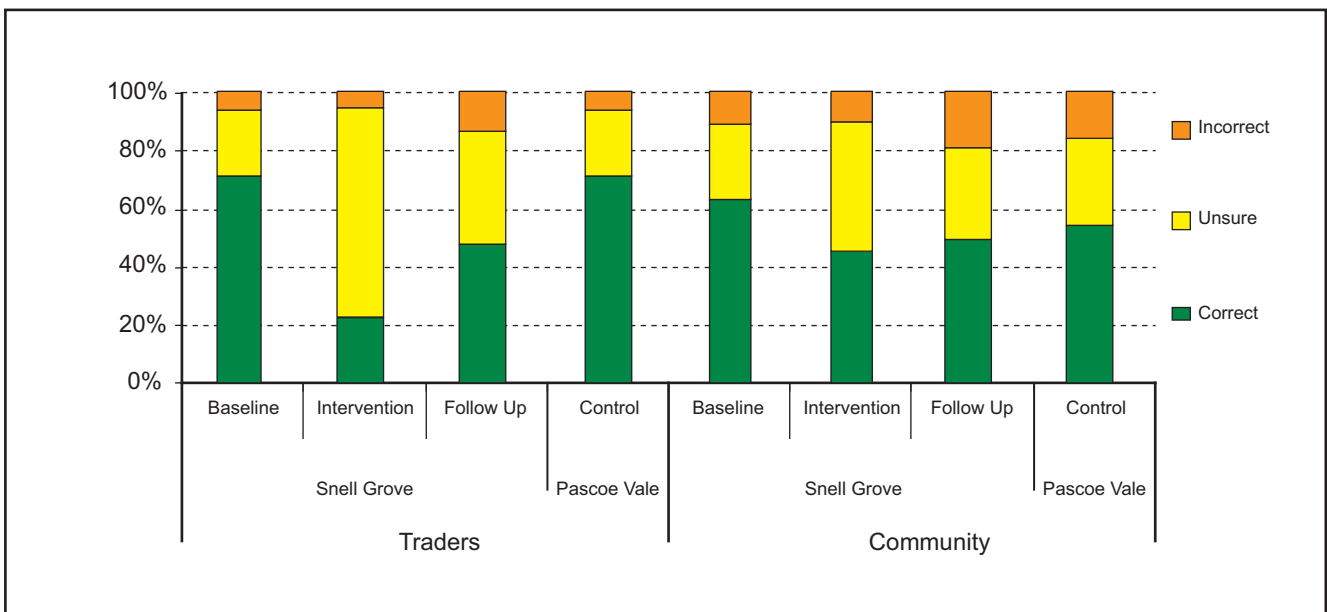


Figure 4.11 Basic Knowledge of Stormwater Management (i.e. is it Treated?)

Source: Curnow and Spehr (2004).

<sup>7</sup> It is noted that awareness and knowledge of the proper use of public place recycling bins may have been influenced by Council removing such a bin during the baseline monitoring period (Curnow, pers. comm., 2005).

Overall, the results appear to be mixed, with 70% of knowledge areas showing no significant change, 10% showing clear deterioration and 20% showing clear improvement. This modest result is disappointing, given the campaign’s educational messages were

primarily directed towards traders using relatively intense and participatory, one-to-one communication strategies.

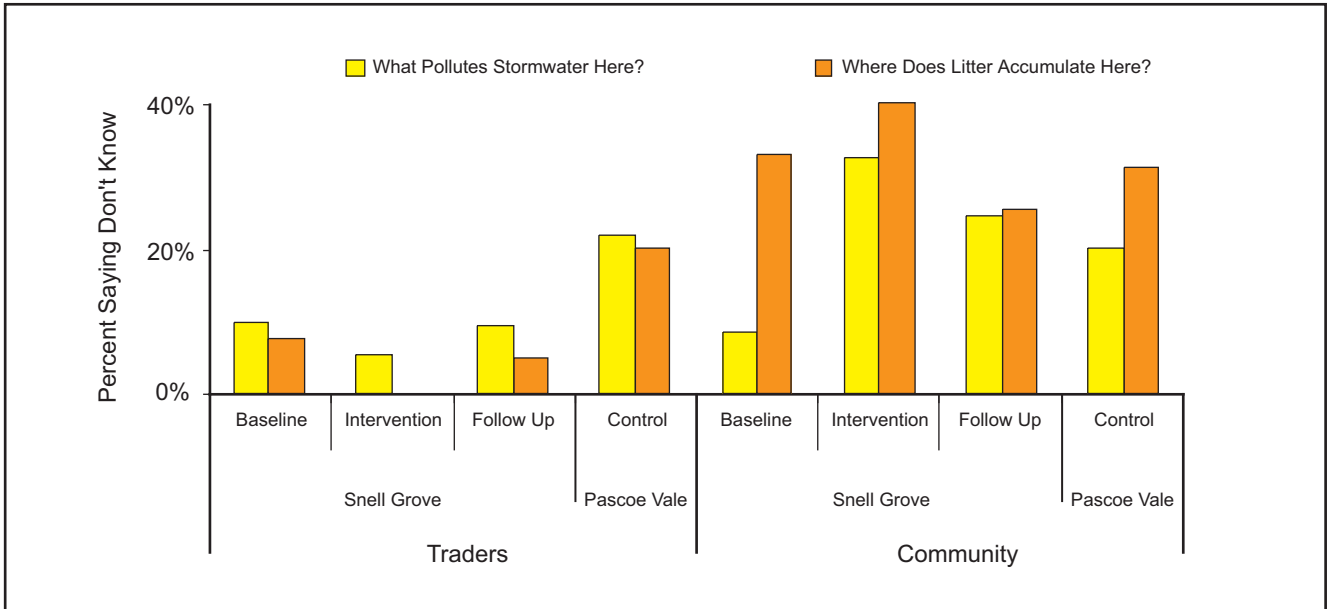


Figure 4.12 Basic Awareness of Littering Activities and Locations

Source: Curnow and Spehr (2004).

Table 4.4 Traders’ Knowledge of Poor Practices in Waste and Stormwater Management

Poor Practice	Snell Grove			Control Site	Change ≥ 10% Compared to Baseline and Control?
	Baseline	Follow-up	Change		
1. Leave waste next to a bin	93%	77%	-16%	87%	No
2. Litter in the street or behind shop	92%	89%	-3%	100%	No
3. Hose footpath to clean it	78%	77%	-1%	81%	No
4. Store liquids that could spill into stormwater	95%	94%	-1%	87%	No
5. Put domestic waste in trader litter bins	76%	77%	+1%	73%	No
6. Leave waste uncontained and open to weather	80%	82%	+2%	87%	No
7. Store waste for collection in street	81%	88%	+7%	93%	No
8. Put litter in street recycling bin	58%	71%	+13%	57%	Yes
9. Put trader waste into street litter bin	60%	82%	+22%	80%	No
10. Put recyclables in street litter bin	15%	59%	+58%	40%	Yes

Source: Modified from Curnow and Spehr (2004).



### 4.3.4 CCAT Ratings - Attitudes and Perceptions

#### Community Attitudes

CCAT ratings for community attitudes and perceptions on the adequacy of facilities for litter prevention are shown in Figure 4.13. These ratings remained relatively stable throughout the project.

Figure 4.14 presents data on community attitudes towards specific litter and waste management activities provided by Council.

In relation to the attitudes highlighted by Figure 4.14, it is suggested that the community responses at Snell Grove were generally more positive compared to the control site. This however, does not appear to have resulted from the education / participation campaign. None of the four attitudes in Figure 4.14 showed clear and strong improvement over the monitoring period.

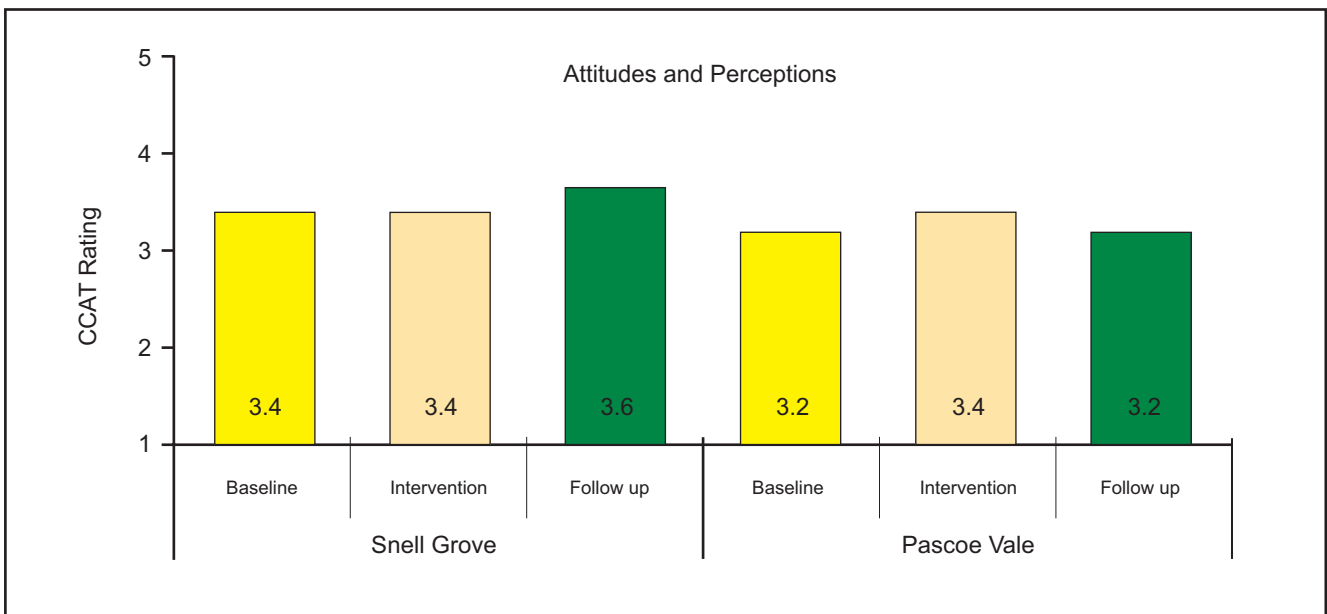


Figure 4.13 CCAT Ratings for Community Attitudes and Perceptions

Source: Curnow and Spehr (2004).

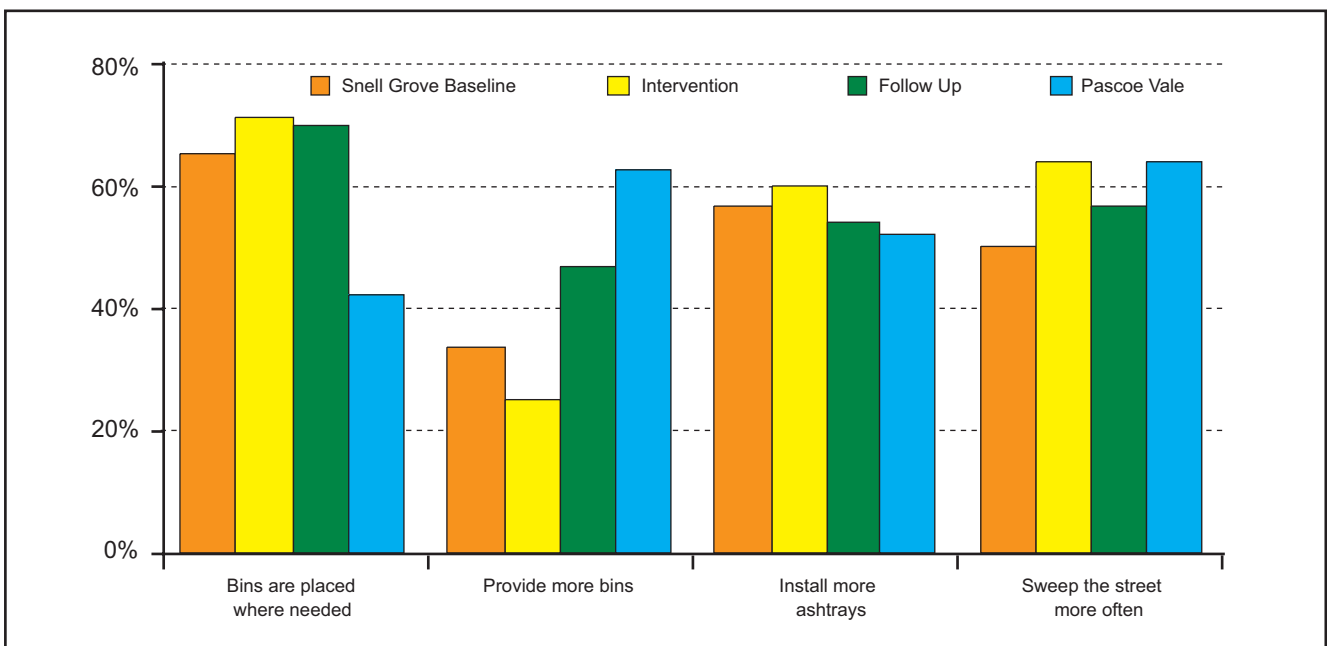


Figure 4.14 Community Attitudes Towards Specific Litter and Waste Management Activities / Facilities Provided by Council

Source: Curnow and Spehr (2004).

Figure 4.15 presents data on community attitudes towards litter management strategies in general.

In relation to the attitudes highlighted by Figure 4.15, it is suggested that none of the four attitudes showed clear and strong improvement over the monitoring period. The only substantial and sustained trend in Figure 4.15 appears to be that the surveyed community members at Snell Grove became increasingly pessimistic over the monitoring period, increasingly

believing that ‘litter will always get washed into the stormwater system’.

**Trader Attitudes**

Figure 4.16 presents data on trader attitudes towards specific litter and waste management activities provided by Council. Only baseline and follow-up surveys were conducted at Snell Grove for this monitoring parameter.

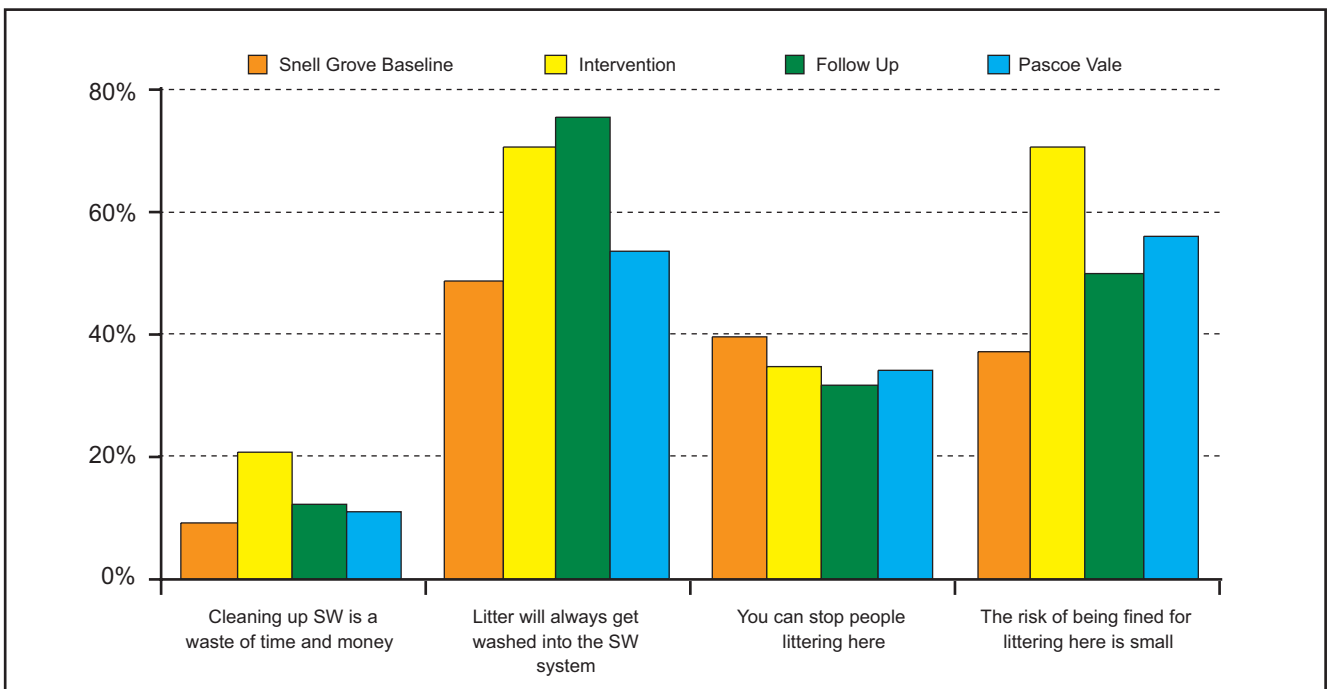


Figure 4.15 Community Attitudes Towards Litter Management Strategies

Source: Curnow and Spehr (2004).

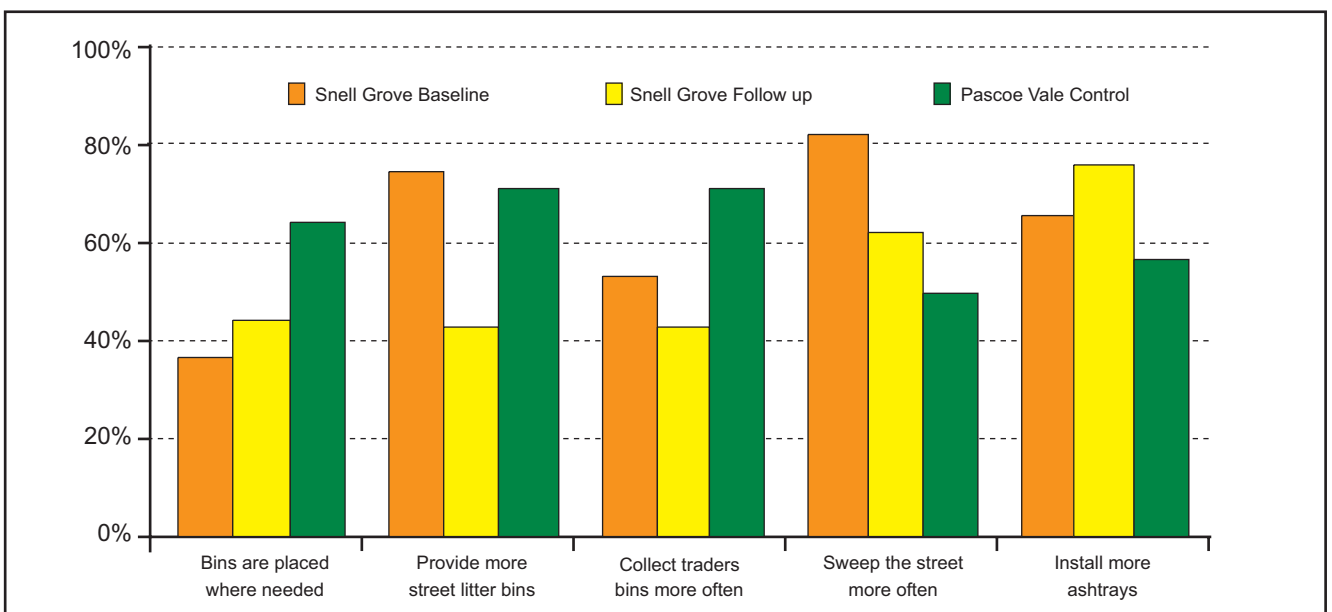


Figure 4.16 Trader Attitudes Towards Specific Litter and Waste Management Activities / Facilities Provided by Council

Source: Curnow and Spehr (2004). 39

The data plotted in Figure 4.16 represent mixed results (i.e. some positive trends). It appears that unlike the community, the majority of traders believe that bins are not placed where needed. More traders held this attitude at Snell Grove than traders at the control location. The strength of this attitude did not greatly decrease over the monitoring period, despite Council’s attempts to improve BINfrastructure at Snell Grove.

