

Australian Research Centre
for Water in Society

**SOCIAL VALUES AND IMPACT STUDY
SOUTH WEST YARRAGADEE
BLACKWOOD GROUNDWATER AREA**

**The Results of the
South West and Perth Community Surveys**

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EXECUTIVE SUMMARY

This study forms part of the community involvement process and social analysis for the Sub-Regional Water Management Plan for the Blackwood Groundwater Area. The formulation of the Plan is in response to a proposal to supply Perth's Integrated Water Supply System (IWSS) with 45GL of groundwater from the South West Yarragadee aquifer. This study follows, and is based on, the findings of the qualitative scoping study with the regional community. It aims to:

- identify the social values associated with the water resources of the Blackwood Groundwater Area and their importance;
- assess how these values may be affected by human use of the water, both in situ and if withdrawn, including withdrawal and export from the region and;
- examine the attitudes people have towards the proposal, and circumstances in which attitudes may change.

The study focuses primarily on the values and views of the residents of the south-west region. However, as the proposal involves taking water to Perth, Perth householders' views on the proposal were also thought to be important and were examined in a separate survey in this study. This report describes the methodology and findings of both the South West survey and the Perth survey.

The sample for the South West survey included residents from the city of Bunbury and the following five townships and their surrounding rural areas: Busselton, Dunsborough, Margaret River, Augusta and Nannup. A total of 414 telephone interviews were completed, including 32 key stakeholders, 221 urban interviews and 192 rural interviews.

The sample for Perth consisted of 316 short telephone interviews of a random sample of Perth householders. This survey was much shorter than that for the South West, but it included a key question asked of the south-west respondents to allow comparisons of responses.

SOUTH WEST SURVEY

Groundwater Values

Respondents were asked to consider seven general categories of groundwater uses (ie. groundwater for irrigation; the natural environment; recreational use; regional households; households outside the region; industrial use and future use) and five specific uses within the categories. Multi-Attribute Utility Theory (MAUT) was the basis for the examination of the relative importance of these uses both within the categories and between categories.

The results of the analyses showed greatest importance for groundwater use for the natural environment followed by regional household use. Future use in the region was also important as was use for irrigation. Household use outside the region was clearly considered to be of least importance.

Measures were made of respondents' intrinsic values, both for the environment generally and for groundwater specifically. Highly reliable statistical measures were achieved which showed that the south-west community held strong intrinsic values for both the environment generally and groundwater specifically. That is, there was widespread value in the environment and groundwater just "being there". Comparisons between these values of the white community with those being investigated in the aboriginal cultural study will be interesting.

Fairness in Allocating Water

Measures to examine attitudes to fairness in water allocation decisions showed that economic analyses were not considered appropriate in allocating water. There was strong agreement throughout the community on the need for everyone to have a say in water allocation; the need for long term, sustainable management over short term gains and the requirement for efficient water use.

These measures found that two distinct groups existed in the community. The groups were described as *Regional Development* (60% of respondents) and *Wider Use* (40% of respondents). It was shown that the two groups judged fair water allocation in two distinct ways. The former group emphasised the allocation of water primarily for the development of the region and its economy, while the other group was more inclined to place importance on a wider use of water to environmental needs and uses outside the region. It is important, therefore, that water allocation decisions be agreed by both these groups, or points of view, if the decision is to be considered fair by the whole community.

Consideration of the Water Export Proposal

There was strong disagreement with the water export proposal by the south-west community. Only 12% directly agreed with it, with 8% being unsure. People's decisions were then challenged through consideration of a variety of outcomes or consequences of their decisions. Aspects of (un)certainly about the future had the greatest potential to change people's minds. That is, those in favour would change their minds given uncertainty about the provision for the region's future needs (including the environment). Those originally opposed to the proposal were more inclined to change their minds if future certainty could be guaranteed.

Issues associated with decision making and ongoing management processes, as well as water-use efficiency were also more likely to change decisions. Economically-based arguments (eg. the possibility of paying more for water, the potential for regional profit, loss of existing allocations, and no assistance in promoting decentralisation) were least likely to affect decisions.

A total decision trade-off score was calculated. From a possible score of 7, being total support, through to -7, being total opposition, the mean score for the south-west sample was -3.83, thus indicating strong opposition despite consideration of possible consequences. Almost one-third of the sample was totally opposed (scores of -7) to the proposal. There was also no statistically significant difference between the two fairness groups in their trade-off decisions. This means that both groups, who judge fairness in two different ways, considered the groundwater export proposal to be unfair, even though one of the groups was more likely to consider wider use outside the region.

Confidence in Science, Planning and Management

An attitudinal scale of high reliability was developed which measured respondents' trust, confidence and certainty in the ability of the experts and authorities to conduct investigations, plan for the future and make appropriate decisions. The mean score indicated little trust and certainty in the community and any demographic differences were in degree rather than in opposition.

Given that certainty issues were important for community support of the proposal as shown above, and the results of this attitudinal scale indicate there was little trust and certainty associated with the ability of the experts and authorities, it is therefore not surprising that respondents were reticent to change their support decisions even given the different challenges and possible consequences.

Water Use Information

Respondents who used groundwater were asked details of their use, including licence ownership, allocations and estimated use. Although the sample of groundwater users was not large, it was evident from the results that the users, particularly the licence holders, did not have a lot of knowledge about their licence details, allocations and current usage. It is suggested that this may be an issue for the future sustainable allocation and management of groundwater in the south-west.

Awareness and Knowledge of the Proposal and Process

Respondents were asked to rate their awareness of the groundwater export proposal, and of the process and investigations being led by the WRC to develop the Groundwater Management Plan. Only 13% were unaware of the proposal, and 18% were unaware of the WRC process and investigations. These are relatively high levels of community awareness of a planning topic and it is therefore not surprising that only 6% of the sample said, when asked, that they were not confident in providing their answers to the questionnaire. This high degree of confidence is borne out in the consistency of findings throughout the survey.

The Predictors of Support for the Proposal

The results of a regression analysis to ascertain the major variables that predicted respondents' trade-off decisions showed the *trust and certainty* scale to be the major predictor along with the *intrinsic groundwater values scale*. That is, if people were confident that the authorities and experts could ensure that the future needs of the region would be met, and the groundwater would be managed sustainably, they might be more inclined to support the proposal.

PERTH SURVEY

The findings of this short survey were both clear and consistent with those of the South West survey. Perth respondents considered the export of Blackwood groundwater for Perth use to be less than fair to the people of the south-west and to be a least favoured source, along with storing wastewater in aquifers for future use. Reuse options and desalination were the most favoured sources of the seven offered for consideration.

When support for the proposal was examined in the same way as for the South West survey, less than a third of the Perth sample absolutely agreed with the water export proposal and less than half the total sample supported the proposal even given the possibility of total sprinkler bans (43% of the total sample) or increased water prices (47%). Support for the proposal markedly increased to almost two-thirds of the total sample if the future needs of the south-west could be guaranteed. On the other hand, a majority of those who originally supported the proposal, reversed this support if the ability to meet future south-west needs was in doubt, or if it could be shown that Perth people were wasting water. This decision pattern was the same as for the south-west community.

Despite the various challenges to decision making, the mean overall trade-off decision score for the Perth sample was -2.05 (from possible scores that ranged from 7 being total agreement to -7 being total disagreement), thus denoting general disagreement with the proposal. One in eight Perth people were totally opposed to the proposal.

There were no statistically significant differences in the trade-off decision scores between respondents of different age groups, different genders, and those with personal association with the south-west study area and those without. This was also the case for favoured water sources and perceptions of fairness

to the south-west people. This provides confidence in these values being wide spread throughout the Perth community.

ISSUES FOR INTEGRATION

The conclusions outline the consistencies between the two surveys and the unequivocal message. Perth respondents have more preferred sources of water and are not in favour of importing groundwater from the South West Yarragadee. The south-west respondents have strong environmental values, favour regional uses and are highly concerned about the future of the region and have little confidence and trust in the ability of the experts to make considered decisions for the future.

There are a number of points here for consideration and comparison with the other investigations currently being conducted.

Firstly, the strong environmental and groundwater intrinsic values will provide important data for comparison with the aboriginal cultural study.

The strong environmental values also have implications for the technical environmental studies. The south-west community will need to be confident that environmental impacts will not eventuate by the proposed groundwater extraction. This also means that the economic study will need to at least identify the externalities in its analyses even if it can't confidently value them.

The fact that people do not consider economics to be appropriate for fair water allocation decision making has important implications for the economics team. This finding does not mean that economic analyses do not have a place in the overall decision making process. But the issue here is that addressing the fairness implications in allocating water have primary importance for people. The economic investigations therefore need to take this into account. Attempting to address the externalities will go some way towards achieving this.

1.0 INTRODUCTION

The Water Corporation, on behalf of the Government of Western Australia is planning future water source options for Perth's Integrated Water Supply System (IWSS) for the next 20 to 30 years. One option under consideration is to take 45 Gigalitres (GL) of water from the South West Yarragadee aquifer within the Blackwood Groundwater Area. A range of other options are also being considered including a 30 GL per year seawater desalination plant at Kwinana. In addition to these major water source development options, the State is looking into smaller water resource options and different water conservation measures. The Government is likely to announce its preferred option, if required, by November 2003. The Water and Rivers Commission (WRC) has the responsibility of ensuring comprehensive and integrated social, cultural, economic and environmental investigations as well as conducting the public involvement program.

The WRC is the Government Agency responsible for managing the State's water resources and assessing applications for groundwater extractions, whether from private users or from water service providers. In considering the Water Corporation's proposal to take water from the Blackwood Groundwater area, the WRC is developing a Sub-Regional Water Management Plan ("the Plan") that will describe the sustainable management of the groundwater resources within the Blackwood Groundwater Area. For the preparation of the Plan, a comprehensive assessment of the South West Yarragadee groundwater aquifer from ecological, economic, social, cultural and heritage perspectives is being concurrently undertaken by independent research teams.

This study forms part of the community involvement process and social analysis for the Plan. It follows, and is based on, the findings of a qualitative scoping study with the regional community. It aims to:

- identify the social values associated with the water resources of the Blackwood Groundwater Area and their importance;
- assess how these values may be affected by human use of the water, both in situ and if withdrawn, including withdrawal and export from the region and;
- examine the attitudes people have towards the proposal, and circumstances in which attitudes may change.

The study focuses primarily on the values and views of the residents of the south-west region. However, as the proposal involves taking water to Perth, Perth householders' views on the proposal were also thought to be important and were examined in a separate survey in this study. This report describes the methodology and findings of both the South West survey and the Perth survey.

2.0 METHODOLOGY – SOUTH WEST SURVEY

2.1 STUDY LOCATIONS

The main study location for the South West survey was the Blackwood Groundwater Area (see Figure 1). This area roughly extends north from Augusta to Margaret River along the highway, east to Nannup and south from Nannup to the coast. As part of the regional planning process, the study location was further extended to include residents living in the Busselton-Capel Groundwater Area (i.e. north to Dunsborough, Busselton and Bunbury).

This area in the south-west corner of WA is reported to have been growing rapidly with an average population growth of 2.3% – above the State average of 1.7%. The region also features diversity in its local economy with agricultural, mining and tourism industries not only well-established but forecast to expand in the near future.

Figure 1. South West study locations – the Blackwood and Busselton Capel Groundwater Areas



The sample for the South West survey included residents from the city of Bunbury and the following five townships and their surrounding rural areas: Busselton, Dunsborough, Margaret River, Augusta and Nannup. The target sample size for each region was set at 60, with the exception of Nannup where 100 respondents were required due to its larger geographical area. The main reasoning for the design of

the sample in this way rather than aiming for a representative community sample was to ensure the ability to make relevant statistical comparisons.

In water allocation decision making, as had already been shown in the scoping study for this project, issues associated with fairness to different groups (eg. urban dwellers, rural properties, irrigators, geographical locations, environmental interests etc.) have the greatest potential to cause conflict. Water allocation decision making needs to take all points of view into consideration and to ensure the process and the decisions do not marginalise any particular groups. By sampling in the way described above, the different view points in the south-west community can be measured and any possibilities for future conflict can be identified in a timely manner enabling them to be addressed early in the decision making process. By including some key demographic variables, comparisons can be extrapolated to the general population and the findings appropriately interpreted if an estimate of the precise value of the participants' viewpoint is useful for the decision making.

2.2 PROCEDURE

Given the timeframe for the conduct of this survey, telephone interviews were chosen as the most appropriate methodology. Households living in the selected south-west regions were telephoned in the first week of May 2003. These households were randomly chosen from telephone lists based on the geographic area they lived in. Due to the complexity of the regions, a minimum number of rural or special rural properties were required for each region to ensure a range of interests was obtained. Efforts were also made to ensure that representatives of industry based groups, community groups and catchment groups, as identified as "Priority 1 Stakeholders" by the Community Consultation and Communications Team of the WRC, were interviewed for the study.