Compared to data from the baseline monitoring stage and the control site, substantially fewer Snell Grove traders during the follow-up stage indicated that Council should provide more litter bins, which represents a positive result.

Compared to data from the baseline monitoring stage and the control site, slightly fewer Snell Grove traders during the follow-up stage indicated that Council should collect their bins more frequently, which represents a positive result.

Compared to data from the baseline monitoring stage and the control site, slightly more Snell Grove traders during the follow-up stage indicated that Council should install more ashtrays, which represents a disappointing result.

Figure 4.17 presents data on trader attitudes towards litter management strategies in general.

The results presented in Figure 4.17 show no strong, sustained, positive trends. All trends in the data for Snell Grove are at best neutral, or at worst strongly negative. The data support the view that traders became pessimistic throughout the campaign, with substantially more traders (i.e. at least 20% more) believing during the follow-up stage that “litter will always get into the stormwater system” and “you can’t stop people littering here”. This is concerning, as this increased level of pessimism, combined with a large (approximately 50%) increase in the number of traders who believed that the risk of being fined for littering at Snell Grove is small, may translate to poorer than normal litter and waste management activities in the future.

Community Change interpreted the lack of optimism of traders in the Snell Grove district to be “probably the result of an increase in the awareness of stormwater issues, but with inadequate knowledge or sense of coordinated competence at being able to address the problem” (Curnow and Spehr, 2004, p. 62).

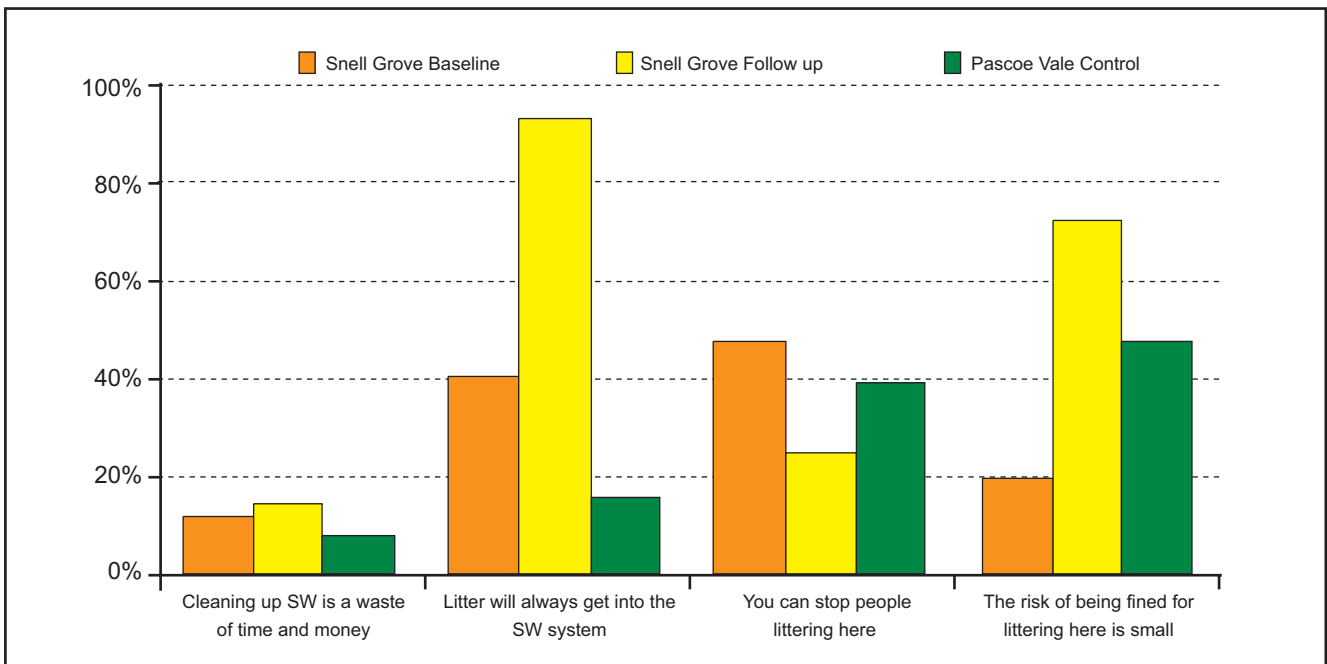


Figure 4.17 Trader Attitudes Towards Litter Management Strategies

Source: Curnow and Spehr (2004).

**Attitudes Towards Council’s Litter Management Performance**

Figure 4.18 highlights how satisfied traders and the community were with litter management in their local area. As the respondents considered that Council was the lead agent for litter management in the area, this is effectively an over-all assessment of Council’s performance over the monitoring period.

The data presented in Figure 4.18 supports the view that the level of trader satisfaction with litter management in the area (by Council) substantially improved during the intervention period, but this improvement was not fully sustained at follow-up. At follow-up, the traders’ level of satisfaction was similar to the control site. This result highlights the need for on-going campaigns / programs that continue to build on the relationships that have been developed through participatory education strategies.

The level of community satisfaction with litter management in the area (by Council) did not appear to substantially change during the monitoring period.

**4.3.5 Self-reported Actions to Manage Litter and Stormwater Quality**

Traders were asked about their litter and waste management activities. These self-reported actions were then checked using visual inspections / audits by the evaluation team.

Figures 4.19 and 4.20 summarise self-reported actions by traders with respect to litter, waste and stormwater management.

The self-reported actions in Figures 4.19 and 4.20 represent unimpressive results, with little clear improvement. Of the six self-reported actions, only one appears to be associated with significant change during the monitoring period at Snell Grove (i.e. “we inform new staff on waste minimisation”). For this self-reported action, there was at least a 25% increase in the number of traders that reported doing this activity “often”. However, the improved results at Snell Grove during the follow-up monitoring period were still not substantially different from the control, with approximately 70% of traders at both locations indicating that they undertake this activity “often”.

In terms of validation of self-reported actions, the evaluation team undertook inspections within and behind the traders shops and assessed all relevant procedures. Curnow and Spehr (2004) reported that: “In the main, the general pattern of clean, well ordered shops and appropriate waste storage practices was followed by most traders, although there were some notable exceptions which remained evident throughout the project. However, for those who were willing to participate in the surveys the self reports were generally accurate about their actions particularly for the majority who were doing the right thing and self reports of actions generally did not change much during the project” (p. 67).

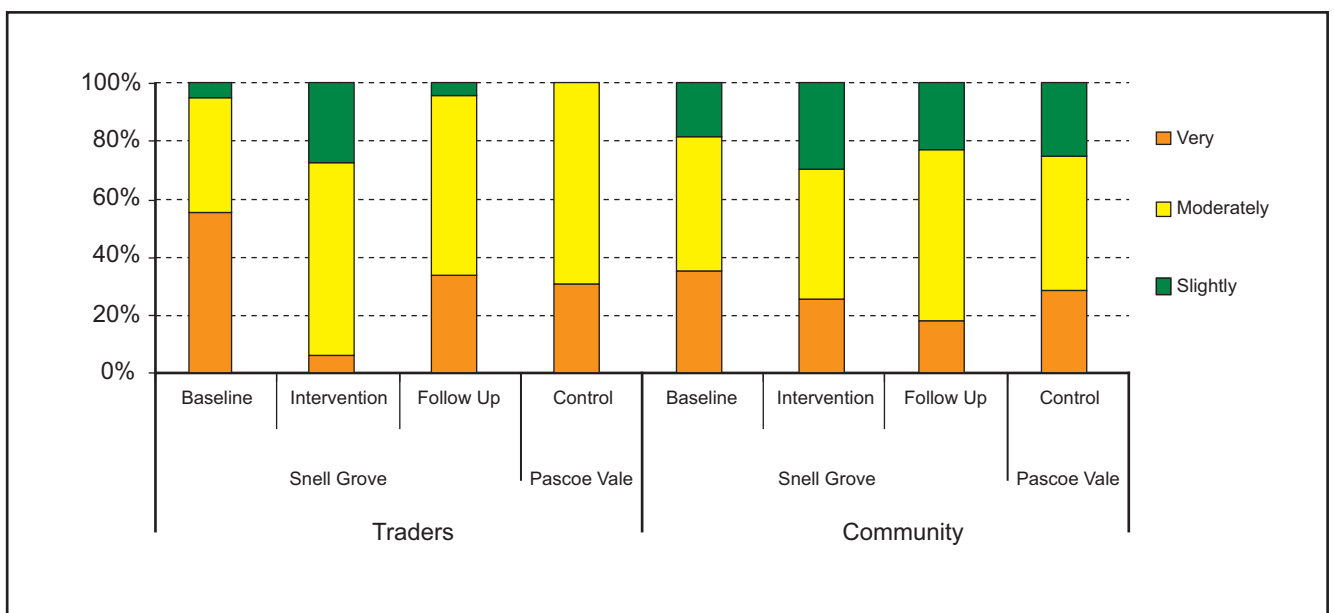


Figure 4.18 Attitudes Towards Council’s Over-all Litter Management Performance

Source: Curnow and Spehr (2004).

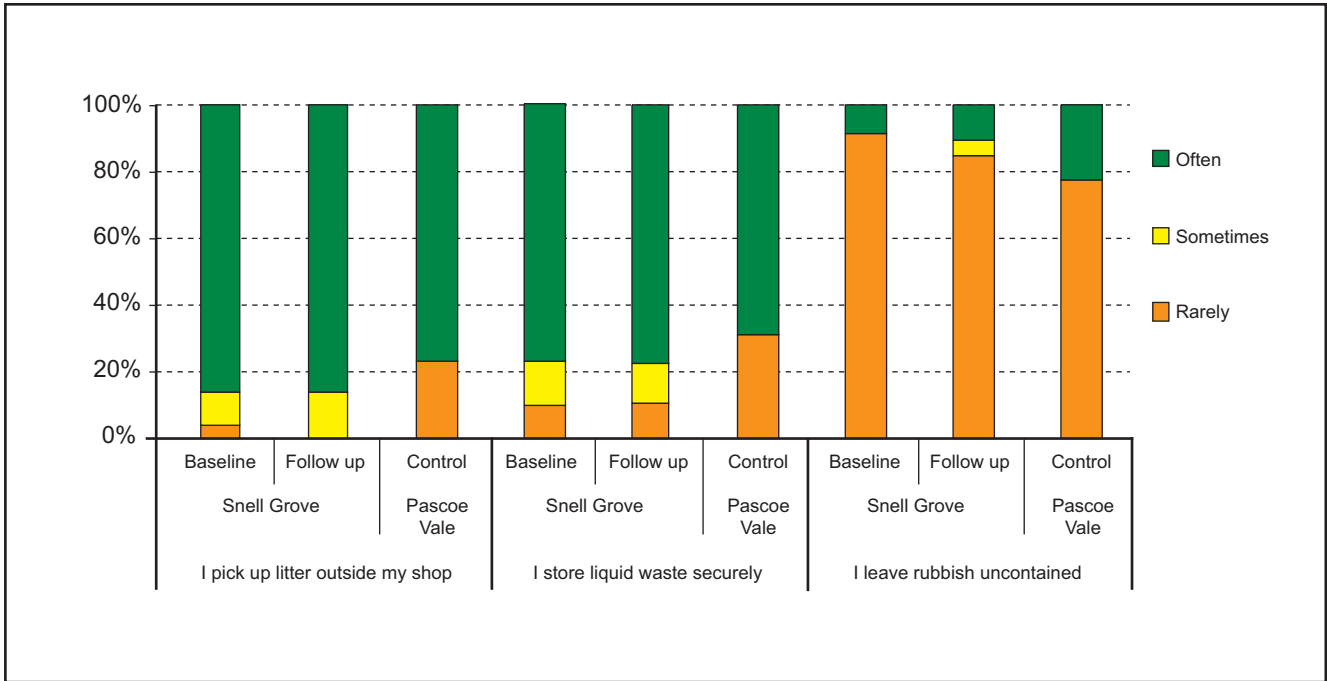


Figure 4.19 Three Self-reported Actions by Traders

Source: Curnow and Spehr (2004).

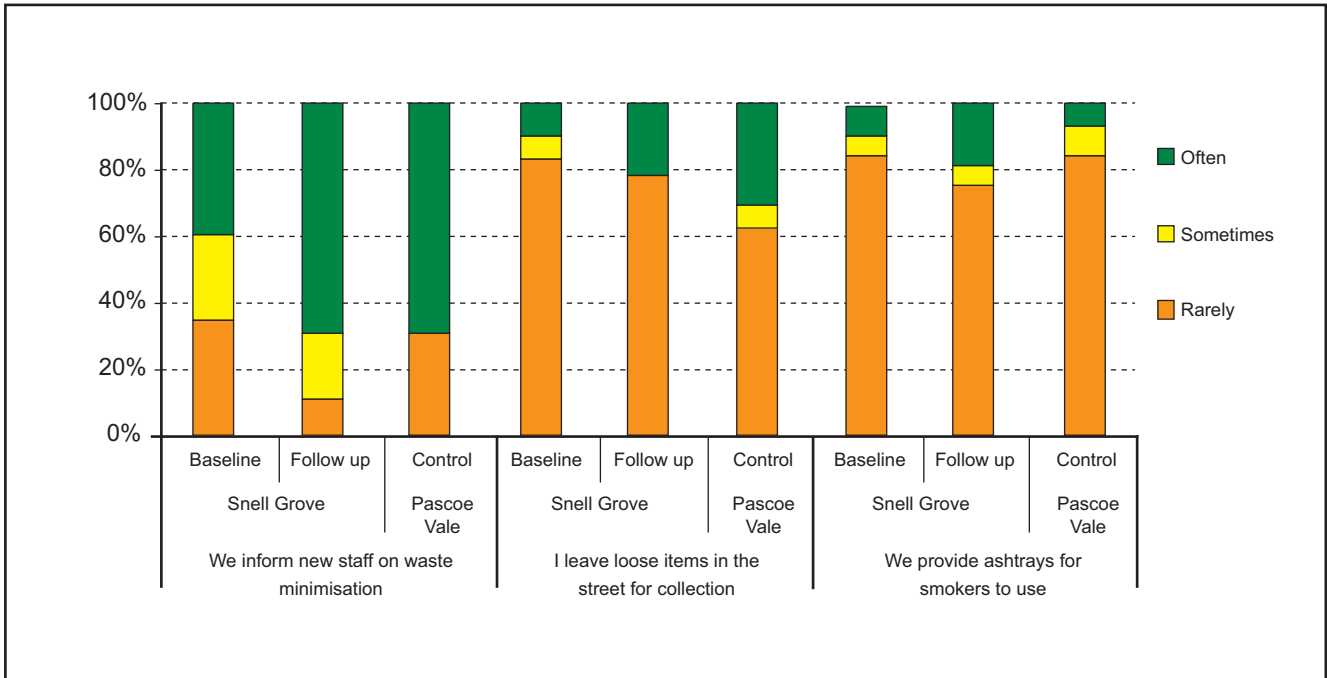


Figure 4.20 Three More Self-reported Actions by Traders

Source: Curnow and Spehr (2004).



### 4.3.6 Changes in People’s Behaviour

#### Traders’ Behaviour

The evaluation team developed a subjective, 10 point sliding scale to rate actions of traders to prevent litter and stormwater pollution. Permission was sought and generally obtained from traders to assess activities such as storing materials, preventing litter and preventing stormwater pollution.

Three types of rating were used: the evaluation team assessed a particular premises; the trader assessed their own premises; and the trader assessed the performance of other traders in their precinct. Average ratings produced from this process are summarised in Figure 4.21.

Qualitative feedback provided to the evaluation team indicated that some traders who had improved their rating thought that the change was due to the education campaign and visits from Council educators, while other traders whose performance had deteriorated appeared disillusioned with the response to the clean-up event and “lack of attention from educators” (Curnow and Spehr, 2004, p. 68).

The results in Figure 4.21 indicate that trader performance was relatively high throughout the monitoring period (i.e. greater than 70%) and using the independent assessor’s ratings, appears to have risen during the monitoring period by approximately 10%. This is a positive result.

In contrast to the independent ratings, the self-assessment ratings declined over the monitoring period at Snell Grove. This may have been due to:

- Traders at Snell Grove became slightly more aware of appropriate management practices throughout the campaign and were less inclined to rate their actions at the high baseline levels (Curnow and Spehr, 2004).
- Traders becoming generally disillusioned with the campaign and pessimistic about the likelihood of long term change in Snell Grove, which resulted in a harsher self assessment at the follow-up stage.
- Random variation in the subjective rating system (i.e. there may have been no real change in trader behaviour).

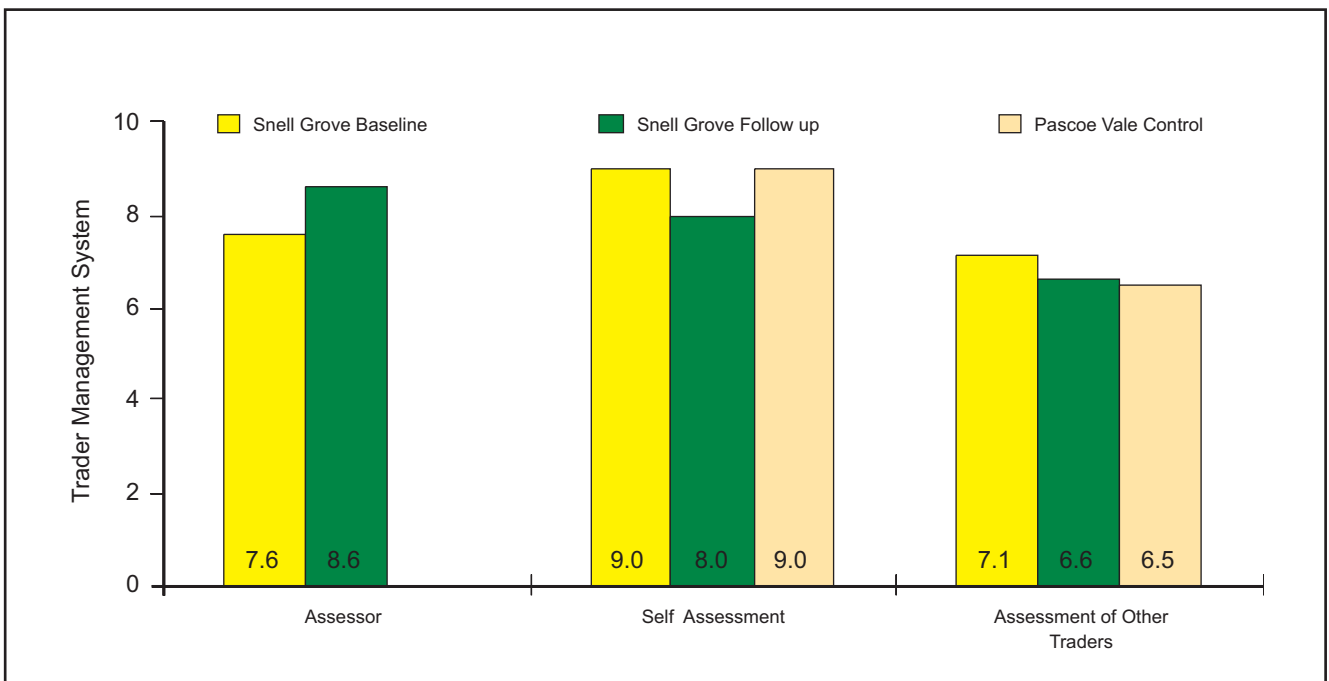


Figure 4.21 Assessment of Trader Actions to Prevent Litter and Stormwater Pollution

Source: Curnow and Spehr (2004).