Interviewers were instructed to call a household a minimum number of three times at different times of the day and on different days before the household could be dismissed as 'no contact'. Interviewers were also required to obtain approximately an equal number of males and females in each regional area. The potential respondents' main places of residence were required to be in the specified regions to be eligible to participate in the study. Minimum and maximum numbers of required urban and rural interviews were also set for each location, with only urban interviews being required for Bunbury.

A final total of 414 interviews were completed. This included 32 key stakeholders, out of the 34 provided by the WRC. The overall distribution of urban and rural (including special rural) samples was 53.4% (n=221) and 46.4% (n=192) respectively.¹ The refusal rate was recorded at 48.8%, which is considered

¹ The numbers excludes an interview with a key stakeholder who resided in Perth.

quite low for this survey methodology, especially given the length of the survey. Tables 1, 2 and 3 show the target and achieved sample for the South West survey and the refusal data.

Table 1: Target and achieved number of South West survey interviews

Region	Target Total N	Achieved Total N	Urban N	Rural N	Special Rural N
Bunbury	60	61	60	1*	0
Busselton	60	68	46	14	8
Dunsborough	60	61	46	7	8
Margaret River	60	62	18	32	12
Augusta	60	60	22	28	10
Nannup	100	101	29	42	30

* Priority stakeholder interview as only urban respondents required for Bunbury.

Table 2: Recruitment data for South West survey

Region	Total calls N	Refused N	Agreed N
Bunbury	154	93	61
Busselton	119	51	68
Dunsborough	143	82	61
Margaret River	112	50	62
Augusta	90	30	60
Nannup	189	88	101

Table 3: Refusal data for South West survey

Reason for refusals	N	%
Not interested	186	47.2
Too busy	142	36.0
Too old/unwell	43	10.9
Not enough knowledge	15	3.8
No English	8	2.0

2.3 THE QUESTIONNAIRE

A series of community briefings were held in the study region by the WRC as part of the foregoing scoping study. The briefings were aimed to raise community awareness of the proposal and allowed concerned parties to express their views. Information gathered from these briefings by the WRC², along with discussions between key stakeholders in the region and the researchers were used as the basis for the development of the survey questionnaire.

The final content of the questionnaire for the South West sample covered the following aspects.

- Background information about the proposal and a description of the Blackwood Groundwater Area and the study area.
- Awareness of the proposal.
- Importance of groundwater from the Blackwood Groundwater Area for various purposes – i.e. irrigation, natural environment, recreational use, regional household use, urban household use, industrial use, and future use.
- Environmental values of the groundwater and its importance to the respondent's daily activities.
- Agreement with statements regarding the respondent's general environmental value orientation.
- Agreement with fairness principles for water allocation (Syme, Nancarrow & McCreddin, 1999). Some of the statements were modified to suit the current study.
- Views on the proposal and specific circumstances under which the views may change.
- Trust, confidence and certainty in the ability of the authorities to plan for the future and carry out scientific investigations.
- Current water use information.
- Future water use information.
- Awareness and views on the process and investigations lead by the WRC.
- Any close relations or friends who live in Perth.
- Confidence in answering the questionnaire, time lived in the region, age and gender.

The questionnaire can be found in Appendix 1.

² The documentation of this process is publicly available at <http://www.wrc.wa.gov.au/whicher/blackwood.htm> and entitled "Planning for the Future of the South West Yarragadee Blackwood Groundwater Area", March 2003.

3.0 RESULTS – SOUTH WEST SURVEY

The following reports the results of the South West survey. Analytical comparisons were made with the responses to all major questions and any statistically significant differences that emerged ($p < .01$) are reported in the text.

3.1 GROUNDWATER VALUES

Respondents were provided with seven general categories of groundwater uses (ie. groundwater for irrigation; the natural environment; recreational use; regional households; households outside the region; industrial use and future use) and five specific uses within the categories. Multi-Attribute Utility Theory (MAUT) was the basis for the examination of the relative importance of these uses (see Winterfeld and Edwards, 1986 and Edwards and Winterfeld, 1987).

Respondents were asked to rate the importance of each use within each category by firstly assigning a base value of “10” to the use of least importance. Each of the other uses were then assigned an importance rating in multiples of ten, depending on how important each was in relation to the previous use (eg. “20” meant the use was twice as important as the least value use). If they were all of equal importance, the same value was assigned to all five uses. Finally, respondents were asked to rate the importance of the use categories as a whole in the same way.

Value ratings within each category were standardised so that they summed to 100. The category ratings were standardised in the same way. Therefore, in each of the following category tables, the sum of the mean importances shown for each specific use is 100, with the higher the value, the greater the importance. This standardisation allows the importance ratings to be compared between respondents by creating a common variance.

3.1.1 Groundwater for Irrigation

The following shows the mean standardised importance ratings for each irrigation use for groundwater in the south-west.

Irrigating fruit and vegetables and pasture for dairy cattle were rated most important and grapevines and plant nurseries least important.

After the importance rating of each category, respondents were asked if they had any comments to make. A wide range of comments was received and those that were nominated most frequently follow. Just over a quarter of respondents (28.4%) noted that all uses were (very/equally) important. Thirteen per cent said that agriculture or a specific industry was important, while 12.3% commented that irrigation should use other sources of water only (ie. irrigators should not be using groundwater at all).

Table 4: Importance ratings of irrigation uses for groundwater

Irrigation Use of Groundwater	Mean Importance
Fruit (including nuts) and vegetables	25.25
Pasture for feeding dairy cattle	22.25
Broadscale crops (eg. grains, legumes)	18.82
Grapevines ³	17.85
Plant nurseries	15.84

3.1.2 Groundwater for the Natural Environment

The following shows the mean standardised importance ratings for each environmental use for groundwater in the south-west.

Table 5: Importance ratings of aspects of the natural environment supported by groundwater

Natural Environment Use of Groundwater	Mean Importance
Blackwood River	20.83
Wetlands, including Lake Jasper	20.46
Animals and birds in the wild	20.30
Natural vegetation	19.35
Forests in conservation areas	19.05

Again there was a wide range of comments offered. As the mean ratings above indicate, 68% of respondents commented that all the natural environment uses were (very/equally) important and 12.2% said that they were all part of the ecosystem and relied on each other.

³ This relatively low importance rating for irrigation of grapevines may seem surprising. However, it is consistent with similar importance ratings in other studies (eg. Nancarrow and Syme, 2001a). That is, people differentiate between the importance of water for providing life essentials and those crops not essential to life.

3.1.3 Groundwater for Recreational Use

Respondents were told that groundwater supported many recreational activities. The following shows the mean standardised importance ratings for each recreational use supported by groundwater in the south-west.

Table 6: Importance ratings of recreational activities supported by groundwater

Recreational Use of Groundwater	Mean Importance
Fishing in fresh water bodies	20.98
Viewing natural scenery	20.39
Bushwalking in the forests	20.12
Swimming in fresh water bodies (eg. lakes & rivers)	19.28
Picnicking or relaxing by springs and waterways	19.23

Again, as the mean ratings above indicate, there was very little difference in the importance of the different uses with 40.7% of respondents commenting that all were (very/equally) important, while 10.3% said recreation was not important. Five per cent commented that recreational uses were important for tourism. Interestingly, 12.7% were unaware of the connection of these uses with groundwater.

3.1.4 Groundwater for Regional Household Use

The following shows the mean standardised importance ratings for each regional household use for groundwater in the south-west.

Table 7: Importance ratings of groundwater for regional household uses

Regional Household Use of Groundwater	Mean Importance
Household use for towns in the Blackwood Groundwater Area (eg. Nannup, Margaret River, Augusta)	22.85
Household and stock use for <i>rural</i> properties in the region	22.59
Household use for Busselton and Dunsborough	19.19
Household and stock use for <i>special rural</i> properties in the region	19.09
Household use for Bunbury	16.28

Groundwater for urban household use in the Blackwood Groundwater Area and rural properties in the region were seen to be more important than household use for special rural properties in the region or urban use outside the Blackwood Groundwater Area. Household use for Bunbury households was seen to be of least importance in this category.

Comments included 29.9% saying all were (very/equally) important, 20.1% saying that there was enough surface water and didn't need groundwater, and 8.2% noted that the water must meet local needs first.

3.1.5 Groundwater for Household Use Outside the Region

The following shows the mean standardised importance ratings for each household use for groundwater outside the south-west study region.

Table 8: Importance ratings of groundwater for household use outside the region

Household Use of Groundwater Outside the Region	Mean Importance
Household use for other southern towns (eg. Manjimup; Bridgetown and Katanning)	26.17
Household use for towns east of Perth (eg. Northam & Merredin)	19.57
Household use for towns in the goldfields	19.34
Household use for Mandurah	18.16
Household use for Perth	16.77

Groundwater for household use for other southern towns was clearly more important than the other four choices, and use by Perth households was clearly rated the least important.

In contrast to previous uses, only 9.1% of respondents said all were (very/equally) important, with 24.8% saying that water should be kept in the region, and 17.3% commenting that another source needed to be found.

3.1.6 Groundwater for Industrial Use in the Region

The following shows the mean standardised importance ratings for each industrial use for groundwater in the south-west study region.

Table 9: Importance ratings of industrial uses for groundwater

Industrial Use of Groundwater in the Region	Mean Importance
Agriculture generally	24.46
Dairy-based industries (eg. cheese manufacturing)	23.70
Forestry industry	19.09
Tourism industry	17.60
Mining industry	15.15

Agriculture and dairy-based industries were seen to be most important, with tourism and mining being rated least important.

Only 18.7% of respondents said all were (very/equally) important, with 13.5% saying that recycled water should be used, and 7.3% noting that mining specifically should use other sources of water.

3.1.7 Groundwater for Future Use in the Region

The following shows the mean standardised importance ratings for each future use for groundwater in the south-west study region.

Table 10: Importance ratings of future uses for groundwater in the region

Future Use of Groundwater in the Region	Mean Importance
Future environmental needs if there is climate change	24.18
Future population growth of towns in the region	23.39
Future needs of existing industries	19.80
Future needs of new industries	16.39
Future needs of increased tourist and visitor numbers	16.24

Future needs of the environment and population growth were rated of greatest importance with new industries and increased tourism being least important.

However, 32.3% of respondents said all were (very/equally) important, and 8.1% said that the future is unknown.

3.1.8 Importance of Groundwater Uses Generally

The following shows the mean standardised importance ratings for each groundwater use category.

Table 11: Importance ratings of general uses for groundwater

Groundwater for	Mean Importance
Natural environment	18.70
Regional household use	17.36
Future use in the region	15.88
Irrigation	15.66
Recreational use	12.07
Industrial use in the region	11.69
Household use outside the region	8.66

The natural environment and regional household uses were rated most important of all the generalised use categories. It is apparent that uses in the region were considered more important than the use outside the region, even though that use involved households.

The category importance ratings were compared between area (eg. Margaret River area, Nannup area etc.) and location (urban, rural and special rural), age and gender. Statistically significant differences ($p < .01$) that emerged were as follows.

- Groundwater use for irrigation was rated significantly less important by respondents in the Nannup area (mean = 12.77) than in the Bunbury (mean = 16.35), Margaret River (mean = 16.53), Augusta (mean = 17.62) and Busselton (mean = 17.68) areas.
- Groundwater use for the natural environment was rated significantly less important by Bunbury respondents (mean = 15.57) than those in the Nannup area (mean = 20.50), and significantly less again than those in the Margaret River area (mean = 22.20).
- Groundwater use for the natural environment was rated significantly less important by urban respondents (mean = 17.44) than by the special rural respondents (mean = 21.27).
- Groundwater for household use in the south-west study region was rated significantly less important by respondents in the Margaret River area (mean = 14.80), the Dunsborough area (mean = 16.05) and the Bunbury area (mean = 16.26) than by respondents from the Augusta area (mean = 19.79).
- Groundwater for household use outside the region was rated significantly less important by respondents in the Nannup area (mean = 7.36) than respondents in the Bunbury area (mean = 11.37).

- Groundwater for household use in the south-west study region was rated significantly less important by respondents aged less than 24 years (mean = 12.79) than by respondents aged between 56 and 65 years (mean = 18.37).

3.1.9 Weighted Importance of Individual Groundwater Uses

Importance weightings for each individual groundwater use in each general category were calculated by multiplying the standardised use ratings by the standardised category ratings. These scores were also standardised so that the importance weightings summed to 100. Table 12 shows the weightings of each groundwater use in order of importance. The weightings tend to indicate three groupings of uses which have been labelled: *primary importance*; *secondary importance* and *least importance*.