**The Community’s Behaviour**

Actions of the community were also monitored at Snell Grove to measure the effect of the education / participation campaign on disposal activities in the street (e.g. littering, recycling and binning). Monitoring of this nature was not undertaken at the control site, due to a limited number of pedestrians moving through the precinct. Figure 4.22 presents the positive disposal actions (i.e. using appropriate bins) as a percentage of all disposal actions that were observed by the evaluation team at Snell Grove.

Despite the education / participation campaign focusing on traders rather than the broader community, the results in Figure 4.22 indicate that there was *probably* a slight improvement in disposal actions over the monitoring period at Snell Grove (i.e. around 10%).

Given the lack of engagement of the broader community in the education / participation campaign and their lack of knowledge improvement throughout the program (see Section 4.3.3), it is possible that the

improvements in disposal behaviours observed at Snell Grove were primarily the result of improvements:

- to the area’s BINfrastructure (e.g. new, clean bins and surrounds, as well as improved access to ashtrays); and
- in facilities and the general cleanliness of the area (Curnow and Spehr, 2004).

It is also possible that improvement in the community’s binning behaviour was influenced by drain stencilling, educational material distributed and displayed by the traders in Snell Grove (i.e. brochures and posters), as well as the provision of windproof ashtrays by traders. That is, the community may not have significantly improved their *knowledge* with respect to litter and stormwater management, but had recognised that an attempt was being made to minimise litter in the area, which may have encouraged them to dispose of litter appropriately.

Another explanation is that the community may have become aware of the evaluation team at Snell Grove, given they interviewed citizens and traders on several occasions (e.g. 342 community surveys were

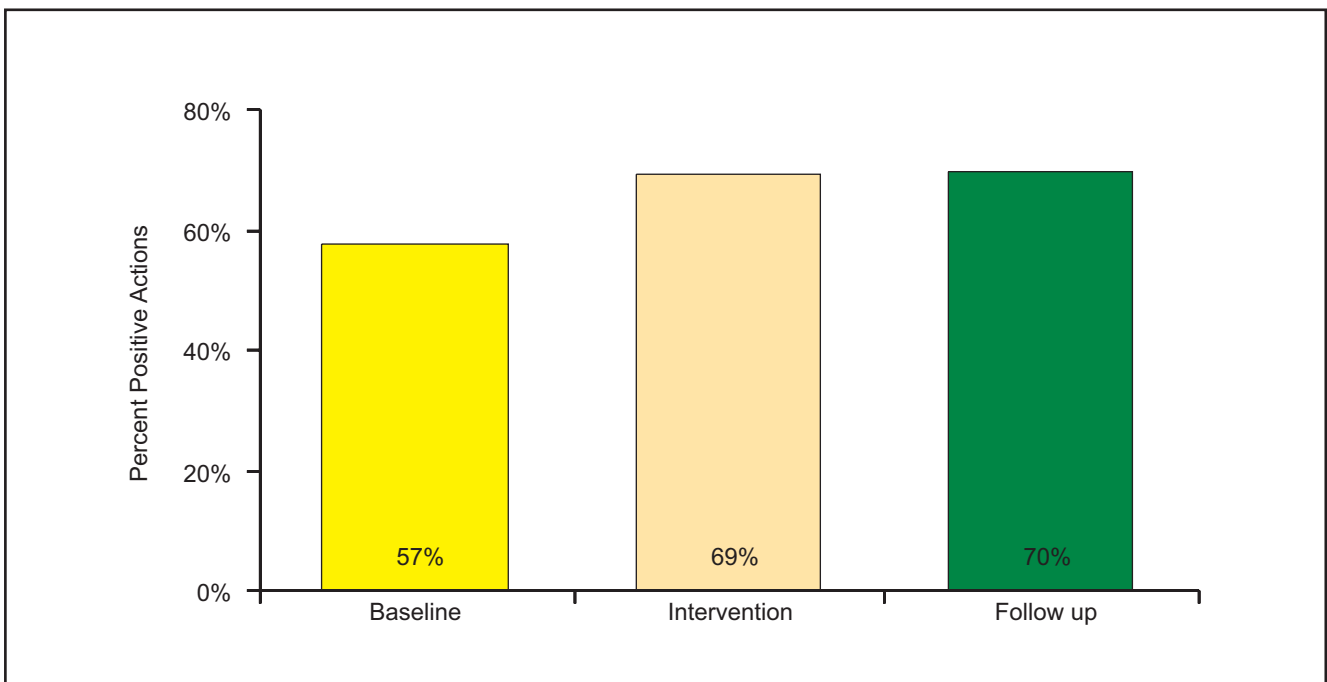


Figure 4.22 Community Disposal Actions

Source: Curnow and Spehr (2004).

undertaken over four monitoring stages) and observed people's littering / binning behaviour in the street. This awareness may have led to improved binning behaviour. As no control data is available for observed 'community disposal actions', this hypothesis cannot be tested.

#### **4.4 Conclusions from this Style of Evaluation**

The CCAT (Clean Communities Assessment Tool) 'summary ratings' are a good indication of the overall effect of the education / participation campaign. That is, it is *most likely* that there was a modest improvement in litter and stormwater management activities in the Snell Grove commercial district during the intervention period which was not fully sustained at the follow-up stage, approximately seven months after the campaign had finished (i.e. CCAT summary ratings at Snell Grove rose from 3.1 to 3.7 during the program, then fell to 3.5, while ratings for the control site varied between 3.1 and 3.3). The statistical significance associated with this result is unknown. This result is however, generally consistent with the findings of the litter load monitoring work (see Chapter 5).

It appears that the most significant factor that influenced the CCAT summary ratings was improvements to 'facilities' at Snell Grove during the program. In particular, improvements were made during the intervention period on bin-related infrastructure (e.g. new bins, access to ashtrays, etc.), and to a lesser extent, other Council-managed infrastructure (e.g. repairing street furniture, boundary markers, maintenance of landscaping, etc.). This effect was measured by the CCAT 'facilities rating'.

The CCAT 'context rating' showed slight improvement throughout the monitoring period, with the highest levels being during the follow-up stage which is thought to be the result of the community 'coming together' after a local tragedy (i.e. the murder of a young man on Snell Grove).

Throughout the program there was an increase in the overall amenity of the area. For example, illegally dumped rubbish and litter was cleaned up from behind

the traders' shops and some of the illegally dumped rubbish was removed from around the railway area. This improvement in context may have been one of the reasons why positive disposal behaviour was observed to slightly increase in the community during the campaign and at follow-up.

Traders and the community at Snell Grove thought that the main reason why people littered was that they were "too lazy to look for bins". Assuming this is true, it would be logical to assume that the provision of improved bin-related infrastructure may have contributed to the improvement in positive disposal behaviour that was observed in the community during the campaign and at the follow-up stage, seven months later.

The campaign did not appear to be successful at improving the knowledge of the community with respect to littering and stormwater management. Of greater concern was the campaign's inability to substantially improve the knowledge of traders in all but a few areas (e.g. two of 10 knowledge areas relating to best practice litter, waste and stormwater management) and to sustain any slight improvement of knowledge throughout the monitoring period. This is of concern, given the focus of the education / participation campaign was on the traders and relatively intensive, tailored, one-to-one educational strategies were employed.

The campaign did not substantially change the CCAT rating for community 'attitudes and perceptions'. The community's attitude towards littering, clean-up and litter prevention either did not substantially change or became generally more pessimistic. This pessimism, combined with the belief that enforcement of litter-related laws at Snell Grove won't occur may hinder future attempts at promoting positive disposal behaviour unless it is addressed (see Chapter 7 for a recommendation on this issue).

The attitudes and perceptions of traders also became more pessimistic over the monitoring period. It appears the campaign did not inspire or motivate many traders, which may have been a result of the campaign not including any positive feedback mechanisms (e.g.

positive incentives, rewards and/or recognition schemes). One positive result was that satisfaction of traders with Council's litter management activities did substantially improve throughout the campaign, although this level of satisfaction was not fully sustained during the follow-up stage.

Self-reported actions of traders produced mixed results, with no areas of substantial improvement being noted. The accuracy of these self-reported actions was relatively high, perhaps because enforcement of litter and stormwater-related environmental legislation was not a part of the campaign, so traders felt comfortable disclosing their activities to evaluators. In addition, those traders who allowed assessors to inspect their premises were generally performing well.

Independent assessors rated the performance of traders in litter, waste and stormwater management as improving by approximately 10% from the baseline to the intervention monitoring stage (i.e. from 7.6 to 8.6 out of 10). This is a positive result. Interestingly, the traders rated their own performance as dropping 10% in this period (i.e. from 9.0 to 8.0). This may have been a result of *slightly* increased knowledge about what they should be doing and/or the psychological effect of becoming more pessimistic about environmental management at Snell Grove.

Observations of people's littering and binning behaviour whilst using Snell Grove indicates that positive disposal behaviour may have slightly increased (by approximately 10%) during the intervention period which was sustained during the follow-up stage. Assuming this observation represents a real phenomenon, rather than a product of natural variation, it is most likely that the improvement is a result of improved bin-related infrastructure at Snell Grove. Other possible explanations are that people became more aware of the presence of the evaluation team and/or the improvement to the amenity of the area (e.g. less illegal dumping, improved infrastructure) may have promoted positive disposal behaviour as reported in the literature (see Curnow, 2004).

The following recommendations are made for future education / participation campaigns of a similar nature to that undertaken at Snell Grove:

- Future campaigns should seek to place a priority on the assessment, replacement and maintenance of bin-related infrastructure (e.g. litter bins, recycling bins and butt bins).
- Future campaigns should seek to place a priority on providing positive feedback mechanisms to people who are improving their behaviour with respect to litter and stormwater management (e.g. traders). These include public recognition and reward / incentive mechanisms that operate regardless of the size of the behavioural change.
- Future campaigns should seek to place a priority on motivating and inspiring participants, rather than simply providing knowledge. Positive feedback mechanisms are one strategy to achieve this (i.e. widely communicating, promoting and rewarding even minor positive outcomes). Care is needed to avoid strategies that have a high probability of failure (e.g. a poorly supported clean-up event), as this may generate disillusionment and pessimism which may handicap a wide variety of subsequent activities.
- Future campaigns should take an on-going and coordinated approach involving education, rewards and enforcement. It is possible that education programs that communicate that enforcement is not part of the campaign may promote unwanted behaviour.
- Multiple agencies should be strongly involved (e.g. for the Snell Grove campaign, action was desired in the areas of bin-related infrastructure, general maintenance of the area, enforcement of illegal activities occurring in the street, clean-up of the railway area, coordination of a community response to a local tragedy, etc.).
- Considerable staff time is needed to design and execute education / participation programs of this nature, particularly if they are to be ongoing. Throughout the program at Snell Grove, traders changed their preferred method of communication

from written material to face-to-face meetings with Council staff. Such meetings take considerable time and effort to deliver given limited opportunities to spend time with busy traders (i.e. re-scheduling and multiple visits are typically needed, with some visits being outside of business hours). Substantial time is also needed to build relationships with traders and respond to other issues that emerge (e.g. the need to enforce specific local laws that may not be litter-related).

- Future campaigns should look to more actively engage the broader community rather than focusing on the traders. Initial attempts to do this at Snell Grove (e.g. to engage school groups) proved to be difficult and were not pursued. As a result, educational strategies were passive and low impact (e.g. drain stencilling, brochures, posters) rather than participatory and made no substantial effect on the community's litter-related attitudes or knowledge.
- The CCAT monitoring method was found to be informative, producing many qualitative and quantitative results. The method also helped to explain findings from other evaluation styles. The inclusion of a control site was very valuable and is recommended for future campaigns.
- The significance of subtle changes in the monitoring parameters used for this style of evaluation were hard to assess without undertaking statistical analyses. For Snell Grove, expert opinion had to be used to determine whether slight increases or decreases (in comparison to baseline and control site conditions) represented real and substantial change. In retrospect, a statistical approach would have been superior.

Further recommendations sourced directly from Curnow and Spehr's (2004) monitoring and evaluation report for work involving the 'Clean Communities Assessment Tool' are provided in Appendix 4.





## 5. Evaluation Style 6 - Monitoring Stormwater Litter Loads

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### 5.1 Introduction

This style of evaluation involved monitoring litter loads in stormwater draining from the Snell Grove precinct as well as the Gaffney Street control site. It aimed to determine whether the education / participation campaign made any noticeable difference to the quantity of litter being washed from the streets and pavements of Snell Grove and into local waterways.

The CRC for Catchment Hydrology (Monash University) undertook this form of monitoring and data analysis. The monitoring was led by Justin Lewis, with Dr Tim Fletcher assisting with the data analysis. Justin's activities were coordinated with those staff from Council who implemented the education / participation campaign through the project's Steering Group.

A more detailed monitoring report for this style of evaluation is available on request (i.e. Lewis *et al.*, 2005). Key findings and conclusions are summarised here. In addition, key monitoring details are summarised in the 'Data Recording Sheet' for evaluation style no. 6 in Appendix 2 (these sheets help to summarise the most salient features of the monitoring and evaluation program to help communicate the results to others).

### 5.2 Monitoring and Analysis Methods

#### 5.2.1 Monitoring Sites and Methods

Monitoring for this style of evaluation used a paired catchment approach, with the 'study catchment' (Snell Grove, 9 ha in size) being compared to a 'control catchment' (Gaffney Street, 3.7 ha in size). Monitoring of litter loads in stormwater was undertaken at each catchment, during the same period, commencing on 27 November 2002<sup>8</sup>. After approximately seven months of pre-campaign monitoring, the education campaign commenced,

operating for approximately eight months (i.e. May to December 2003). Litter load monitoring continued throughout the campaign and for another 7 months (see Table 5.1).

Gross pollutants in stormwater were monitored using side entry pit traps (SEPTs) (see Plates 5.1 and 5.2). Three SEPTs were located at each site (i.e. Snell Grove and Gaffney Street). Temporary monitoring nets were used for the first three monitoring events (clean-outs) at Snell Grove until the SEPTs were obtained. 'Enviropod' SEPTs were kindly donated to the project by their supplier, Ingal Environmental.

The temporary monitoring nets were a type commonly used for fishing nets and had a fine mesh (i.e. a 3 mm pore size). These nets were firstly checked for strength during a previous SEPT study conducted by Monash University in Frankston and St Kilda and were found to be suitable. Installation of the monitoring net occurred as follows. Each side of the Side Entry Pit (SEP) had two holes drilled into it approximately 20 - 25 cm below the invert of the gutter. The sides of the SEP were measured and pine planks (4 cm x 2 cm in cross-section) were attached to the SEP walls. This was followed by using a staple gun to affix the netting to the timber. This then formed the capture net where any material that entered the SEP would be retained.

The temporary monitoring nets were installed with a 2 cm gap at one end which acted as a crude overflow device to prevent local flooding during significant rainfall events. This end was 5 cm higher than the other sides of the monitoring net which increased the potential storage volume of the monitoring net and also reduced the possibility of litter being washed over the bypass mechanism.

The nets were routinely sampled every four to six weeks or after significant rainfall. During sampling, the trapped gross pollutants were manually removed and taken to a laboratory where it was sorted, weighed and broadly catalogued according to type and source (see Plate 5.3). The categories of litter were broadly aligned with those used by Community Change during their analysis of people's actual littering behaviour (see Figure 4.4).

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<sup>8</sup> Monitoring at Snell Grove commenced slightly earlier (i.e. 9 September 2002), but the earlier data has been excluded from the analysis, to satisfy the 'paired-catchment' approach.

Table 5.1 Timeline and Number of Storm Events Sampled

<b>Stage</b>	<b>Storm Event Number</b>	<b>Monitoring Date</b>	<b>Rainfall (mm)</b>	<b>Cleanout Interval (days)</b>
<b>Pre-campaign</b>	4	27/11/2002	23	41
	5	6/12/2002	9	9
	6	7/01/2003	4	30
	7	4/03/2003	24	55
	8	14/4/2003	68	40
	9	29/4/2003	14	15
	10	28/5/2003	12	29
<b>During campaign</b>	11	27/06/2003	10	30
	12	28/7/2003	39	31
	13	15/08/2003	37	18
	14	11/09/2003	39	24
	15	26/9/2003	14	15
	16	10/11/2003	83	46
<b>Post-campaign</b>	17	22/12/2003	49	42
	18	7/01/2004	8	16
	19	16/2/2004	26	40
	20	12/03/2004	11	25
	21	31/03/2004	10	19
	22	19/04/2004	2	19
	23	28/04/2004	47	9
	24	18/05/2004	8	20
	25	28/06/2004	34	41
	26	6/07/2004	4	8



Plates 5.1 and 5.2 The Bag Liners Used in the 'Enviropod' Side Entry Pit Traps  
(photos courtesy of Ingal Environmental)



Plate 5.3 Collecting and Sorting Trapped Litter for Analysis

### 5.2.2 Data Analysis

Data were summarised and graphed to identify general trends and behaviour. Analysis of variance (ANOVA) with Tukey's HSD Post-hoc Tests were used to test for significant differences in litter loads (expressed as the average mass of dry litter per day over each clean-out interval) and proportions (i.e. the proportion of litter in all captured gross pollutants, by mass) across the three stages (i.e. before, during and after the education campaign). Analysis of variance was also undertaken for the difference between the two sites, in terms of both litter loads and proportions.

Alternative statistical techniques, such as analysis of the composition of the error term in regressions between the study and control catchments were also undertaken, but provided no further insight, so the results of these analyses are not reported here.

## 5.3 Key Results and Discussion

### 5.3.1 Results

The following results are the *key findings* from analysis of the litter load data. For the raw data, detailed analysis and a more in-depth discussion of the

data, refer to the background monitoring report for this style of evaluation by Lewis *et al.* (2005).

The load of gross pollutants (i.e. all captured material), organic matter and litter are summarised for Snell Grove and Gaffney Street in Table 5.2.

#### *Gross Pollutant Loads and Organic Matter*

The average daily mass of trapped gross pollutants increased over time at both sites, although the changes were *not statistically significant* when considered either over time (using linear regression) or considered as three stages (using ANOVA). The daily loads of organic matter also increased over time at both sites, although these increases were also not statistically significant (at  $p < 0.05$ ).