It is evident that regional household uses (current and future), uses for food production (human and animal), and sustaining the natural environment were considered to be of primary importance for groundwater use in the region. Use for wetlands, including Lake Jasper, was the environmental use of greatest importance. Household use outside the region (with the exception of other southern towns) and industrial use (apart from providing for future use by existing industries) were seen to be of least importance.

Table 12: Weighted importance ratings of individual uses for groundwater

Groundwater Use	Weighted Importance
<i>Primary Importance</i>	
Household use for towns in the Blackwood Groundwater Area	4.07
Irrigation of fruit and vegetables	3.95
Household and stock use for rural properties in the region	3.88
Wetlands, including Lake Jasper	3.88
Future environmental needs if there is climate change	3.88
Blackwood River	3.87
Animals and birds in the wild	3.76
Future population growth of towns in the region	3.66
Natural vegetation	3.62
Forests in conservation areas	3.58
Pasture for feeding dairy cattle	3.49
Household use for Busselton and Dunsborough	3.33
Household and stock use for special rural properties in the region	3.28
Future needs of existing industries	3.14

Table 12: Weighted importance ratings of individual uses for groundwater ... cont.

Groundwater Use	Weighted Importance
Secondary Importance	
Irrigation for broadscale crops	2.95
Irrigation for grapevines	2.83
Household use for Bunbury	2.80
Future needs of new industries	2.62
Future needs of increased tourist and visitor numbers	2.58
Fishing in freshwater bodies	2.53
Viewing natural scenery	2.47
Irrigation for plant nurseries	2.45
Bushwalking in forests	2.42
Picnicking or relaxing by springs and waterways	2.33
Swimming in fresh water bodies	2.32
Household use for other southern towns outside the region	2.15
Least Importance	
Dairy-based industries (eg. cheese manufacturing)	1.93
Agriculture generally	1.93
Forestry industry	1.92
Tourism industry	1.91
Mining industry	1.90
Household use for towns east of Perth	1.73
Household use for towns in the goldfields	1.72
Household use for Mandurah	1.59
Household use for Perth	1.48

3.1.10 Personal Groundwater Values

To ensure that all personal values associated with groundwater had been captured, respondents were asked two open-ended questions. The first addressed which aspects of the natural environment that are supported by groundwater were most important to them. The second asked the activities in the natural environment supported by groundwater that were of greatest importance. The following tables show the responses most often nominated. Respondents could give up to three responses for each question.

Table 13: Aspects of the natural environment supported by groundwater of greatest importance to respondents

Important Environment supported by Groundwater	% (N=412)
All of it/all inter-related	32.5
Forests	25.5
Fauna and flora	23.1
Sustaining the ecosystem	22.1
Lakes and wetlands	21.8
Rivers and streams	21.1

NB: Up to three responses were allowed so percentages do not add to 100.

Table 14: Activities in the natural environment supported by groundwater of greatest importance to respondents

Important Environmental Activities supported by Groundwater	% (N=406)
Bushwalking	35.0
Water sports/swimming	34.7
Fishing	34.5
Enjoying the scenery	28.6
Picnicking and camping	7.9
Tourism/recreation	6.7

NB: Up to three responses were allowed so percentages do not add to 100.

3.1.11 Intrinsic Environmental Values

There are environmental values associated with aspects of the environment just “being there”. In an attempt to measure these intrinsic values (both generally for the environment and specifically for groundwater), a number of statements were devised and respondents were asked to rate their agreement on a five point scale. For ease of interpretation, the scale was recoded so that the higher the score, the greater the value. Table 15 shows the ratings results for each statement.

Table 15: Agreement with intrinsic environmental values statements

Statement	1 Strongly Disagree %	2 Disagree %	3 Neither %	4 Agree %	5 Strongly Agree %	Mean
Personally, the protection of the natural environment is beyond question.	0.7	5.3	1.4	35.7	56.8	4.43
I believe the protection of the natural environment is vital for future generations.	0.0	1.7	1.7	36.0	60.6	4.56
Ancient groundwater should not be touched by humans.	5.1	38.3	17.7	23.0	16.0	3.07
I feel a moral obligation to protect the natural environment.	0.2	2.9	3.9	49.5	43.5	4.33
In the end, the only value of protecting groundwater is in its use for human welfare.	11.1	41.6	10.7	29.1	7.5	2.80
To me, the protection of natural groundwater is vital.	0.2	4.1	3.9	45.4	46.4	4.34
Human welfare is more important than the natural environment.	10.9	45.9	21.4	19.4	2.4	2.57
We need to protect ancient groundwater to avoid running out of water in the future.	1.9	13.3	8.7	47.8	28.3	3.87
I feel a moral obligation to protect natural and ancient groundwater.	0.7	11.4	7.7	50.8	29.3	3.97

Reliability of the statements for use as two scales in future analyses was tested: a general intrinsic environmental values scale, and a specific intrinsic groundwater values scale. The following scales proved to be highly reliable⁴ for further analyses.

Intrinsic Environmental Values Scale

- Personally, the protection of the natural environment is beyond question.
- I believe the protection of the natural environment is vital for future generations.
- I feel a moral obligation to protect the natural environment.

Standardised item U = .8036

Possible scores on this scale could range from 3 to 15, with the higher the score indicating the greater the intrinsic value of the environment generally.

Minimum 4

Maximum 15

Mean 13.31

⁴ A Cronbach alpha (U) is a statistic which summarises how closely the items in a scale correlate with each other. A perfect scale (ie. totally reliable) would have an U of 1. An unreliable scale would have an U of 0. Any value above about 0.65 can be regarded as satisfactory for analysis.

Intrinsic Groundwater Values Scale

- Ancient groundwater should not be touched by humans.
- To me, the protection of groundwater is vital.
- We need to protect ancient groundwater to avoid running out of water in the future.
- I feel a moral obligation to protect natural and ancient groundwater.

Standardised item U = .7125

Possible scores on this scale could range from 4 to 20, with the higher the score indicating the greater the intrinsic value of groundwater specifically.

Minimum 7

Maximum 20

Mean 15.24

The mean scores for both scales indicate high intrinsic values by the sample as a whole for the existence of the natural environment and groundwater.

Comparisons were made between the responses to the two values scales and geographic areas, respondent type (urban or rural), users and non-users of groundwater, licence and non-licence holders, length of time of residence in the area, age and gender. The following statistically significant differences were found, but it should be noted that all differences were in degree rather than opposing attitudes. All means for all groups indicate high environmental and groundwater intrinsic values.