#### *Effect of the Education / Participation Campaign on Litter Loads*

The mass of litter at Gaffney Street (the control site / catchment) increased from the pre-campaign to post-campaign stages (refer to Table 5.2 and the box plot in Figure 5.1). The difference between stages is however not statistically significant (ANOVA  $p = 0.29$ ). However, the result shows that the increase from pre-

Table 5.2 Gross Pollutant-related Statistics Before, During and After the Education / Participation Campaign

Stage	Average Mass of Gross Pollutants (kg/day)	Average Mass of Organic Matter (kg/day)	Average Mass of Litter (kg/day)	Litter (% by mass)	Organic Matter (% by mass)	Average Rainfall (mm)	Average Cleanout Interval (days)
<b>Snell Grove</b>							
<b>Pre-campaign</b>	0.274	0.250	0.024	12.0	88.0	21.8	31.3
<b>During campaign</b>	0.391	0.363	0.029	8.50	91.5	37.1	27.3
<b>Post-campaign</b>	0.468	0.440	0.028	6.70	93.3	19.9	23.9
<b>Gaffney Street (control site)</b>							
<b>Pre-campaign</b>	0.441	0.424	0.016	7.50	92.5	21.8	31.3
<b>During campaign</b>	0.718	0.687	0.031	4.50	93.3	37.1	27.3
<b>Post-campaign</b>	0.652	0.621	0.031	7.00	93.0	19.9	23.9

Note: Pollutant loads are presented on a time-weighted per-day basis (i.e. the sum of all clean-out masses in the monitoring periods [kg] divided by the sum of all of the clean-out intervals [days]). Note that litter is part of the gross pollutant load.

to post-campaign is 71% likely to be more than just a product of random variation. That is, for some reason litter loads are *likely* to have increased at the control site over the monitoring period. Possible reasons include changes in rainfall intensity, greater number of people using the area and/or changed weather conditions (e.g. wind blowing material from bins).

At Snell Grove, there was also a slight increase in litter loads from the pre-campaign to post-campaign monitoring stages (see Figure 5.1). However, the differences at this site are clearly not statistically significant (ANOVA  $p = 0.90$ ). Thus, the increase is 90% likely to be just a function of random variation.

One of the objectives of the project was to quantify the magnitude of change in litter loads. The data indicate that compared to Gaffney Street, there was a 77%

*relative* decrease in litter load (time-weighted average mass in kg/day) over the pre- to post-campaign stages, even though the time-weighted average mass of litter per day increased at both sites over this period. That is, the time-weighted average mass of litter in kg/day at Snell Grove increased by 17% and at Gaffney Street it increased by 94%. However, as the confidence associated with these results is low, we cannot claim that these results are statistically significant. We can only say that there is some evidence, albeit *very weak*, that relative to the control site, Snell Grove experienced lower litter generation as a result of the education / participation campaign.

When the *differences in litter loads between the two sites* are considered using Equation 1, the difference between the three stages are not statistically significant (ANOVA  $p = 0.34$ ). In simple terms, this means that

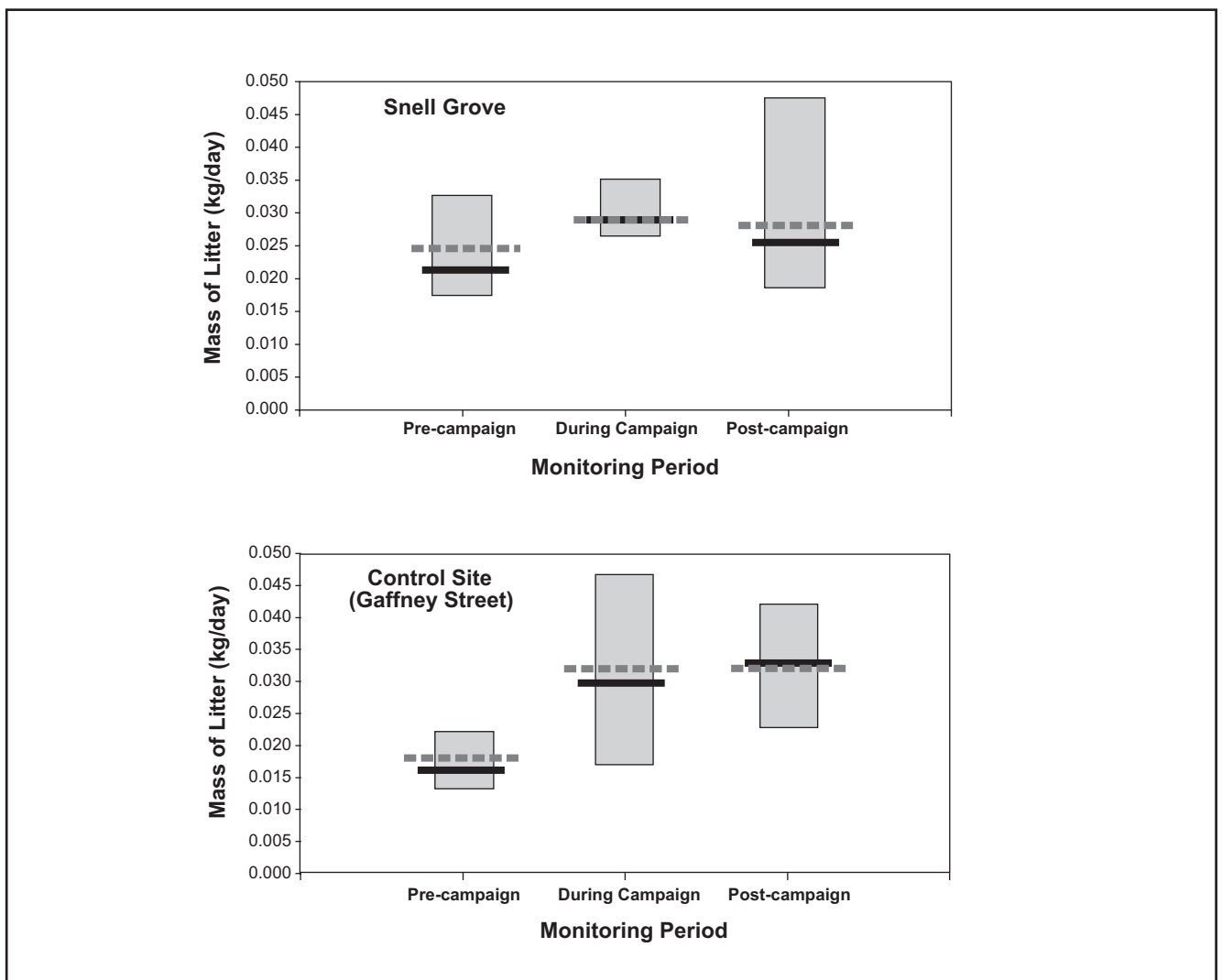


Figure 5.1 Box Plots Showing Time-weighted Average (Dotted Line), Median (Solid Line) and Inter-quartile Range (Box) of Litter Mass at Snell Grove and Gaffney Street Pre-, During and Post-Campaign



there is a 66% probability that the difference in litter loads between the two sites is not just a function of random variation (i.e. chance). This gives only low confidence (in traditional statistical terms a probability of 95% is deemed to be 'significant') that the campaign has reduced litter loads at Snell Grove, relative to the control.

$$\begin{aligned} & \text{Litter mass difference} \\ & = \text{Snell Grove litter mass/day} \quad (1) \\ & - \text{Gaffney Street litter mass/day} \end{aligned}$$

### ***Effect of Education Campaign on Litter Proportion***

Changes in the *proportion* of litter in the total gross pollutant load provides another important insight into the effect of the education campaign.

The proportion of litter at both sites generally decreases over time (see Table 5.2). The proportion of gross pollutants made up by litter decreases from the pre- to post-campaign stages at Snell Grove (i.e. from 12 to 6.7%), whilst the decrease at Gaffney Street is less clear (i.e. decreasing from 7.5 to 7.0%, but with a bigger decrease to 4.5% during the campaign). At Snell Grove, this decrease over the pre- to post-campaign *stages* is much more statistically significant (ANOVA  $p = 0.17$ ) than at Gaffney Street ( $p = 0.55$ ). Similarly, the decreasing trend over time (rather than the stages) in the proportion of litter at Snell Grove is statistically significant (regression  $p = 0.01$ ), whilst it is not significant at Gaffney Street (regression  $p = 0.36$ ). Whilst it is important to acknowledge that the Snell Grove result is affected by one very high value in the pre-campaign period (on 7 January 2003), analysis without that point still produces a significant result ( $p = 0.03$ ).

Note however that decreases in the proportion of litter in the total gross pollutant load could be the result of factors such as seasonal leaf-fall. For this reason, the *relative difference* of this parameter between the two sites is a better indication of the effect of the campaign.

If the *difference between sites* in terms of the proportion of gross pollutants made up by litter is considered, similar observations can be made. The broad conclusion is that at Snell Grove, the proportion of gross pollutants made up by litter decreases from

before to after the education / participation campaign by a greater amount than occurred at Gaffney Street. Specifically, at Snell Grove there was a 37% decrease in the percent of litter in the total gross pollutant load (kg/day) over the pre- to post-campaign stages *relative* to Gaffney Street (i.e. Snell Grove reduced by 44%, while Gaffney Street only reduced by 6.7%). This relative change over time was weakly significant (ANOVA  $p = 0.09$ ), suggesting that it was 91% likely to be a function of more than just random chance.

### ***Litter Composition***

The analysis of captured litter included a breakdown of littered items before, immediately after and approximately eight months after the campaign at Snell Grove and Gaffney Street. Categories included plastic, paper, cardboard, foil, metal, glass, commercial and tobacco products.

The breakdown of litter at both sites, as well as pre-, immediately after, and post-campaign was remarkably similar (see Lewis *et al.*, 2005). Figure 5.2 gives an indication of this breakdown as a percentage by mass.

The most prevalent littered item by number at both sites was discarded cigarette butts and their packaging. The predominant item by volume was plastic drink containers (i.e. cola drinks and flavoured milk). Other common items included fast food wrappers and confectionary wrappers which may be a result of the high numbers of school children who passed by each location on school days.

### **5.3.2 Discussion**

The results of this style of evaluation suggest that the education / participation campaign at Snell Grove probably had a *very weak* positive effect in reducing litter loads from the catchment, when compared with the control catchment, Gaffney Street. However, the result is less than certain. The relatively low degree of confidence in these findings may be due to:

- A relatively small sample set (i.e. seven litter sampling events before the campaign, six events during the campaign, and 10 events after the campaign). Whilst this was a substantial monitoring effort, it is still a small dataset and thus



prone to the effects of variations in rainfall, wind, season differences (e.g. leaf-fall), etc.

- The intensity and/or quality of the education / participation campaign at Snell Grove, relative to that needed to achieve a substantial and sustained reduction in litter loads in stormwater.

#### 5.4 Conclusions from this Style of Evaluation

The primary objective for this style of evaluation was to determine whether loads of litter in stormwater draining the commercial district of Snell Grove significantly decreased during and/or after the anti-litter education / participation campaign compared to pre-campaign litter loads and if so, quantify the magnitude of change. Litter loads appeared to increase at both Snell Grove and Gaffney Street, over the period from pre- to post-campaign.

Overall however, when data from both the intervention and control sites are analysed together, the results *suggest* that:

- the education / participation campaign reduced litter loads at Snell Grove *relative* to those at Gaffney Street despite increases in total litter loads over time at both sites; and
- the proportion of litter in the total gross pollutant load decreased at Snell Grove *relative* to Gaffney Street.

However, the education / participation campaign's effect appears to be relatively weak resulting in subtle effects on stormwater quality, few of which are statistically significant. This may be due to a combination of the relatively small dataset (i.e. a relatively small number of litter load samples) and/or possible deficiencies in the design and implementation of the education / participation campaign (i.e. it may have only produced a small improvement in litter-related activity).

This style of evaluation has been very useful to the over-all evaluation of litter-related activities at Snell Grove as it has highlighted the importance of statistical analysis in the interpretation of data such as that plotted in Figure 5.1. It is very tempting at first glance and without much thought to interpret such data as being strongly supportive that the mass of litter has dropped at the intervention site *relative* to the control site. The statistical analyses conducted for this style of evaluation indicate that at best, we have only 66% confidence that relative to the 'control' litter loads from Gaffney Street, Snell Grove experienced a decrease in litter loads over the whole monitoring period. That is, we have a fairly weak case to suggest the campaign reduced litter loads in comparison to the control site, given the generally accepted level of confidence for statistical 'significance' is  $\geq 95\%$ . This lesson is one that provides value when interpreting the results from evaluation styles 2, 3, 4 and 5, where levels of confidence associated with results have not been calculated, only estimated in broad terms.

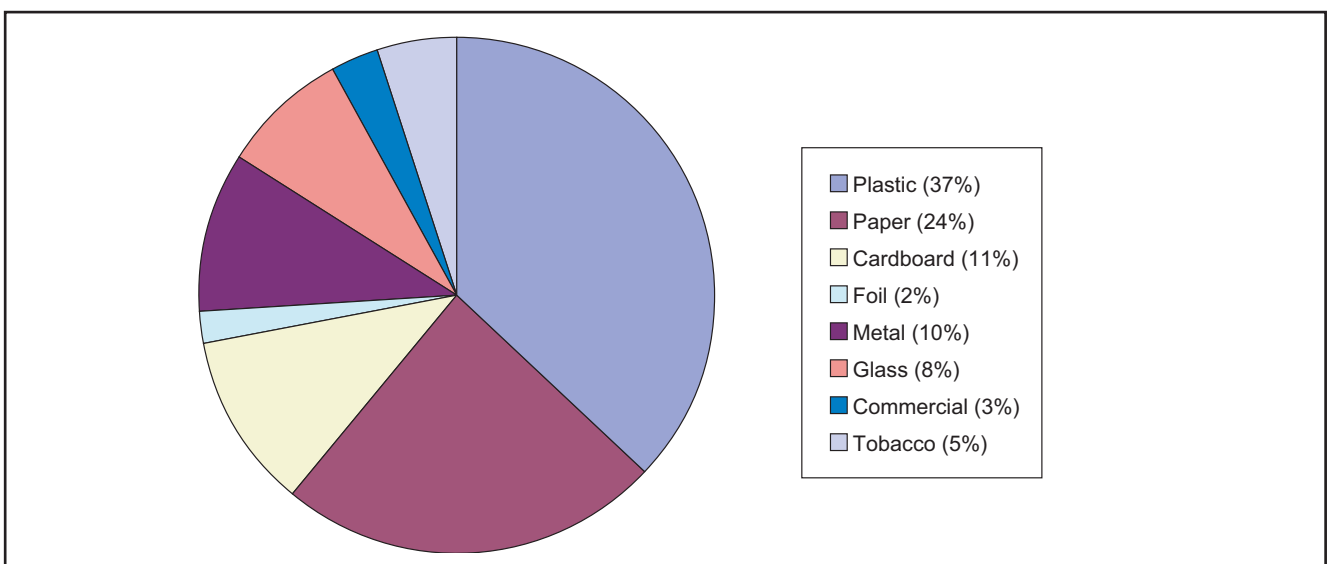


Figure 5.2 Litter Composition (by Mass) at Snell Grove Immediately Post-campaign



## 6. Conclusions from All Forms of Evaluation

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These conclusions are structured using the four 'evaluation objectives' for the project that are defined in Section 2.3.

**Evaluation objective no. 1: Determine whether the anti-litter education / participation campaign that was run within the commercial district of Snell Grove in 2003 was fully implemented as set out in the project plan that was current immediately prior to the commencement of the campaign.**

Approximately 50% of the actions planned immediately before the beginning of the campaign were delivered on time. Approximately 30% were delivered later than expected. Approximately 20% of planned tasks were not done.

Some important activities that would have provided positive feedback to traders and engaged non-trader groups in participatory education were not delivered. Overall however, the Council officers implemented the vast majority of the planned campaign actions (approximately 80%). This is a positive result.

**Evaluation objective no. 2: Determine whether levels of awareness, knowledge, attitudes and behaviour with respect to littering and stormwater management changed as a result of the campaign.**

The Clean Communities Assessment Tool (CCAT) was used as a monitoring method for these styles of evaluation. The CCAT 'summary ratings' are a good indication of the overall effect of the education / participation campaign in terms of changes to awareness / knowledge, attitudes and behaviour. That is, it is *most likely* that there was a modest improvement in litter and stormwater management activities in the Snell Grove commercial district during the intervention period which was not fully sustained at the follow-up stage, approximately seven months after the campaign had finished (i.e. the 1 to 5 CCAT summary ratings at Snell Grove rose from 3.1 to 3.7 during the program, then fell to 3.5, while ratings for

the control site varied between 3.1 and 3.3). The statistical significance of this result is unknown.

The campaign did not appear to be successful at improving the knowledge of the community with respect to littering and stormwater management. Of greater concern was the campaign's inability to substantially improve the knowledge of traders in all but a few areas (e.g. two of 10 knowledge areas relating to best practice litter, waste and stormwater management) and to sustain any slight improvement of knowledge throughout the monitoring period. This is of concern, given the focus of the education / participation campaign was on the traders and relatively intensive, tailored, one-to-one educational strategies were employed.

The campaign did not substantially change the CCAT rating for community 'attitudes and perceptions'. The community's attitude towards littering, clean-up and litter prevention either did not substantially change or became generally more pessimistic.

The attitudes and perceptions of traders also became more pessimistic over the monitoring period. It appears the campaign did not inspire or motivate many traders, which may have been a result of the campaign not including any positive feedback mechanisms (e.g. positive incentives, rewards and/or recognition schemes). One positive result was that satisfaction of traders with Council's litter management activities did substantially improve throughout the campaign, although this level of satisfaction was not fully sustained during the follow-up stage.

Self-reported actions of traders produced mixed results, with no areas of substantial improvement being noted. The accuracy of these self-reported actions was relatively high.

Independent assessors rated the performance of traders in litter, waste and stormwater management as improving by approximately 10% from the baseline to the intervention monitoring stage (i.e. from 7.6 to 8.6 out of 10). This is a positive result.

Observations of people's littering and binning behaviour whilst using Snell Grove indicates that

positive disposal behaviour may have slightly increased (by approximately 10%) during the intervention period which was sustained during the follow-up stage. Assuming this observation represents a real phenomenon, rather than a product of natural variation, it is most likely that the improvement is a result of improved bin-related infrastructure at Snell Grove. Other possible explanations are that people became more aware of the presence of the evaluation team and/or the improvement to the amenity of the area (e.g. less illegal dumping, improved infrastructure) may have promoted positive disposal behaviour as reported in the literature (see Curnow, 2004).

**Evaluation objective no. 3: Determine whether loads of litter in stormwater draining from the commercial district of Snell Grove significantly decreased during and/or after the anti-litter education / participation campaign compared to pre-campaign litter loads (and if so, quantify the magnitude of change).**

When data from both the intervention and control sites are analysed together, the litter load monitoring results suggest that the education / participation campaign *probably* reduced litter loads at Snell Grove, despite increases in the total load of gross pollutants over time, due to other influences such as seasonal leaf-fall. However, the education / participation campaign's effect appears to be relatively weak resulting in subtle effects on stormwater quality, few of which are statistically significant.