- Respondents who lived in the Nannup area had a significantly higher ($p < .01$) environmental intrinsic values score (mean = 13.79) than those who lived in the Bunbury area (mean = 12.67).
- Those who had lived in the region for less than 5 years had a significantly higher ($p < .01$) environmental intrinsic values score (mean = 13.96) than those who had lived there for greater than 30 years (mean = 12.87).
- Respondents who lived in the Nannup and Augusta areas had a significantly higher ($p < .01$) groundwater intrinsic values scores (means = 16.12 and 16.17) than those who lived in the Bunbury area (mean = 13.97).
- Special rural respondents had a significantly higher ($p < .01$) groundwater intrinsic values score (mean = 16.24) than rural respondents (mean = 15.15) and urban respondents (mean = 14.98).
- Groundwater users had a significantly lower ($p < .01$) intrinsic groundwater values score (mean = 14.67) than those who did not use groundwater (mean = 15.53).

- Males had a significantly lower ($p < .01$) intrinsic groundwater values score (mean = 14.63) than females (mean = 15.98).

3.1.12 Summary – Groundwater Values

The results of the previous questions show the extent to which the natural environment, that is supported by groundwater, is valued by the south-west community. Both groundwater itself, and the environment generally were highly valued for just “being there”. Environmental use was also rated the most important of all seven categories of groundwater use. One of the more important environmental uses was seen to be groundwater for wetlands, such as Lake Jasper. While people generally saw all aspects of the environment as being linked and inter-dependent, the standardised importance weighting for wetlands indicated higher importance for this environmental aspect than others, such as the Blackwood River and forests.

Uses for human, animal and environmental life were all seen to be the most important uses for groundwater. Very clearly, use by households in Perth’s IWSS was seen to be least important of all thirty-five specific uses.

3.2 CONSIDERATIONS OF FAIRNESS IN ALLOCATING WATER

Respondents were asked to rate a series of twenty-two statements on a five point scale from 1 being strongly agree to 5 being strongly disagree. These statements⁵ related to different aspects of fairness in the allocation of water generally.

For ease of interpretation, they are shown in terms of **high (dis)agreement**, where more than 80% of the sample (dis)agreed; **general (dis)agreement**, where between 60% and 80% (dis)agreed; and **split opinion**, where there was a spread of responses from “strongly agree” to “strongly disagree”.

Table 16: Statements of fairness in the allocation of water generally where there was high (dis)agreement (> 80% (dis)agreement)

Fairness Statement	Response
All sections of the community have the right to have a say on allocating water.	high agreement
Everyone should recognise that they may have to make some personal sacrifices if we are going to have effective long term planning.	high agreement
All water should be put on the market and sold to those who will pay most, regardless of what it is used for.	high disagreement
Water should be allocated for long term sustainability even if it reduces the short term profits of local businesses.	high agreement
Water has a value other than its dollar value.	high agreement
Saving water for the future is more important than making money now.	high agreement
People should only be allocated water if they can show it is being used efficiently on their properties.	high agreement

The above statements represent fairness issues where there is virtually no argument in the community. They provide a philosophical basis from which allocation policy can be developed and considered fair by most in the regional community. There is high agreement on the need for everyone to have a say in water allocation; the need for long term, sustainable management over short term gains; the requirement for efficient water use; and the need to consider water and its allocation in other than an economic sense.

The statements shown in Table 17 represent fairness issues where there is general agreement in the community. Little conflict surrounds these issues. In summary, they represent issues of prior rights; environmental rights; the rights of landholders and local communities; and decision making and process issues. It is interesting that the prior rights of the environment are recognised, but not the rights of people who have previously held water allocations. And while the rights of the local community and the

⁵ These *Universal Fairness* statements have been developed and replicated by ARCWIS in a research program spanning more than 12 years in a variety of allocation scenarios nationally. See Syme, Nancarrow and McCreddin (1999).

public good are generally supported, the rights of individual landholders to the water under their land are not. Economic analyses were thought not to be useful in water allocation decisions, and that the particular situation needed to be examined, rather than deciding with the use of rules.

Table 17: Statements of fairness in the allocation of water where there was general (dis)agreement (> 60% & < 80% (dis)agreement)

Fairness Statement	Response
You can't solve water sharing problems by analysing the costs and benefits in dollars	agreement
Since the environment was the original "user" of water, it should always have higher priority than other possible users.	agreement
If the decision making process is fair, people should accept the final water allocation decisions.	agreement
The natural environment has the same rights to water as people have.	agreement
There are no general rules about how to share water, it depends on the situation	agreement
Water can only be allocated out of the region after the basic needs of the regional communities have been met.	agreement
Water is owned by everyone and therefore it should be managed for the overall public good.	agreement
Landholders have the right to use groundwater under their land as they see fit.	disagreement
Those who have had water allocations in the past have a greater right to water than newcomers.	disagreement

The general disagreement with supporting those with previous allocations over newcomers may seem to be contrary to the findings in the previous section of this report where priority was given to existing uses of groundwater over new uses (see Table 10). However, this is consistent with previous research by ARCWIS (eg. Syme and Nancarrow, 1996, 1997) where fairness decisions made in specific allocation situations may be different from the general (universal) fairness philosophies held by people. For example, prior rights may not be supported in the general context because the details of how the water is being used are not known. It may be that it is being used inefficiently, or for a lesser priority use. However, if the specifics of the situation are known, prior rights can be supported, and often are.

Finally, Table 18 shows the statements where there was a split opinion in the regional community. These are the areas where there is likely to be the greatest possibility of conflict within the community. These mostly relate to issues of priority for allocation (ie. those who have it already; those who work hardest; those who use it to make a living etc.) and the appropriateness of equal treatment of everyone when allocating water.

Table 18: Statements of fairness in the general allocation of water where there was a split opinion (a spread of responses)

Fairness Statement	Response
In water allocation everyone should be treated equally	split opinion
It would be highly unfair to take water away from those who already have allocations.	split opinion
Priority for water should be given to those who need it to make a living.	split opinion
Groundwater under land is naturally the property of the local communities.	split opinion
Water allocations should be made to maximise the overall economic income of the regional community	split opinion
Water should only be allocated to those who work hardest to use it most productively.	split opinion

To ascertain if there were any overall fairness viewpoints by which water allocation decisions would be judged by the regional community, a cluster analysis was conducted using the twenty-two fairness statements. The two cluster solution was the one most easily interpreted. A discriminant analysis was then conducted to determine which statements discriminated between the two clusters of respondents. The resulting discriminant analysis ($\eta^2 = .331$; $p < .001$) correctly classified 96% of cases to the clusters.