In terms of quantifying the likely reduction in litter loads, at best the data indicate that the time-weighted average litter mass (kg/day) over the pre- to post-campaign monitoring stages at Snell Grove increased by approximately 17%, while at the control site it increased by approximately 94%. Consequently the *relative* reduction in litter load at Snell Grove compared to the control site over these stages was approximately 77%. This result is however indicative only and is not statistically significant, as there is only a 66% chance that the difference in litter loads between the two sites over the three stages of the monitoring period is real, and not a function of random variation.

**Evaluation objective no. 4: Provide a broad evaluation on the overall success of the campaign, its strengths and weaknesses, and provide recommendations for future projects of a similar nature.**

The perceived quality of the campaign's design and implementation was also assessed. With the benefit of hindsight, several strengths and weaknesses of the campaign were identified. Specific recommendations for future campaigns are outlined in Chapter 7.

Overall, it is suggested that the education / participation campaign for traders was acceptable, while the campaign for other members of the community was weak.

**Conclusions with respect to the trial of the CRC for Catchment Hydrology's draft monitoring guidelines.**

The Snell Grove project provided a valuable opportunity to trial and improve the CRC for Catchment Hydrology's guidelines. It allowed the evaluation team to improve the draft guidelines before they were finalised (e.g. by adding elements such as the need for a detailed project plan to coordinate activities run by the education and evaluation teams) and to examine the strengths and weaknesses of six of the seven evaluation styles covered by the guidelines.

The project found that evaluation style no. 1 (i.e. assessing whether the campaign was fully implemented and its quality) *on its own* was of little value. It is needed to support more advanced styles of evaluation (e.g. monitoring litter loads and people's behaviour). It is important to confirm that planned actions were in fact delivered, when they were delivered, and identify potential issues (e.g. activities that were not done, or were a feature of the campaign) that may be causes for positive or negative outcomes. For example, the lack of positive feedback mechanisms that were delivered for traders during the campaign *may* have been a reason why their levels of optimism decreased during the campaign.

It was pleasing to note that the overall findings from evaluation styles no. 1, numbers 2, 3, 4 and 5

(combined) and no. 6 were similar. For example, using a 1 to 5 rating scale for the effectiveness of the campaign, the ratings were 3 (evaluation style no. 1), 2.5 (evaluation style numbers 2, 3, 4 and 5) and 3 (evaluation style no. 6). In particular, the conclusions from the summary CCAT rating was consistent with the findings from evaluation style no. 6 (i.e. the measurement of loads of litter in the stormwater network). It is a valuable finding that these two monitoring methods, that are rarely used in parallel given their cost, have produced similar findings when undertaken by two different, independent and specialist monitoring groups.

The monitoring of knowledge / awareness, attitudes and behaviour using the CCAT monitoring method provided great insight into where progress had been made, barriers to improvement and opportunities for improvement (e.g. deficiencies with the education / participation campaign). Styles of evaluation that involved monitoring baseline levels of knowledge / awareness, attitudes and behaviour have the added benefit that they can be used to help design the education campaign (i.e. using baseline information) and help to keep the campaign focused. This benefit is potentially a very significant one.

It is suggested that the only significant weakness of monitoring involving knowledge / awareness, attitudes and behaviour during the Snell Grove project using the CCAT method was in its explanatory power, given many of the observed / measured changes were subtle or non-existent and analysis of the data to identify 'statistical significance' was not undertaken. Sceptical observers are entitled to question whether some of the subtle changes in attitudes, knowledge and behaviour were in fact real, or just the product of chance. Given this reality, little weight has been placed on subtle *changes* in attitudes, knowledge or behaviour that were identified using these styles of evaluation.

The statistical analyses conducted for evaluation style no. 6 (litter load monitoring) indicate that at best, there is a 66% probability that the difference in litter loads between Snell Grove and Gaffney Street is a real phenomenon and not just a function of random variation (i.e. chance). That is we have a case to

suggest the campaign reduced litter loads, but not a strong one, given the generally accepted level of confidence for statistical 'significance' is  $\geq 95\%$ . This lesson is one that provides value when interpreting the results from evaluation style numbers 2, 3, 4 and 5, where levels of confidence associated with results have not been calculated, only estimated using expert judgment.





## 7. Recommendations for Future Programs

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Substantial work was put into designing and implementing the Snell Grove education / participation campaign. While the results were not as positive as those involved would have liked, it is important to recognise that overall, the results *were positive*, particularly in respect to the most important indicators - behavioural change and litter load reductions. The education team, as well as supporting staff within Moreland City Council (e.g. maintenance staff) should therefore be commended for their efforts.

The monitoring and evaluation team believe it is important that the issue of pessimistic attitudes by traders towards litter management at Snell Grove (see Section 4.4) be quickly addressed by Council. This pessimism, combined with the belief that enforcement of litter-related laws at Snell Grove won't occur and the education activities have ceased in the precinct *may* result in poor littering behaviour. It is recommended that Council continue to work with traders in the precinct to address their concerns about issues highlighted in this report and adopt an approach that is consistent with the points for improvement highlighted in this Chapter.

Opportunities to learn from the Snell Grove project and to improve future education / participation campaigns of a similar nature are summarised below.

Based on relevant information from the literature (e.g. Curnow and Crispijn, 2005 and Taylor and Wong, 2002), the benefit of hindsight, and knowledge about the on-the-ground outcomes produced from the campaign, the primary conclusion for future campaigns that aim to minimise litter in commercial areas is: To get a substantial reduction in litter loads entering stormwater, significant resources (mainly human) are needed to make the campaign:

- ongoing;
- participatory (rather than using passive education strategies);
- balanced (i.e. target traders and the community with equal intensity);

- inspirational and motivational (e.g. by recognising positive achievements and rewarding such behaviour);
- self aware of its effect (i.e. using monitoring and evaluation mechanisms to provide feedback throughout the campaign on whether knowledge, attitudes and/or behaviour is changing as desired);
- tailored to accommodate known local characteristics (e.g. the social and physical environment); and
- multi-dimensional (i.e. include strong incentives / rewards, penalties, provision of high quality bin-related infrastructure and associated maintenance, provision of a high level of maintenance activities to improve people's pride in their local community, provision of regulatory services to stop illegal activities in the precinct, etc.) and complete (i.e. include all of these elements).

Considerable staff time is needed to design and execute education / participation programs of this nature, particularly if they are to be ongoing. Throughout the program at Snell Grove, traders changed their preferred method of communication from written materials to face-to-face meetings with Council staff. Such meetings take considerable time and effort to deliver given limited opportunities to spend time with busy traders (i.e. re-scheduling and multiple visits are typically needed, with some visits being outside of business hours). Substantial time is also needed to build relationships with traders and respond to *other* issues that emerge (e.g. the need to enforce specific local laws that may not be litter-related). Organisations need to plan to ensure these resources will be available.

In terms of future evaluation programs, it is recommended that statistical analysis be undertaken on the monitoring data involving changes to awareness / knowledge, attitudes and behaviour (where resources allow) to determine those changes that are statistically significant. In addition, the 'paired catchment' approach proved to be a very good initiative and greatly increased the explanatory power of monitoring results.

The quantified results on the *likely* magnitude of the decrease in litter load over the pre- to post-campaign stages *relative* to the control site (i.e. approximately 77%), while not being statistically significant, *suggests* that substantial improvement *may* have occurred in relative terms. This level of relative decrease is a substantial reduction that warrants further investigation in future monitoring programs of this type.

## 8. References

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- American Society of Civil Engineers and US Environment Protection Agency (ASCE & US EPA) (2002). *Urban Stormwater Best Management Practice (BMP) Performance Monitoring: A Guidance Manual for Meeting the National Stormwater BMP Database Requirements*. Report prepared by GeoSyntec Consultants and the Urban Water Resources Research Council of ASCE in cooperation with the Office of Water, US EPA, Washington, D.C., USA.
- Curnow, R. and Crispijn, J. (2005). *Hobart CBD Stormwater Improvement Program, Paper 2: Non-structural BMPs to Improve Stormwater Quality*. Draft paper for the 4th South Pacific Stormwater Conference, 3 May 2005 - 6 May 2005, Auckland, New Zealand.
- Curnow, R.C and Spehr, K.L. (2003). *Clean Communities Assessment: A Local Government Resource for Changing Disposal Behaviour*. Paper presented at the 2003 International Solid Waste Association World Congress, Melbourne, Victoria.
- Curnow, R.C and Spehr, K.L. (2004). *Monitoring and Evaluating an Anti-litter Education/Participation Campaign Using the Clean Communities Assessment Tool to Help Evaluate the Performance of Non-structural Stormwater Quality Best Management Practices*. Unpublished report for Moreland City Council and the CRC for Catchment Hydrology. Community Change Pty Ltd, Melbourne, Victoria.
- Curnow, R.C. (2004). *Community Friendly Public Spaces: A Holistic Approach to Preventing Litter that Works*. Keynote address at the 'Leading on Litter' 2004 National Conference and Expo, Richmond, Melbourne, Victoria.
- Lewis, J., Taylor, A., Fletcher, T. (2005). *Snell Grove Litter Monitoring Project - An Analysis of the Effect of a Commercial Area Education Campaign on Litter Loads*. Unpublished Report. CRC for Catchment Hydrology, Monash University, Melbourne, Victoria.
- Taylor, A.C. and Wong T.H.F. (2002). *Non-structural Stormwater Quality Best Management Practices - A Literature Review of Their Value and Life-Cycle Costs*. Technical report No. 02/13. Cooperative Research Centre for Catchment Hydrology, Melbourne, Victoria. Available at [www.catchment.crc.org.au](http://www.catchment.crc.org.au) (January 2005).
- Taylor, A.C. and Wong T.H.F. (2003). *Non-structural Stormwater Quality Best Management Practices - Guidelines for Monitoring and Evaluation*. Technical Report 03/14. Cooperative Research Centre for Catchment Hydrology, Melbourne, Victoria. Available at [www.catchment.crc.org.au](http://www.catchment.crc.org.au) (January 2005).



**APPENDIX 1      An Evaluation Framework for Non-structural Best  
Management Practices that Aim to Improve Stormwater  
Quality**

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Source: Modified from Taylor and Wong (2003)

Style of Evaluation	Description	Who Typically Does It	Example of 'Monitoring Tools'	Advantages	Disadvantages
<p><b>1. BMP implementation</b></p>	<p>Evaluation of whether the BMP has been fully implemented as designed and the quality of implementation.</p>	<p>Stormwater management agencies (e.g. local or State government authorities) or community groups.</p>	<p>Audits with audit checklists.</p>	<ul style="list-style-type: none"> <li>▪ Inexpensive.</li> <li>▪ Provides the basis for more advanced styles of evaluation (see below).</li> <li>▪ Simple to design and implement.</li> <li>▪ Useful for BMPs that have a relatively low risk of failure once implemented.</li> <li>▪ Can usually also evaluate the quality of implementation (e.g. feedback on the relevance and quality of training materials as well as the quality of its delivery).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Provides no information on whether the BMP has changed people's behaviour, water quality or waterway health.</li> <li>▪ Desktop evaluation may not truly reflect what is happening 'on the ground'.</li> </ul>
<p><b>2. Changes in people's awareness and/or knowledge</b></p>	<p>Evaluation of whether the BMP has increased levels of awareness and/or knowledge of a specific stormwater issue within a segment of the community.</p>	<p>Stormwater management agencies, often with the help of specialist community survey consultants.</p>	<p>Surveys (with survey forms) that examine people's level of awareness and/or knowledge.</p>	<ul style="list-style-type: none"> <li>▪ Relatively inexpensive (depending on the level of confidence needed in the results).</li> <li>▪ Relatively fast.</li> <li>▪ Can <i>directly</i> examine levels of awareness and knowledge (i.e. this style of evaluation does not need to rely on <i>self-reported</i> changes to awareness and/or knowledge).</li> <li>▪ Can gather valuable information that helps to improve the <i>design</i> of the BMP (e.g. a baseline survey for an educational program may find that a high percentage of people mistakenly believe that stormwater is a minor risk to waterway health in the region).</li> <li>▪ Can usually monitor changes in people's awareness / knowledge, attitudes and/or self-reported behaviour with the same instrument (e.g. a survey).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Changes in awareness and/or knowledge do not necessarily lead to a change in people's attitudes, behaviour or water quality.</li> </ul>
<p><b>3. Changes in people's attitude (self-reported)</b></p>	<p>Evaluation of whether the BMP has changed people's attitudes (either towards the goal of the BMP, or towards implementing the BMP itself, as indicated through self-reporting).</p>	<p>Stormwater management agencies, often with the help of specialist community survey consultants.</p>	<p>Surveys (with survey forms) that examine people's self-reported attitudes.</p>	<ul style="list-style-type: none"> <li>▪ Relatively inexpensive (depending on the level of confidence needed in the results).</li> <li>▪ Relatively fast.</li> <li>▪ Can gather information that helps to improve the design of the BMP (e.g. people's attitudes may be based on incorrect assumptions that could be easily clarified).</li> <li>▪ Can usually monitor changes in people's awareness / knowledge, attitudes and/or self-reported behaviour with the same instrument (e.g. a survey).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Changes in people's attitudes towards stormwater management do not necessarily lead to changes in behaviour.</li> <li>▪ The evaluation process and social norms may influence <i>self-reported</i> attitudes (e.g. some survey respondents may report a 'socially acceptable' attitude rather than their actual attitude).</li> <li>▪ Potential for confusion exists depending on the attitude being monitored (e.g. some builders may have the unchanged <i>attitude</i> that new erosion and sediment control laws are unnecessary, but their <i>attitude</i> towards compliance may have changed simply because of the financial consequences).</li> </ul>
<p><b>4. Changes in people's behaviour (self-reported)</b></p>	<p>Evaluation of whether the BMP has changed people's behaviour, as indicated through self-reporting.</p>	<p>Stormwater management agencies, often with the help of specialist community survey consultants.</p>	<p>Surveys (with survey forms) that examine people's self-reported behaviour.</p>	<ul style="list-style-type: none"> <li>▪ Relatively inexpensive (depending on the level of confidence needed in the results).</li> <li>▪ Relatively fast.</li> <li>▪ Can examine types of behaviour that are very difficult and expensive to directly observe or monitor (e.g. infrequent application of lawn fertiliser, disposal of used engine oil).</li> <li>▪ Can usually monitor changes in people's awareness / knowledge, attitudes and/or self-reported behaviour with the same instrument (e.g. a survey).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Self-reported behaviour can be a <i>very</i> poor indicator of actual behaviour in some contexts (e.g. littering in public places). Validation of its veracity is usually needed (e.g. using evaluation style no. 5).</li> </ul>



Style of Evaluation	Description	Who Typically Does It	Example of 'Monitoring Tools'	Advantages	Disadvantages
5. Changes in people's behaviour (actual)	Evaluation of whether the BMP has changed people's behaviour, through direct measurement (e.g. the 'observational approach').	Specialists (e.g. research bodies, specialist consultants, trained staff from stormwater management agencies).	Observational studies (e.g. the 'Clean Communities Assessment Tool' and the 'Disposal Behaviour Index' methods, used for Australian littering studies) or audits with checklists (e.g. erosion and sediment control audits).	<ul style="list-style-type: none"> <li>Changes in actual behaviour is a very good indicator for likely changes to stormwater quality and waterway health.</li> <li>Data from such evaluations can potentially be used to model predicted changes to stormwater quality and waterway health.</li> <li>Such evaluations can provide valuable information that can be used for BMP design or improved evaluation strategies (e.g. highlighting errors associated with monitoring <i>self-reported</i> behaviour, and identifying why certain forms of behaviour occurs).</li> </ul>	<ul style="list-style-type: none"> <li>Can be very difficult and costly to apply in some contexts due to issues such as invasion of people's privacy and the need to monitor a large number of infrequent events.</li> <li>People's behaviour that influences stormwater quality is inherently complex, and is typically influenced by many variables (e.g. people's age, whether they are in groups, surrounding infrastructure, economic circumstances, etc.). Designing evaluation strategies to accommodate this complexity can be challenging.</li> <li>The presence of evaluators may influence some people's behaviour.</li> </ul>
6. Changes in stormwater quality	Evaluation of whether the BMP (or set of BMPs) has improved stormwater quality in terms of loads and/or concentrations of pollutants.	Specialists (e.g. research bodies) or stormwater management agencies with a very high level of in-house expertise.	Stormwater quality monitoring programs (e.g. 'BACI' design experiments <sup>9</sup> ). Alternatively, pollutant export <i>modelling</i> can be used to translate known changes in behaviour into probable changes in stormwater quality.	<ul style="list-style-type: none"> <li>Directly measures changes in stormwater quality.</li> <li>The information collected may allow non-structural BMPs to be included in pollutant export modelling exercises when undertaking major stormwater quality management decisions (along with structural BMPs).</li> <li>Can be used for individual non-structural BMPs or combinations of BMPs (e.g. monitoring the collective effect on stormwater quality over time of implementing a new city-wide urban stormwater management plan).</li> </ul>	<ul style="list-style-type: none"> <li>Relatively expensive and time-consuming (depending upon the desired level of confidence in the results).</li> <li>Usually requires a very high level of technical expertise to design the monitoring program and analyse the results.</li> <li>Can be difficult to measure subtle changes in stormwater quality, given the very high spatial and temporal variability of urban stormwater quality.</li> <li>Can be difficult to find and maintain suitable control sites or catchments.</li> <li>Typically, a variety of pollution sources and other types of BMPs heavily influence stormwater quality in areas where non-structural BMPs are applied.</li> <li>Can take a long time to get enough rainfall events to allow statistically significant results to be obtained.</li> </ul>
7. Changes in waterway health	Evaluation of whether the BMP (or set of BMPs) has improved the health of receiving waters.	Stormwater management agencies, often with the help of specialist consultants or research bodies.	Ecological health monitoring programs (e.g. trend analysis). Alternatively, receiving water quality <i>modelling</i> can be used to predict the ecological effect of known changes in stormwater quality (e.g. in estuary systems).	<ul style="list-style-type: none"> <li>Directly measures changes in aspects of waterway health (the <i>ultimate</i> goal of most stormwater quality managers who are implementing non-structural BMPs).</li> <li>Can be an efficient form of evaluation where BMPs involve a specific stormwater pollutant with few sources (e.g. an education campaign to phase out the use of specific pesticide in an urban catchment) or where a cause-effect relationship has already been established (e.g. the relationship between sewer overflows and ambient water quality in a river).</li> </ul>	<ul style="list-style-type: none"> <li>Relatively expensive and time-consuming (depending upon the desired level of confidence in the results).</li> <li>It is often very difficult to attribute subtle, long-term changes in waterway health to the use of any particular BMP. This style of evaluation is mainly used to evaluate the <i>collective</i> effect of all catchment management activities over time.</li> <li>Usually requires a very high level of technical expertise to design the monitoring program and analyse the results.</li> </ul>

<sup>9</sup> 'BACI' is an acronym for an experimental design that has Before and After sampling at the Control (no action) site and Intervention / Investigation (action) site.