The major discriminating statements, and the clusters' degree of agreement with the statements are shown in the following table.

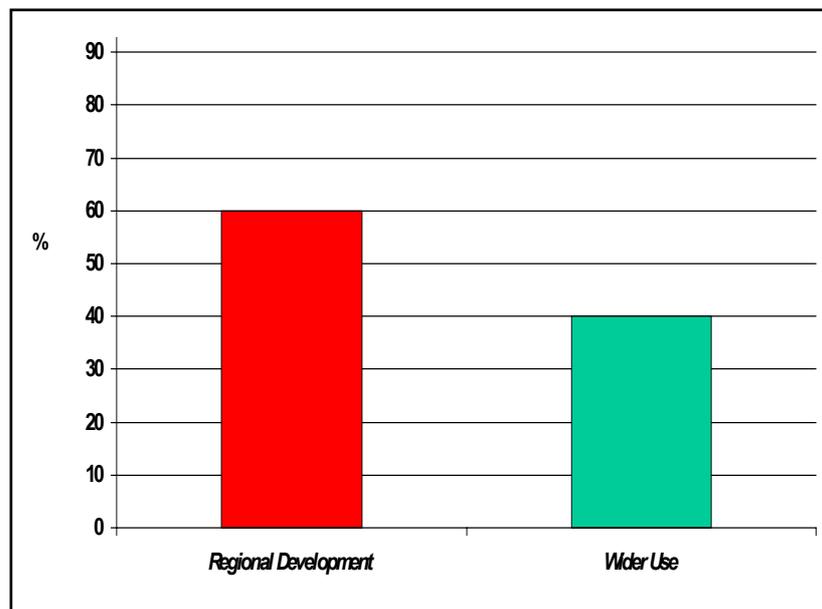
Table 19: The clusters' degree of agreement with each of the discriminating fairness statements

Discriminating Statements	Mean Score and Degree of Agreement with statements			
	Cluster 1		Cluster 2	
	Mean score	Agreement	Mean score	Agreement
Water allocations should be made to maximise the overall economic income of the regional community.	2.40	<i>greater</i>	3.69	<i>lesser</i>
Priority for water should be given to those who need it to make a living.	2.35	<i>greater</i>	3.57	<i>lesser</i>
Landholders have the right to use groundwater under their land as they see fit.	2.93	<i>greater</i>	4.05	<i>lesser</i>
Groundwater under land is naturally the property of the local communities.	2.44	<i>greater</i>	3.30	<i>lesser</i>
Water can only be allocated out of the region after the basic needs of the regional communities have been met.	2.03	<i>greater</i>	2.72	<i>lesser</i>
The natural environment has the same rights to water as people have.	2.32	<i>lesser</i>	2.03	<i>greater</i>

NB: The higher the score the greater the disagreement with the statement.

On examining the discriminating statements in Table 19, the clusters could be described as *Regional Development* (Cluster 1) and *Wider Use* (Cluster 2). These two groups judge fair water allocation in two distinct ways. The former group emphasised the allocation of water primarily for the development of the region and its economy, while the other group was more inclined to place importance on a wider use of water to environmental needs and uses outside the region. ***It is important, therefore, that water allocation decisions be agreed to by both these groups, or points of view, if the decision is to be considered fair by the whole community.*** Figure 2 shows the relative proportions of the clusters in the sample.

Figure 2: Relative proportions of the two fairness clusters of respondents



There were no statistically significant differences in cluster membership between geographic areas in the survey, urban and rural respondents, age or gender. There were though a number of other differences.

- *Wider Use* respondents rated significantly greater importance ($p < .001$) to environmental uses of groundwater (mean = 20.61) than did *Regional Development* respondents (mean = 17.26).
- *Regional Development* respondents rated significantly greater importance ($p < .01$) to industrial uses of groundwater (mean = 12.28) than did *Wider Use* respondents (mean = 10.75).
- *Wider Use* respondents scored significantly higher ($p < .001$) on the *intrinsic environmental value* scale (mean = 13.91) than did *Regional Development* respondents (mean = 12.91).
- *Wider Use* respondents scored significantly higher ($p < .01$) on the *intrinsic groundwater value* scale (mean = 15.78) than did *Regional Development* respondents (mean = 14.88).

3.3 CONSIDERATIONS OF SUPPLYING PERTH WITH SW YARRAGADEE GROUNDWATER

Although the introduction to the survey discussed the proposal to supply Perth's IWSS with groundwater from the Yarragadee aquifer in the Blackwood Groundwater Area, the following questions asked specifically about the supply of water to Perth. Survey scoping discussions in the study region indicated that there were varied views on providing water to different parts of the IWSS, as has also been shown in the results reported here. This would provide difficulties in providing yes/no answers to the proposed questions. Therefore, as the greater proportion of the water would be allocated for Perth use, the question focused on this aspect. With supply to Perth being the most controversial aspect of the proposal, any agreement or decision about this aspect could therefore be considered as the worst case scenario.

The aim of this question was to ascertain the strength of the respondents' views and the limits to their allocation decisions. Respondents were asked the following question.

Water use in the Blackwood and surrounding regions is going to grow in the future. Over the next 20 years alone, irrigated agriculture is expected to grow by 60% to 80%. It is likely there will also be increased demand due to mining, tourism and population growth.

Similar growth is expected in the Vasse and Preston regions, with a similar increase in demand for water.

The population of Perth is increasing and hence the demand for water will also grow. While there are a number of alternative sources and technological solutions available, most mean higher costs of water (eg. desalination).

Do you believe water should be supplied for Perth use from the Blackwood Groundwater area?

The respondents could answer YES, NO or NOT SURE to the above question. If they answered YES or NOT SURE, they were then challenged by six possible consequences of the decision. If they answered NO or NOT SURE, they were also challenged by a different set of six possible consequences of that decision. The following shows the responses to these questions.

Twelve per cent of the total sample agreed outright to supplying Perth with Blackwood groundwater. A further 8% were unsure and a total of 80% disagreed with the proposal. Those who agreed or were unsure (N = 83; 20.1%) were then asked if they would *still believe in providing Blackwood groundwater to Perth*

if it was not known what effects taking water from the area would have on the regional environment?