## **APPENDIX 2      Data Recording Sheets for the Evaluation Exercise**

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**A form of summary reporting recommended in the *Monitoring and Evaluation Guidelines for Non-structural Stormwater Quality Best Management Practices* (Taylor and Wong, 2003)**

**Data Recording Sheet for Evaluation of 'BMP Implementation' (Evaluation Style no. 1)**

HEADING	RECORDED DATA
<b>BMP INFORMATION</b>	
<b>Name of the BMP being monitored:</b>	Snell Grove Project: An Education / Participation Campaign to Reduce Littering and Stormwater Litter Loads in a Small Commercial Shopping District in Melbourne.
<b>Type and nature of the BMP:</b>	Two target audiences: <ul style="list-style-type: none"> <li>▪ Traders in the commercial district (the primary focus): BMP elements included a brochure, site visits / meetings with traders (i.e. one-to-one discussions), a clean-up event, a newsletter / fact sheet, maintenance of infrastructure in the street (incl. bin-related infrastructure), posters in shop windows, windproof ash-trays and drain stencilling.</li> <li>▪ The general public / community: BMP elements included posters in shop windows and the railway station, drain stencilling, brochures distributed by traders, and maintenance of the local environment (e.g. clean-up of dumped rubbish and improvement to local Council-managed infrastructure).</li> </ul>
<b>Date(s) of BMP implementation:</b> (i.e. start and finish dates, where relevant)	Main period of anti-litter activity: May to December 2003.
<b>Life span of the BMP:</b> (i.e. the time over which the BMP will operate)	BMP ran for approximately 8 months.  Little <i>long term</i> effect is expected (e.g. > 12 months), as a only a weak positive response was observed during the intervention stage that, for most indicators, was not fully sustained during the follow-up period (approximately 6 months after the campaign).
<b>TEST SITE INFORMATION</b>	
<b>Location of BMP implementation:</b>	Snell Grove commercial district, Oak Park, Moreland, Melbourne, Victoria, Australia
<b>Agency implementing the BMP</b>	Moreland City Council.
<b>Name:</b>	Contact: Ms Iona Theodoridis.
<b>Type of agency:</b>	Local Council.
<b>Address:</b>	90 Bell Street, Coburg, Melbourne, Victoria, Australia.
<b>CATCHMENT INFORMATION</b>	
<b>Catchment name:</b>	Moonee Ponds Creek Catchment.
<b>Receiving waters:</b>	Moonee Ponds Creek, Yarra River and Port Phillip Bay in Victoria.
<b>Area over which the BMP operates:</b> (i.e. the <i>potential</i> area of influence of the BMP in ha, km <sup>2</sup> or m <sup>2</sup> )	Small commercial district, say 1 ha in size. The public education elements may have a wider reach.
<b>Population over which the BMP operates (if applicable):</b> (e.g. the approximate number of people who live in the area potentially influenced by the BMP)	Small commercial district, with 26 trading premises. In addition, many more members of the public would have been exposed to campaign messages (potentially hundreds).
<b>MONITORING INFORMATION</b>	
<b>Objectives being evaluated using this style of evaluation:</b>	<ul style="list-style-type: none"> <li>▪ To determine whether the anti-litter education / participation campaign that was run within the commercial district of Snell Grove in 2003 was fully implemented as set out in the initial Project Plan (and if not, determine why not).</li> <li>▪ To determine the quality of the campaign's design and implementation.</li> </ul>
<b>Type of evaluation:</b> (e.g. 'desk top' review or independent audit / survey of 'on the ground' outcomes)	Desktop review by an independent evaluator, using information supplied from the education team (e.g. when key tasks were delivered) as well as information gathered by all evaluators (i.e. for all evaluation styles).
<b>Monitoring parameters:</b> (i.e. what is being monitored / measured)	The parameters were the tasks that were contained in the project plan immediately prior to the commencement of the campaign in April 2003. That is, they were checked against the tasks that were actually delivered to determine whether the planned tasks were implemented and when they were implemented.  In addition, an assessment has been made on the quality of the design and implementation of the tasks (i.e. an assessment of whether the campaign's design and implementation was best practice).
<b>Sampling design:</b>	All planned actions / tasks to minimise littering were included in this style of evaluation.

HEADING	RECORDED DATA
<b>Monitoring frequency and timeframe:</b>	Information on the 'planned tasks' was taken from the version of the project plan that was current immediately prior to the implementation of the campaign (version 5, dated 10 April 2003). Information on the 'delivered tasks' was taken from the version of the project plan that was updated by Council's education officer after the campaign to document what was done (version 7, 29 December 2004). The core of the campaign ran from May to December 2003.
<b>Monitoring location(s):</b>	Snell Grove, Oak Park, Melbourne, Victoria, Australia.
<b>Monitoring method:</b> (describe the monitoring tools that were used, such as audit checklists, questionnaires, review of written records)	Review of written records (including educational products, self-reported data from the education team, and all evaluation reports) as well as personal experience from being on the project's Steering Committee.
<b>Who did the monitoring and evaluation for this style of evaluation:</b> (include a comment regarding their degree of independence)	André Taylor from the Urban Stormwater Quality Program of the CRC for Catchment Hydrology, Monash University. This group was not involved with the delivery of the education / participation campaign. This group has strong expertise in stormwater quality management (including monitoring, data analysis, and the design of structural and non-structural stormwater management practices).
<b>EVALUATION RESULTS</b>	
<b>Key findings:</b> (include quantitative information on the effects the BMP produced, where available)	<p><u>Implementation of actions:</u></p> <p>Approximately 50% of the actions planned immediately before the beginning of the campaign were delivered on time. Approximately 30% were delivered later than expected. Approximately 20% of planned tasks were not done.</p> <p>Some important activities that would have provided positive feedback to traders and engaged non-trader groups in participatory education were not delivered.</p> <p>Overall, it appears that the Council officers implemented the vast majority of the planned campaign actions (approximately 80%). This is a positive result.</p> <p><u>Quality of campaign design and implementation:</u></p> <p>With the benefit of hindsight, several strengths and weaknesses of the campaign have been identified. Overall, it is suggested that the education / participation campaign for traders was acceptable, while the campaign for other members of the community was weak.</p> <p>Based on relevant information from the literature (e.g. Curnow and Crispijn, 2005 and Taylor and Wong, 2002), the benefit of hindsight, and knowledge about the on-the-ground outcomes produced from the campaign (i.e. from other styles of evaluation), the key conclusion for future campaigns that aim to minimise litter in commercial areas is: To get a substantial reduction in litter, significant resources (mainly human) are needed to make the campaign:</p> <ul style="list-style-type: none"> <li>▪ ongoing;</li> <li>▪ participatory (rather than using passive education strategies);</li> <li>▪ balanced (i.e. target traders and the community with equal intensity);</li> <li>▪ inspirational and motivational (e.g. by recognising positive achievements and rewarding such behaviour);</li> <li>▪ self aware of its effect (i.e. using monitoring and evaluation mechanisms to provide feedback throughout the campaign on whether knowledge, attitudes and/or behaviour is changing as desired);</li> <li>▪ tailored to accommodate known local characteristics (e.g. the social and physical environment); and</li> <li>▪ multi-dimensional (i.e. include strong incentives / rewards, penalties, provision of high quality bin-related infrastructure and associated maintenance, provision of a high level of maintenance activities to improve people's pride in their local community, provision of regulatory services to stop illegal activities in the precinct, etc.) and complete (i.e. include all of these elements).</li> </ul>

<b>Caveats, assumptions and areas of uncertainty:</b>	<p>Data on whether the proposed campaign tasks were delivered and the date that they were delivered has been largely derived from the education officer who delivered the campaign (i.e. self-reported data).</p> <p>There is a moderate level of uncertainty associated with the assessment of the quality of the campaign's design and implementation, as:</p> <ul style="list-style-type: none"> <li>▪ There is uncertainty in the stormwater industry associated with the 'best practice' design of stormwater-related education campaigns, given such campaigns have often been associated with poor evaluations in the past.</li> <li>▪ One does not know for sure what the result would have been if changes have been made to the design or implementation strategy.</li> <li>▪ Without being present at every event run by the education team, it is impossible to know for sure whether some tasks were executed well or not (e.g. explaining to traders how to better manage stormwater quality and litter). This is why this basic style of evaluation needs to be supported by other styles.</li> </ul>
<b>Overall assessment of BMP 'value' (a score of 1 – 5):</b> (where: <ul style="list-style-type: none"> <li>▪ '0' = detrimental impacts;</li> <li>▪ '1' = no positive or detrimental impacts;</li> <li>▪ '2' = fair [achieved &lt;1/2 of the objectives/expectations];</li> <li>▪ '3' = average [achieved 1/2 of the objectives/expectations];</li> <li>▪ '4' = good [achieved &gt;1/2 of the objectives/expectations]; and</li> <li>▪ '5' = excellent [achieved all of the objectives/expectations])</li> </ul>	Based on this style of evaluation, 3.
<b>COST INFORMATION</b> (include the cost of staff time and overheads, where appropriate)	
<b>Total cost to <i>develop</i> the BMP or combination of BMPs (\$):</b>	Approximately \$3,600 to plan and design the campaign (estimate by Moreland City Council).
<b>Total cost to <i>implement</i> the BMP (\$):</b> (over the implementation period, or annually if implementation is on-going)	Approximately \$10,800 to implement the campaign (estimate by Moreland City Council).
<b>Estimated <i>total life-cycle cost</i> of the BMP (\$):</b>	Approximately \$14,400 for an 8 month program. This includes approximately \$2,000 worth of materials (e.g. posters, brochures) that were sourced from another project.
<b>Estimated total cost to <i>monitor and evaluate</i> the BMP (\$):</b>	For this style of evaluation: approximately \$2,000 (estimate by the CRC for Catchment Hydrology).
<b>ADMINISTRATIVE INFORMATION</b>	
<b>Contact person for the evaluation:</b>	
<b>Name:</b>	André Taylor.
<b>Organisation:</b>	Cooperative Research Centre for Catchment Hydrology & Institute for Sustainable Water Resources, Monash University.
<b>Contact details (ph and e-mail):</b>	Tel/Fax: 02 6582 0762, <a href="mailto:andretaylor@iprimus.com.au">andretaylor@iprimus.com.au</a> .
<b>Date of data entry:</b>	June 2005.
<b>COMMENTS:</b> (e.g. reasons for the evaluation findings, and recommendations for future projects of a similar nature)	This style of evaluation <i>on its own</i> is of little value. It is needed to support more advanced styles of evaluation (e.g. monitoring litter loads and people's behaviour). It is important to confirm that planned actions were in fact delivered, when they were delivered, and identify potential issues (e.g. activities that were not done, or were a feature of the campaign) that may be causes for positive or negative outcomes. For example, the lack of positive feedback mechanisms that were delivered for traders during the campaign <i>may</i> have been a reason why their levels of optimism decreased during the campaign (see Section 4.3.4.).



**Data Recording Sheet for Evaluation of 'Changes in Awareness / Knowledge, Attitudes, Self-reported Behaviour and Actual Behaviour' (Evaluation Style Numbers 2, 3, 4 and 5)**

HEADING	RECORDED DATA
<b>BMP INFORMATION</b>	
<b>Name of the BMP being monitored:</b>	Snell Grove Project: An Education / Participation Campaign to Reduce Littering and Stormwater Litter Loads in a Small Commercial Shopping District in Melbourne.
<b>Type and nature of the BMP:</b>	Two target audiences: <ul style="list-style-type: none"> <li>▪ Traders in the commercial district (the primary focus): BMP elements included a brochure, site visits / meetings with traders (i.e. one-to-one discussions), a clean-up event, a newsletter / fact sheet, maintenance of infrastructure in the street (incl. bin-related infrastructure), posters in shop windows, windproof ash-trays and drain stencilling.</li> <li>▪ The general public / community: BMP elements included posters in shop windows and the railway station, drain stencilling, brochures distributed by traders, and maintenance of the local environment (e.g. clean-up of dumped rubbish and improvement to local Council-managed infrastructure).</li> </ul>
<b>Date(s) of BMP implementation:</b> (i.e. start and finish dates, where relevant)	Main period of anti-litter activity: May to December 2003.
<b>Life span of the BMP:</b> (i.e. the time over which the BMP will operate)	BMP ran for approximately 8 months. Little <i>long term</i> effect is expected (e.g. > 12 months), as a only a weak positive response was observed during the intervention stage that, for most indicators, was not fully sustained during the follow-up period (approximately 6 months after the campaign). One indicator that was sustained at the follow-up period was a ~10% improvement in positive disposal actions by the public (i.e. binning / recycling litter), which is probably a consequence of improved bin-related infrastructure in the area (see Chapter 4 of this report for more details).
<b>TEST SITE INFORMATION</b>	
<b>Location of BMP implementation:</b>	Snell Grove commercial district, Oak Park, Moreland, Melbourne, Victoria, Australia
<b>Agency implementing the BMP</b>	Moreland City Council.
<b>Name:</b>	Contact: Ms Iona Theodoridis.
<b>Type of agency:</b>	Local Council.
<b>Address:</b>	90 Bell Street, Coburg, Melbourne, Victoria, Australia.
<b>CATCHMENT INFORMATION</b>	
<b>Catchment name:</b>	Moonee Ponds Creek Catchment.
<b>Receiving waters:</b>	Moonee Ponds Creek, Yarra River and Port Phillip Bay in Victoria.
<b>Area over which the BMP operates:</b> (i.e. the <i>potential</i> area of influence of the BMP in ha, km <sup>2</sup> or m <sup>2</sup> )	Small commercial district, say 1 ha in size. The public education elements may have a wider reach.
<b>Population over which the BMP operates (if applicable):</b> (e.g. the approximate number of people who live in the area potentially influenced by the BMP)	Small commercial district, with 26 trading premises. In addition, many more members of the public would have been exposed to campaign messages (potentially hundreds).
<b>MONITORING INFORMATION</b>	
<b>Objectives being evaluated:</b>	For this style of evaluation: To determine whether levels of awareness, knowledge, attitudes and behaviour (both self-reported and actual) of traders and the broader community in relation to littering and stormwater management changed as a result of the campaign.
<b>Monitoring parameters:</b>	A wide range of parameters were measured as part of the CCAT (Clean Communities Assessment Tool). These included: <ul style="list-style-type: none"> <li>▪ CCAT Summary Ratings.</li> <li>▪ Demographic features of respondents (e.g. whether they lived locally, usage patterns for locations, involvement with local waterways).</li> <li>▪ CCAT Ratings of Location Features - Facilities (e.g. maintenance and replacement of damaged BIN infrastructure, access to butt BIN infrastructure, consistency of BIN infrastructure presentation, improvement in infrastructure).</li> </ul>

HEADING	RECORDED DATA
	<ul style="list-style-type: none"> <li>▪ CCAT Ratings of Context, Community Awareness and Knowledge (e.g. litter counts, illegal dumping, graffiti, identifying with area, sense of community, explanations for littering and involvement in stormwater protection, trader and domestic dumping in the street, support for a clean local environment, accumulation of litter, awareness and knowledge).</li> <li>▪ CCAT Ratings for Community Attitudes and Perceptions (e.g. attitudes towards management of litter and stormwater).</li> <li>▪ Self reported actions to manage litter and stormwater.</li> <li>▪ Actions Assessments - Changes in People's Behaviour (e.g. CCAT Actions Scores as indicators of intervention effectiveness).</li> </ul> <p>CCAT is a frequently used, verified and numerical (1-5 scale) assessment tool for litter-related monitoring programs in Australia. It provides ratings that monitor three factors in a location that influence littering behaviour. These factors are the:</p> <ul style="list-style-type: none"> <li>▪ 'Context' involving the sense of community and level of cleanliness in a location.</li> <li>▪ 'Facilitates' involving infrastructure and BIN infrastructure.</li> <li>▪ 'Attitudes and perceptions' of people using public spaces involving community views on the adequacy of facilities and attitudes toward the location being studied.</li> </ul>
<p><b>Sampling design:</b> (e.g. how the sample was selected for the survey – see Phase II, Step 2 of the monitoring and evaluation protocol)</p>	<p>A three stage 'pre-, during and post- intervention' assessment design with a control was used to evaluate the education / participation campaign implemented with the two key target groups - traders and the wider community. The assessment program was conducted from December 2002 to July 2004, using a participatory approach with in-depth one to one assessments conducted with traders and on-the-street surveys conducted with the wider community in two separate locations - Snell Grove, Oak Park (the intervention site) and Gaffney Street, Pascoe Vale (the control site).</p> <p>Education campaign effectiveness was assessed using the recently developed and validated Clean Communities Assessment Tool (CCAT, see Curnow and Spehr, 2003) for assessing community litter and littering, within the framework of evaluation styles for monitoring non-structural interventions identified by Taylor and Wong (2003).</p> <p>In addition to the CCAT ratings, a total of 81 surveys were conducted with traders and 342 with community members in Snell Grove. In Gaffney Street, 15 surveys were conducted with traders and 105 with community members.</p>
<p><b>Monitoring frequency and timeframe:</b></p>	<p>Five months before, during, and approximately seven months after the campaign. See Table 4-3 for the timing of specific stages.</p>
<p><b>Monitoring location(s):</b></p>	<p>The Snell Grove site was located in Oak Park, Victoria (Melways reference 16 K6). The Gaffney Street site was located nearby in Pascoe Vale (Melways reference 16 K9).</p>
<p><b>Monitoring method:</b></p>	<p>Used the CCAT method (see Curnow and Spehr, 2003). It includes face-to-face interviews and surveys (with traders and the broader community using the area), observations (e.g. of littering / binning behaviour, illegal dumping, litter counts), and audits (e.g. to check actual behaviour of traders and validate self-reported data).</p>
<p><b>Who did the monitoring and evaluation:</b> (include a comment regarding their degree of independence)</p>	<p>Community Change Pty Ltd (<a href="http://www.communitychange.com.au">www.communitychange.com.au</a>). This consultancy specialises in social research and is a leading group in the development and use of tools for monitoring the effectiveness of programs that aim to prevent or minimise litter. Their only significant involvement with the design and implementation of the education / participation campaign was to inform the program's education officers (from Moreland City Council) what they found during baseline monitoring activities (e.g. what traders desired, issues that need to be resolved, etc.).</p> <p>Community Change Pty Ltd was engaged by the CRC for Catchment Hydrology and encouraged to objectively report their results, whether they were positive or negative.</p>
<p><b>EVALUATION RESULTS</b></p>	
<p><b>Key findings:</b> (include quantitative information where available, such as the change in the % of respondents who gained relevant knowledge, adopted 'desirable' attitudes or adopted 'desirable' self-reported behaviours)</p>	<p>The CCAT 'summary ratings' are a good indication of the overall effect of the education / participation campaign. That is, it is <i>most likely</i> that there was a modest improvement in litter and stormwater management activities in the Snell Grove commercial district during the intervention period which was not fully sustained at the follow-up stage, approximately seven months after the campaign had finished (i.e. CCAT summary ratings at Snell Grove rose from 3.1 to 3.7 during the program, then fell to 3.5, while ratings for the control site varied between 3.1 and 3.3). The statistical significance of this result is unknown.</p> <p>It appears that the most significant factor that influenced the CCAT summary ratings was improvements to 'facilities' at Snell Grove during the program. In particular, improvements were made during the intervention period on bin-related infrastructure (e.g. new bins, access to ashtrays, etc.), and to a lesser extent, other Council-managed infrastructure (e.g. repairing street furniture, boundary markers, maintenance of landscaping, etc.). This effect was measured by the CCAT 'facilities rating'.</p> <p>The campaign did not appear to be successful at improving the knowledge of the community with respect to littering and stormwater management. Of greater concern was the campaign's inability to substantially improve the knowledge of traders in all but a few areas (e.g. two of 10 knowledge areas relating to best practice litter, waste and stormwater management) and to sustain any slight improvement of knowledge throughout the monitoring period. This is of concern, given the focus of the education / participation campaign was on the traders and relatively intensive, tailored, one-to-one educational strategies were employed.</p>

HEADING	RECORDED DATA
	<p>The campaign did not substantially change the CCAT rating for community ‘attitudes and perceptions’. The community’s attitude towards littering, clean-up and litter prevention either did not substantially change or became generally more pessimistic. This pessimism, combined with the belief that enforcement of litter-related laws at Snell Grove won’t occur may hinder future attempts at promoting positive disposal behaviour unless it is addressed.</p> <p>The attitudes and perceptions of traders also became more pessimistic over the monitoring period. It appears the campaign did not inspire or motivate many traders, which may have been a result of the campaign not including any positive feedback mechanisms (e.g. positive incentives, rewards and/or recognition schemes). One positive result was that satisfaction of traders with Council’s litter management activities did substantially improve throughout the campaign, although this level of satisfaction was not fully sustained during the follow-up stage.</p> <p>Self-reported actions of traders produced mixed results, with no areas of substantial improvement being noted. The accuracy of these self-reported actions was relatively high, perhaps because enforcement of litter and stormwater-related environmental legislation was not a part of the campaign, so traders felt comfortable disclosing their activities to evaluators. In addition, those traders who allowed assessors to inspect their premises were generally performing well.</p> <p>Independent assessors rated the performance of traders in litter, waste and stormwater management as improving by approximately 10% from the baseline to the intervention monitoring stage (i.e. from 7.6 to 8.6 out of 10). This is a positive result. Interestingly, the traders rated their own performance as dropping 10% in this period (i.e. from 9.0 to 8.0). This may have been a result of <i>slightly</i> increased knowledge about what they should be doing and/or the psychological effect of becoming more pessimistic about environmental management at Snell Grove.</p> <p>Observations of people’s littering and binning behaviour whilst using Snell Grove indicates that positive disposal behaviour may have slightly increased (by approximately 10%) during the intervention period which was sustained during the follow-up stage. Assuming this observation represents a real phenomenon, rather than a product of natural variation, it is most likely that the improvement is a result of improved bin-related infrastructure at Snell Grove. Other possible explanations are that people became more aware of the presence of the evaluation team and/or the improvement to the amenity of the area (e.g. less illegal dumping, improved infrastructure) may have promoted positive disposal behaviour as reported in the literature (see Curnow, 2004).</p> <p>It is noted that the overall finding from these styles of evaluation (i.e. that there were mixed results, but overall a subtle positive change to the summary CCAT rating) is consistent with the findings from evaluation style no. 6 (i.e. the measurement of loads of litter in the stormwater network). It is a valuable finding that these two monitoring methods, that are rarely used in parallel given their cost, have produced similar findings when undertaken by two different, independent and specialist monitoring groups.</p>
<p><b>Caveats, assumptions and areas of uncertainty:</b> (e.g. where relevant, include a brief comment on the reliability of the project’s self-reported data, or other influences on the target audience’s behaviour)</p>	<p>The CCAT monitoring method was found to be informative, producing many related qualitative and quantitative results. The method also helped to explain findings from other evaluation styles. In retrospect, the inclusion of a control site was very valuable.</p> <p>The significance of <i>subtle changes</i> of the monitoring parameters used for this style of valuation was hard to rigorously assess without undertaking statistics. For Snell Grove, expert opinion had to be used to determine whether slight increases or decreases (in comparison to baseline and control site conditions) represent real and substantial change. A statistical approach would have been preferable in retrospect.</p> <p>Observations of people’s littering and binning behaviour at Snell Grove <i>may</i> have been influenced by increasing awareness of the presence of the evaluation team who surveyed pedestrians and traders and conducted litter counts on several occasions.</p> <p>Self-reported behaviour of traders was reasonably accurate, probably because: no enforcement activity was likely to follow the disclosure of poor practice; and most traders who agreed to have independent assessors inspect their premises (to validate self-reported data) were performing well.</p>

<p><b>Overall assessment of BMP 'value' (a score of 1 – 5):</b> (where:</p> <ul style="list-style-type: none"> <li>▪ '0' = detrimental impacts;</li> <li>▪ '1' = no positive or detrimental impacts;</li> <li>▪ '2' = fair [achieved &lt;1/2 of the objectives/expectations];</li> <li>▪ '3' = average [achieved 1/2 of the objectives/expectations];</li> <li>▪ '4' = good [achieved &gt;1/2 of the objectives/expectations]; and</li> <li>▪ '5' = excellent [achieved all of the objectives/expectations])</li> </ul>	<p>Based on these four styles of evaluation, 2.5 (i.e. very little positive change was observed in relation to knowledge / awareness or attitudes, while slight improvement was observed in relation to the litter-related behaviour of traders and the community).</p>
<p><b>COST INFORMATION</b> (include the cost of staff time and overheads, where appropriate)</p>	
<p><b>Total cost to develop the BMP or combination of BMPs (\$):</b></p>	<p>Approximately \$3,600 to plan and design the campaign (estimate by Moreland City Council).</p>
<p><b>Total cost to implement the BMP (\$):</b></p>	<p>Approximately \$10,800 to implement the campaign (estimate by Moreland City Council).</p>
<p><b>Estimated total life-cycle cost of the BMP (\$):</b></p>	<p>Approximately \$14,400 for an 8 month program. This includes approximately \$2,000 worth of materials (e.g. posters, brochures) that were sourced from another project.</p>
<p><b>Estimated total cost to monitor and evaluate the BMP (\$):</b></p>	<p>For this style of evaluation: \$92,820 (Community Change's fee for service) plus approximately \$5,000 for input by the CRC for Catchment Hydrology (including final reporting).  The exact figure is hard to determine as many styles of evaluation were used, so the CRC's staff time was spread over several styles. Note that the total analysis and reporting cost by the CRC for Catchment Hydrology for all evaluation styles was \$23,100.</p>
<p><b>ADMINISTRATIVE INFORMATION</b></p>	
<p><b>Contact person for the evaluation:</b></p>	
<p><b>Name:</b></p>	<p>André Taylor.</p>
<p><b>Organisation:</b></p>	<p>Cooperative Research Centre for Catchment Hydrology &amp; Institute for Sustainable Water Resources, Monash University.</p>
<p><b>Contact details (ph and e-mail):</b></p>	<p>Tel/Fax: 02 6582 0762, <a href="mailto:andretaylor@iprimus.com.au">andretaylor@iprimus.com.au</a>.</p>
<p><b>Date of data entry:</b></p>	<p>June 2005.</p>
<p><b>COMMENTS:</b> (e.g. reasons for the evaluation findings, and recommendations for future projects of a similar nature)</p>	<p>Future campaigns should seek to place a priority on the assessment, replacement and maintenance of bin-related infrastructure (e.g. litter bins, recycling bins and butt bins).</p> <p>Future campaigns should seek to place a priority on providing positive feedback mechanisms to people who are improving their behaviour with respect to litter and stormwater management (e.g. traders). These include public recognition and reward / incentive mechanisms that operate regardless of the size of the behavioural change.</p> <p>Future campaigns should seek to place a priority on motivating and inspiring participants, rather than simply providing knowledge. Positive feedback mechanisms are one strategy to achieve this (i.e. widely communicating, promoting and rewarding even minor positive outcomes). Care is needed to avoid strategies that are likely to fail (e.g. a poorly attended clean-up event), as this may generate disillusionment and pessimism which may handicap a wide variety of subsequent activities.</p> <p>Future campaigns should take an on-going and coordinated approach involving both education, rewards <i>and</i> enforcement. It is possible that education programs that communicate that enforcement is not part of the campaign, may promote unwanted behaviour.</p> <p>Multiple agencies should be strongly involved (e.g. in the Snell Grove campaigns action was desired in the areas of bin-related infrastructure, general maintenance of the area, enforcement of illegal activities occurring in the street, clean-up of the railway area, coordination of a community response to a local tragedy, etc.).</p> <p>Considerable staff time is needed to design and execute education / participation programs of this nature, particularly if they are to be ongoing. Throughout the program at Snell Grove, traders changed their preferred method of communication from written materials to face-to-face meetings with Council staff. Such meetings take considerable time and effort to deliver given the difficulty of arranging meeting times with busy traders who work long hours. Substantial time is also needed to build relationships with traders and respond to <i>other</i> issues that emerge (e.g. the need to enforce specific local laws that may not be litter-related).</p> <p>Future campaigns should look to more actively engage the broader community rather than focusing on the traders. Initial attempts to do this at Snell Grove (e.g. to engage school groups)</p>

	<p>proved to be difficult and were not pursued. As a result, educational strategies were <i>passive</i> and low impact (e.g. drain stencilling, brochures, posters) rather than <i>participatory</i> and made no substantial effect on the community's litter-related attitudes or knowledge.</p> <p>These styles of evaluation, when used in combination via the CCAT method, provided great insight into where progress had been made, barriers to improvement and opportunities for improvement (e.g. deficiencies with the education / participation campaign). It is suggested that its only significant weakness during the Snell Grove project was in its explanatory power, given many of the observed / measured changes were subtle or non-existent and analysis of the data to identify 'statistical significance' was not undertaken.</p> <p>Sceptical observers are entitled to question whether some of the subtle changes in attitudes, knowledge and behaviour were in fact real, or just the product of chance. Given this reality, little weight should be placed on <i>subtle changes</i> in attitudes, knowledge or behaviour that were identified using these styles of evaluation.</p> <p>It is recommended that in future, statistical analysis be undertaken on the CCAT data (where resources allow) to determine those changes that are statistically significant.</p> <p>This type of evaluation has the added benefit that it can be used to help <i>design</i> the education campaign (i.e. using baseline information) and help to keep the campaign focused. This benefit is potentially, a very significant one.</p>
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**Data Recording Sheet for Evaluation of 'Changes in Stormwater Quality'  
(Evaluation Style no. 6)**

HEADING	RECORDED DATA
<b>BMP INFORMATION</b>	
<b>Name of the BMP being monitored:</b>	Snell Grove Project: An Education / Participation Campaign to Reduce Littering and Stormwater Litter Loads in a Small Commercial Shopping District in Melbourne.
<b>Type and nature of the BMP:</b>	Two target audiences: <ul style="list-style-type: none"> <li>▪ Traders in the commercial district (the primary focus): BMP elements included a brochure, site visits / meetings with traders (i.e. one-to-one discussions), a clean-up event, a newsletter / fact sheet, maintenance of infrastructure in the street (incl. bin-related infrastructure), posters in shop windows, windproof ash-trays and drain stencilling.</li> <li>▪ The general public / community: BMP elements included posters in shop windows and the railway station, drain stencilling, brochures distributed by traders, and maintenance of the local environment (e.g. clean-up of dumped rubbish and improvement to local Council-managed infrastructure).</li> </ul>
<b>Date(s) of BMP implementation:</b> (i.e. start and finish dates, where relevant)	Main period of anti-litter activity: May to December 2003.
<b>Life span of the BMP:</b> (i.e. the time over which the BMP will operate)	BMP ran for approximately 8 months. Little <i>long term</i> effect is expected (e.g. > 12 months), as a only a weak positive response was observed during the intervention stage that, for most indicators, was not fully sustained during the follow-up period (approximately 6 months after the campaign).
<b>TEST SITE INFORMATION</b>	
<b>Location of BMP implementation:</b>	Snell Grove commercial district, Oak Park, Moreland, Melbourne, Victoria, Australia
<b>Agency implementing the BMP</b>	Moreland City Council.
<b>Name:</b>	Contact: Ms Iona Theodoridis.
<b>Type of agency:</b>	Local Council.
<b>Address:</b>	90 Bell Street, Coburg, Melbourne, Victoria, Australia.
<b>CATCHMENT INFORMATION</b>	
<b>Catchment name:</b>	Moonee Ponds Creek Catchment – a creek catchment.
<b>Catchment area (in ha, km<sup>2</sup> or m<sup>2</sup>):</b>	Catchment area of litter load monitoring: 9 ha for Snell Grove (Oak Park); and 3.7 ha for Gaffney Street (Pascoe Vale) which was the control site.
<b>Altitude of study area (m):</b> (relevant only if evaluation information will be shared internationally)	<100 m above sea level. Temperate climate.
<b>Land uses in the catchment being monitored and their % of the total catchment area:</b>	Urban: commercial (~80%) and residential (~20%).
<b>Total % impervious area of the catchment being monitored:</b>	70% for Snell Grove.
<b>Receiving waters:</b>	Moonee Ponds Creek, Yarra River and Port Phillip Bay, Victoria.
<b>Area over which the BMP operates:</b> (i.e. the <i>potential</i> area of influence of the BMP in ha, km <sup>2</sup> or m <sup>2</sup> )	Small commercial district, say 1 ha in size. The public education elements may have had a wider reach.
<b>Population over which the BMP operates:</b> (e.g. the approximate number of people who live/work in the area potentially influenced by the BMP)	Small commercial district with 26 trading premises. In addition, many more members of the public would have been exposed to campaign messages (i.e. potentially hundreds).
<b>Specific details of the number of participants and area of managed land (if applicable):</b> (e.g. a local industrial regulation program may involve 100 businesses and cover 200 ha of land)	See above. Twenty-six commercial trading premises were the focus.



HEADING	RECORDED DATA
<b>MONITORING INFORMATION</b>	
<b>Objectives being evaluated:</b>	For this style of evaluation: To determine whether loads of litter in stormwater draining the commercial district of Snell Grove significantly decreased during and/or after the anti-litter education / participation campaign compared to pre-campaign litter loads and if so, quantify the magnitude of change.
<b>Monitoring parameters:</b> (i.e. what is being monitored)	Gross pollutants, including litter (categorised) and organic matter (e.g. leaves). Rainfall data was also collected. Data were collected from the intervention site (Snell Grove) and a control site (Gaffney Street). That is, the design was a paired catchment study.
<b>Monitoring locations and station information:</b> (e.g. name, type, location, relationship to area affected by BMP)	The Snell Grove site is located in Oak Park, Victoria (Melways reference 16 K6). The Gaffney Street site is located nearby in Pascoe Vale (Melways reference 16 K9). Both catchments were small. The location of litter monitoring sites are mapped in the Monitoring and Evaluation Plan for this style of evaluation (available on request from the CRC for Catchment Hydrology).
<b>Rainfall information / data:</b>	<p>Provided in Table 5-1 of this report. Rainfall data was sourced from the Victorian Bureau of Meteorology. The most proximal rain gauge was located at Melbourne Airport:</p> <ul style="list-style-type: none"> <li>▪ BOM Station Number, 086282</li> <li>▪ Name, Melbourne Airport</li> <li>▪ Latitude 37°40'30"S</li> <li>▪ Longitude 144°50'32"E</li> <li>▪ Elevation 113.4m</li> <li>▪ Opened on 1970-06-18</li> </ul>
<b>Stormwater flow information / data:</b>	Not relevant. If bypass of the litter traps occurred due to large, intense storms, then the control site would also have been similarly affected.
<b>Stormwater quality information/data:</b>	Provided in Table 5.2 of this report (i.e. gross pollutant loads are broken down into litter and organic matter only) and Figure 5.1 (i.e. calculated average mass of litter per day collected in the side entry pit traps). A more detailed break-down of litter composition (incl. plastic, paper, cardboard, foil, metal, glass, commercial and tobacco products) is available in Lewis <i>et al.</i> (2005) and Figure 5.2 of this report.
<b>Sampling design:</b> (e.g. explain how the number of samples were determined and if a paired catchment study design was used)	<p>This study developed and implemented a field-monitoring program to investigate gross pollutant loads in Snell Grove (Oak Park), prior to, during and after an eight month anti-littering education campaign. In addition, a control site located in Gaffney Street (Pascoe Vale) was selected. The Gaffney Street site was located less than 1 km from Snell Grove and was similar in size and land use.</p> <p>Data collected during the monitoring period were used to estimate the types and quantities of gross pollutants entering stormwater in the study catchments and subsequently the effectiveness of the educational campaign.</p> <p>Side entry pit traps (SEPTs) were routinely sampled every four to six weeks or after significant rainfall events. During sampling, the trapped gross pollutants were manually removed and taken to a laboratory where it was sorted, weighed and catalogued according to type.</p> <p>As a 'rule of thumb', the program aimed to involve at least 10 sampling events before, during and after the campaign (from both sites). This rule was derived from expert advice, and was seen as the minimum needed. It was also practical in terms of the campaign's timing. The program eventually used data from 7 pre-campaign events, 6 during-campaign events and 10 post-campaign events.</p> <p>Note that the CRC for Catchment Hydrology's peer review processes positively affected the design of the monitoring program for litter loads, by recommending a paired catchment design.</p>
<b>Monitoring frequency and timeframe:</b>	<p><u>Pre-campaign:</u></p> <p>The pre-campaign phase of the study was between September 2002 through to the end of May 2003. A total of 10 litter trap clean-outs were conducted at Snell Grove and 7 clean-outs for Gaffney Street. Only data from Snell Grove obtained after 27 November 2002 was used in the analysis of the data due to the paired catchment design (i.e. seven events).</p> <p><u>During the campaign:</u></p> <p>The education campaign ran from late May 2003 – December 2003. During this period at Snell Grove and Gaffney Street a further six litter trap clean-outs were conducted.</p> <p><u>Post-campaign:</u></p> <p>A further 10 post campaign litter trap clean-outs were conducted from late December 2003 to July 2004 which followed the cessation of the core of the education / participation campaign.</p>

<p><b>Monitoring method:</b> (e.g. briefly describe how stormwater quality, flow and/or rainfall data was obtained)</p>	<p>Rainfall data was received from the Victorian Bureau of Meteorology.</p> <p>Litter was collected via six side entry pit traps (SEPTs) or temporary nets that were routinely sampled every four to six weeks or after significant rainfall events (&gt;5 mm). Three SEPTs were located at each site. Temporary nets were used for the first 3 clean-outs at Snell Grove until the SEPTs were obtained.</p> <p>The contents of individual SEPTs / nets were weighed and a volume estimate made. The next step involved sorting the material from each monitoring net into categories. The material was then divided into the following categories:</p> <ul style="list-style-type: none"> <li>▪ Organic material = leaves, twigs, sediment, faeces, food and chewing gum.</li> <li>▪ Plastics = bags, film wrap, wrappers, bottles, cups, containers, (Styrofoam pieces), utensils, caps and straws.</li> <li>▪ Paper = bags, serviettes, tissues, receipts, ATM receipts, general supermarket receipts, train tickets, newspaper and advertising material, take away boxes, cups and drink boxes.</li> <li>▪ Cardboard = boxes and pieces.</li> <li>▪ Foil = confectionary and ice cream wrappers.</li> <li>▪ Metal = aluminium and steel cans.</li> <li>▪ Glass = bottles and bits.</li> <li>▪ Commercial = Packaging straps.</li> <li>▪ Tobacco = Packets, wrappers, foil and matches.</li> </ul>
<p><b>Storm criteria used to trigger monitoring events:</b> (e.g. rainfall events <math>\geq 4\text{mm}</math>)</p>	<p>Side entry pit traps were routinely sampled every four to six weeks or after significant rainfall events (&gt;5 mm).</p>
<p><b>Who did the monitoring and evaluation:</b> (include a comment regarding their degree of independence and expertise)</p>	<p>The Urban Stormwater Quality Program of the CRC for Catchment Hydrology, Monash University, Melbourne. This group was not involved with the delivery of the education / participation campaign. This group has strong expertise in stormwater quality management (including monitoring and data analysis).</p>
<p><b>EVALUATION RESULTS</b></p>	
<p><b>Key findings:</b> (include information on the BMP's efficiency, using the effluent probability method where possible – see ASCE &amp; US EPA, 2002)</p>	<p>Overall, when data from both the intervention and control sites are analysed together, the results <i>suggest</i> that:</p> <ul style="list-style-type: none"> <li>▪ the education / participation campaign <i>probably</i> reduced litter loads at Snell Grove <i>relative</i> to those at Gaffney Street despite increases in total litter loads over time at both sites; and</li> <li>▪ the proportion of litter in the total gross pollutant load <i>probably</i> decreased at Snell Grove <i>relative</i> to Gaffney Street as a result of the campaign.</li> </ul> <p>However, the education / participation campaign's effect appears to be relatively weak resulting in subtle effects on stormwater quality, few of which are statistically significant. This may be due to a combination of the relatively small dataset (i.e. a relatively small number of litter load samples) and/or possible deficiencies in the design and implementation of the education / participation campaign (i.e. it may have only produced a small improvement in litter-related activity).</p> <p>One of the objectives of the project was to <u>quantify</u> the magnitude of change in litter loads. The data indicate that compared to Gaffney Street, there was a 77% <i>relative decrease</i> in litter load (time-weighted average mass in kg/day) at Snell Grove over the pre- to post-campaign stages, even though the time-weighted average mass of litter per day increased at both sites over this period. That is, the time-weighted average mass of litter in kg/day at Snell Grove increased by 17% while at Gaffney Street it increased by 94%. However, as the confidence associated with that these results is low, we cannot claim that these results are statistically significant. We can only say that there is some evidence, albeit <i>very weak</i>, that relative to the control site, Snell Grove experienced lower litter generation which was probably a result of the education / participation campaign.</p> <p>When these differences in litter loads between the two sites are considered from a statistical perspective, the difference between the three stages are not statistically significant (ANOVA <math>p = 0.34</math>). In simple terms, this means that there is only a 66% probability that the difference in litter loads between the two sites is a real phenomenon and not just a function of random variation (i.e. chance).</p> <p>If the difference between sites in terms of the proportion of gross pollutants made up by litter is considered, similar observations can be made. The broad conclusion is that at Snell Grove, the proportion of gross pollutants made up by litter decreases from before to after the education / participation campaign by a greater amount than occurred at Gaffney Street. Specifically, at Snell Grove there was a 37% <i>relative decrease</i> in the percent of litter in the total gross pollutant load (kg/day) over the pre- to post-campaign stages compared to Gaffney Street (i.e. Snell Grove reduced by 44%, while Gaffney Street only reduced by 6.7%). This relative change over time was weakly significant (ANOVA <math>p = 0.09</math>), suggesting that it was 91% likely to a function of <i>more</i> than just random chance.</p> <p>The use of statistical analyses has provided much value in the interpretation of these results. This lesson is salient when interpreting the results from evaluation style numbers 2, 3, 4 and 5, where levels of confidence associated with results have not been calculated, only estimated in broad terms.</p>

<b>Caveats, assumptions and areas of uncertainty:</b> (e.g. where relevant, include a brief comment on the similarity of the intervention and the control catchments)	The relatively low level of confidence in the positive results may be due to a combination of the relatively small dataset (i.e. a relatively small number of litter load samples) and/or possible deficiencies in the design and implementation of the education / participation campaign (i.e. it may have only produced a small improvement in litter-related activity).
<b>Overall assessment of BMP 'value' (a score of 1 – 5):</b> (where: <ul style="list-style-type: none"> <li>▪ '0' = detrimental impacts;</li> <li>▪ '1' = no positive or detrimental impacts;</li> <li>▪ '2' = fair [achieved &lt;1/2 of the objectives/expectations];</li> <li>▪ '3' = average [achieved 1/2 of the objectives/expectations];</li> <li>▪ '4' = good [achieved &gt;1/2 of the objectives/expectations]; and</li> <li>▪ '5' = excellent [achieved all of the objectives/expectations])</li> </ul>	Based on this style of evaluation, 3.  As summarised above, we have a case to suggest the campaign probably reduced litter loads at Snell Grove, but not an overwhelming (i.e. statistically significant) one. Attempts to quantify the extent of reduction in litter loads as a result of the campaign cannot be done with $\geq 95\%$ confidence (see 'key findings' section above).
<b>COST INFORMATION</b> (include the cost of staff time and overheads, where appropriate)	
<b>Total cost to develop the BMP or combination of BMPs (\$):</b>	Approximately \$3,600 to plan and design the campaign (estimate by Moreland City Council).
<b>Total cost to implement the BMP (\$):</b>	Approximately \$10,800 to implement the campaign (estimate by Moreland City Council).
<b>Estimated total life-cycle cost of the BMP (\$):</b>	Approximately \$14,400 for an 8 month program. This includes approximately \$2,000 worth of materials (e.g. posters, brochures) that were sourced from another project.
<b>Estimated cost to monitor and evaluate the BMP (\$):</b>	For this style of evaluation: \$60,000 (estimate by the CRC for Catchment Hydrology). The exact figure is hard to determine as many styles of evaluation were used, so staff time was spread over several styles. The data analysis cost for this style of evaluation is known and was \$15,000. Note also that Ingal Environmental kindly donated six side entry pit traps to the project (i.e. these costs have not been included).
<b>ADMINISTRATIVE INFORMATION</b>	
<b>Contact person for the evaluation:</b>	
<b>Name:</b>	André Taylor.
<b>Organisation:</b>	Cooperative Research Centre for Catchment Hydrology & Institute for Sustainable Water Resources, Monash University.
<b>Contact details (ph and e-mail):</b>	Tel/Fax: 02 6582 0762, <a href="mailto:andretaylor@iprimus.com.au">andretaylor@iprimus.com.au</a> .
<b>Date of data entry:</b>	June 2005.
<b>COMMENTS:</b>	<p>This form of evaluation, although expensive, provides valuable insight into the affect of the education / participation program. In particular, this style of evaluation has highlighted the importance of statistical analysis in the interpretation of data such as that plotted in Figure 5.1. It is tempting at first glance at the median values and without much thought to interpret such data as being strongly supportive that the average mass of litter (per day) has dropped at the intervention site <i>relative</i> to the control site. Statistical analyses however reveal that we cannot make this conclusion with <math>\geq 95\%</math> confidence.</p> <p>In retrospect, the paired catchment approach was a very good initiative and greatly increases the explanatory power of the results.</p> <p>In retrospect, perhaps more samples should have been taken before, during and after the campaign to increase the likelihood of generating statistically significant results. However the ability to do this was limited by the budget, monitoring timeframe and rainfall frequency.</p> <p>The quantified results on the <i>likely</i> magnitude of the decrease in litter load over the pre- to post-campaign stages <i>relative</i> to the control site (i.e. approximately 77%), while not being statistically significant, <i>suggests</i> that substantial improvement <i>may</i> have occurred in relative terms. This level of relative decrease is a substantial reduction and warrants further investigation in future monitoring programs of this type.</p>



## APPENDIX 3 Examples of Products from the Education / Participation Campaign

### Stormwater Fact Sheet for Traders



#### Everything thrown on our streets goes into our creeks!

##### Why is stormwater management important?

Stormwater from the Snell Grove precinct travels via street gutters, drains and local creeks into Moonee Ponds Creek and eventually into the Yarra River. Unlike sewerage, stormwater is not treated. Some of the activities carried out in small businesses (as well as many other activities) have the potential to pollute stormwater. Pollutants such as litter, wastes, grease, oil or other chemicals can kill fish and plants, and seriously pollute the environment where people swim, fish and play.

##### How does this affect you?

There are a number of simple things you can do to reduce pollution and help keep the Moonee Ponds Creek clean and healthy:

- Keep garbage and recycling bins covered and don't overfill them;
- Provide containers for cigarette butts and any other waste produced by customers who have visited your shop or office so that it does not end up as litter;
- Sweep up around your business and place sweepings in the bin.

Did you know that it is against the law to pollute water or place pollutants in a position where they could be blown or fall into a drain, gutter or local waterway? Pollutants include waste materials, dirt, litter, oil, grease, metals, paint, detergents, acids, alkalis, plastics, papers, etc. Fines start from \$200 and can go as far as \$6,000 for aggravated littering.

##### What is Moreland City Council doing to improve stormwater?

Moreland Council has prepared a Stormwater Management Plan, which identifies stormwater pollution sources as being of concern. As a result of this work, Council has been actively working to help Moreland's community to adopt practices which protect the stormwater system. Council has also been working with five other councils and the Housing Industry Association to address stormwater pollution from construction sites.

##### How will Council work with you?

As part of a joint project with the Centre for Cooperative Research in Catchment Hydrology, Moreland City Council and the "Moonee Ponds Creek- Keep It Clean" project Education and Promotion Coordinator will be working with Snell Grove traders to look at their activities and provide advice on protecting the stormwater system. Suggestions will focus on:

- Waste storage and disposal;
- Litter prevention;
- Cleaning up around your premises.

Council will provide assistance where possible to enable businesses to implement improved stormwater practices and help obtain other environmental information as needed.

##### How will you be involved?

Iona Theodoridis, Moreland City Council's Environmental Education Officer and Nicolette Rose, Moonee Ponds Creek- Keep it Clean will be visiting Snell Grove traders over the next few months. Iona can be contacted by telephone on 9240 1173, by e-mail at [itheodoridis@moreland.vic.gov.au](mailto:itheodoridis@moreland.vic.gov.au), by fax or 9240 1205. Nicolette can be contacted by telephone on 9333 2406, by e-mail at [nic@mpccc.org](mailto:nic@mpccc.org) or by fax on 9333 2413.

### Things your business can do to prevent stormwater pollution & help keep the Moonee Ponds Creek clean and healthy

#### Cleaning up around your shop or office

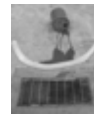


##### Do

- Sweep the gutters and driveways regularly & put the sweepings in a bin.

##### Don't

- Hose dirt off hard surface (roads, paths, driveways) into gutters.



#### Spill Prevention

##### Do

- Prevent ANY materials or leaks from entering the stormwater drains.



#### Litter Prevention

##### Do

- Provide containers for cigarette butts in areas frequented by smokers.
- Recycle bottles, cans, paper etc. Contact Moreland City Council for information on your recycling service.

##### Don't

- Drop packaging or cigarette butts on the ground.
- Leave loose rubbish near drains.
- Overfill rubbish bins.

#### Waste Storage & Disposal

##### Do

- Store garbage and recycling bins on your property until they are placed out for collection
- Bins should only be placed out on the street up to 24 hours before your collection day. They need to be taken back into your property within 24 hours of collection.
- Place ALL garbage or recycling inside bins, NOT on top or on the side of them and keep bin lids closed at all times.



- Contact Moreland City Council on 9240 1111 for information on Council's garbage and recycling services.

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This project has been assisted by funding from the Victorian Government through EPA Victoria as part of the Victorian Stormwater Action Program.



**Project Fact Sheet for Traders and the Public**

The Snell Grove stormwater education project is supported by:



**SNELL GROVE  
STORMWATER EDUCATION  
PROJECT**

For more information contact:

Iona Theodoridis  
Environmental Education Officer  
Moreland City Council  
Ph. 9240 1173  
Fax: 9240 1205  
E-mail: [itheodoridis@moreland.vic.gov.au](mailto:itheodoridis@moreland.vic.gov.au)  
Locked Bag 10,  
Moreland 3058



*This flyer has been reproduced with the kind permission of the Moonee Ponds Creek- Keep it Clean initiative*



**What is the Snell Grove stormwater education project?**

The Snell Grove stormwater education project is an initiative to reduce stormwater pollution in the Moonee Ponds Creek.

**WHAT IS STORMWATER?**

Water which comes out our homes or workplaces is discharged into the sewerage system. Rainwater which flows onto the street goes down drains, stormwater pipes and into our waterways- such as creeks, rivers and beaches. These waterways (and the infrastructure associated with them) are collectively referred to as the stormwater system.

**WHY IS STORMWATER PROTECTION IMPORTANT?**

The stormwater infrastructure system performs important drainage functions and our waterways sustain habitats for a variety of plant and animal species. In addition, many of our waterways are recreation sites and may even be of cultural significance. Some of the things that we do in our everyday lives can lead to the degradation of the stormwater system and therefore we all have a part to play in protecting this system.

Every year over 230,000 cubic metres or 2 billion items of litter are washed into our creeks and waterways. This amounts to one piece of litter per person per day ending up in our waterways.



**AIMS OF THE PROJECT**

- To increase awareness about the negative impacts of littering and stormwater pollution.
- To encourage practices which prevent litter and improve stormwater quality.
- To reduce the quantity of litter in the street and waterways.
- To reduce the levels of pollutants in the stormwater system.

**WHAT WILL THE PROJECT INVOLVE?**

- The Snell Grove stormwater education project involves:
- increasing trader and shopper awareness of the impacts of littering and stormwater pollution and encouraging stormwater responsible practices.
  - encouraging traders and shoppers to minimise the volume of litter and the level of pollutants that end up on Snell Grove, surrounding streets and in the Moonee Ponds Creek.

**COMMUNITY INVOLVEMENT**

Members of the local community, such as school students and local residents, will be invited to be involved in the Snell Grove stormwater education project.





**Poster for Traders' Shop Windows**

**A STORMWATER MESSAGE FROM SOME MORELAND RESIDENTS...**

Svo smeće bačeno na ulicama  
završava u našim potocima!

Todo lo que se arroja en  
nuestras calles va a dar  
a nuestros riachuelos.

إن كل ما يُرمى في شوارعنا  
يدخل في جداولنا وأنهارنا!

Wszelkie śmieci  
rzucane na naszych  
ulicach kończą w  
naszych rzeczках  
i strumieniach!

Tất cả những thứ bị liệng  
ra đường đều trôi vào  
sông lạch của chúng ta!

任何丟棄在我們的街上的物  
品都會進入我們的溪流!

**Everything  
thrown on our  
streets goes into  
our creeks!**

Οτιδήποτε πετάμε στους  
δρόμους μας καταλήγει  
στα ρυάκια μας!

Tutto ciò che si getta  
per la strada finisce nelle  
nostre acque!

Sokaklarınıza fırlatılan her  
şey derelerinize gitmektedir!

**Stormwater drains**  
collect rain and other  
water from our roofs,  
driveways, footpaths and  
roads and channel it directly  
into our creeks and rivers.

Unlike sewerage, stormwater  
is NOT treated.

Help protect our  
waterways!



**3** easy  
ways you  
can help...



**Walking the dog...**

Use a plastic bag to collect dog  
droppings and put them in the bin.



**Washing the car...**

Wash your car on the lawn  
or take it to a car wash.



**Smoking...**

Put out your butts and place them  
in a bin, or carry a portable ashtray.

**FURTHER INFORMATION:**

If you would like further information on protecting waterways within  
the City of Moreland, please contact Moreland City Council by  
• Telephone: 9240 1111 • TTY: 9240 2256 • Fax: 9240 1212  
• E-mail: [info@moreland.vic.gov.au](mailto:info@moreland.vic.gov.au)  
• Website: [www.moreland.vic.gov.au](http://www.moreland.vic.gov.au)





## APPENDIX 4      **Recommendations from the Community Change Report for Evaluation Styles 2, 3, 4 and 5**

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Source: Curnow and Spehr (2004), pp. 10-11.

### **Recommendations**

1. Council should take the opportunity to build on its improved perception as a change agent and leader involved with the area and extend infrastructure and BIN infrastructure initiatives to include trader suggestions such as keeping garden beds weed free, protecting trees on parking islands to prevent damage, installations and support for public place recycling bins and assistance for traders who have to store garbage bins on the street. Improvements in BIN infrastructure should be supported by continued maintenance programs, a review of cleaning schedules and provision of information to traders about environmental achievements.
2. The willingness of most traders to take responsible action needs to be publicly acknowledged and supported. Recalcitrant traders dumping waste require the application of a highly visible, systematic program of warnings and sanctions.
3. Action needs to be taken to reduce illegal activities occurring in the precinct (e.g. the illegal brothel currently in operation, to improve community pride in the area).<sup>10</sup>
4. Resources need to be made available in relation to Council staff time and management support for engaging local communities in litter prevention and stormwater management initiatives. A brainstorming session with key stakeholders may be required to develop partnerships as a way of continuing to implement and widen campaign messages.
5. Education campaign messages and methods need to be reviewed, particularly for Snell Grove traders where face-to-face contact was appreciated. Specific relatively low cost participatory / education interventions are likely to create sustainable outcomes when:
  - Sufficient time is allocated for educators to be present in a location to gradually build a relationship with key stakeholders particularly to overcome difficulties in finding mutually convenient meeting times and some of the traditional barriers and misunderstandings associated with local government and its priorities
  - Demonstrable action occurs in response to community requests for assistance, use of preferred communication channels by educators and recognition of achievements
  - Councils provide local leadership and support for programs coordinated across Council areas covering education, enforcement and infrastructure involved with litter prevention and stormwater quality initiatives
  - A program that is broadly based and engages traders, their customers and customers families as well as government agencies with interests in the local area
6. A regularly implemented ongoing approach to stormwater education would help to address the fatalistic attitude adopted by traders and the community that 'litter will always be a problem in the area'. In addition to education initiatives, the implementation of recommendations for general infrastructure improvement and addressing illegal activities is likely to yield positive results in the light of people's strong sense of identity with the area. Such an approach would be enhanced with a whole of Council commitment to litter prevention and stormwater quality that spanned the environmental, health, social, engineering, enforcement and local laws areas of Council.

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<sup>10</sup> Note that this premises was subsequently closed on 8 December 2004.

7. The Clean Communities Assessment Tool (CCAT) rating scales provide a comprehensive approach to integrated assessment of the first five styles of evaluation of non-structural stormwater quality interventions developed by Taylor and Wong (2003) and ought to be used more broadly.
8. The project has demonstrated the usefulness of summary CCAT ratings for a location and action scores as a method for assisting evaluations of styles 2, 3, 4 and 5, and to a lesser extent, 1 when non-structural best management practice (BMP) intervention involves changing peoples knowledge, attitudes and/or behaviour in relation to litter<sup>11</sup>.

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<sup>11</sup> The CCAT tool (along with others) has been referenced in the finalised CRC for Catchment Hydrology monitoring and evaluation guidelines (see Taylor and Wong, 2003).

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- Department of Sustainability and Environment, Vic
- Goulburn-Murray Water
- Grampians Wimmera Mallee Water
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- Murray-Darling Basin Commission
- Natural Resources and Mines, Qld
- Southern Rural Water
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