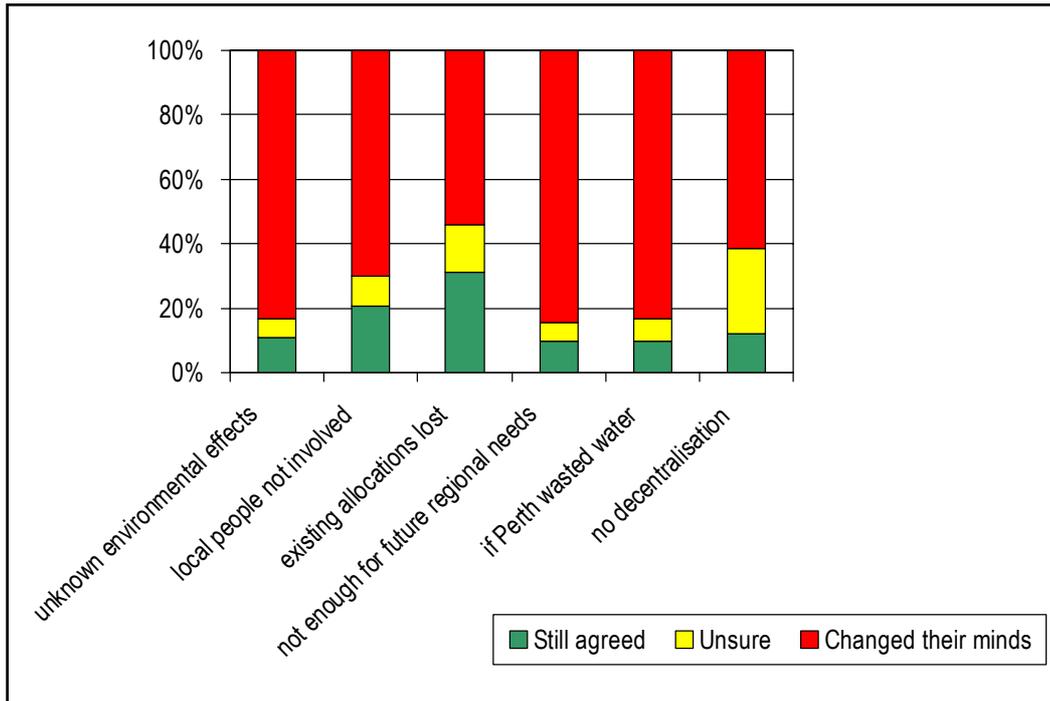
if local people were not involved in making the decision?

if it meant that people with existing groundwater allocations could lose some of their water in the future?

if there was insufficient groundwater to meet future regional development needs?
if it could be shown that Perth people were wasting water?
if it was not helpful in promoting a policy of decentralisation?

Figure 3 shows the proportions of respondents who still believed in supplying Perth with Blackwood groundwater despite each challenge, those who were unsure, and those who changed their minds.

Figure 3: Trade-off decisions by those who originally agreed with or were unsure about supplying Blackwood groundwater to Perth (N=83)



It can be seen that the three main areas of concern that reduced support for the proposal were those associated with unknown environmental effects in the region, not enough water for future regional needs and if Perth people wasted water. That is, issues associated with certainty and efficiency. Local people not being involved in the decision making process was also of concern. However, issues of decentralisation and existing allocations were less of an issue in the decision making.

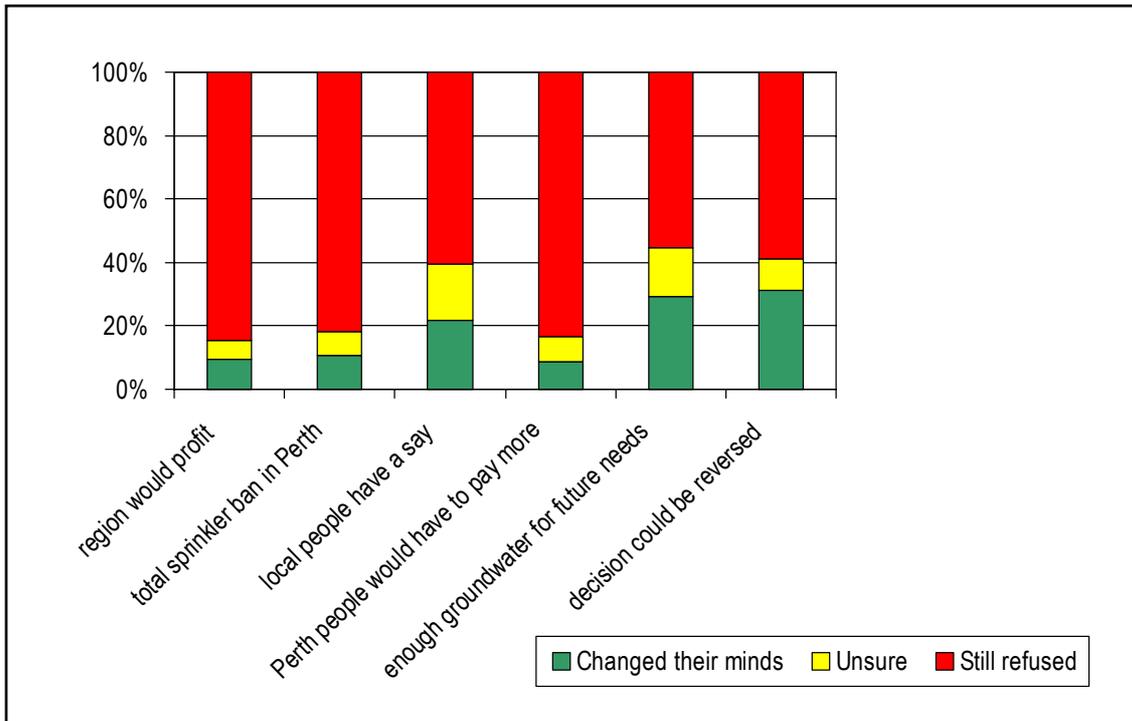
Those who disagreed with the proposal, or were unsure (N = 363; 87.9%), were asked if they would *still refuse to provide Blackwood groundwater to Perth*

if it meant that the region could profit by selling the water to Perth?
if it meant that Perth people would have increased water restrictions to total sprinkler bans?
if local people had a say in the management and monitoring of the aquifer?
if it meant that Perth people would have to pay more for other sources of water?

if it could be shown there was sufficient groundwater to meet future development needs in the region?

Figure 4 shows the proportions of respondents who still refused to provide Perth with Blackwood groundwater despite each challenge, those who were unsure, and those who changed their minds.

Figure 4: Trade-off decisions by those who originally disagreed with or were unsure about supplying Blackwood groundwater to Perth (N=363)

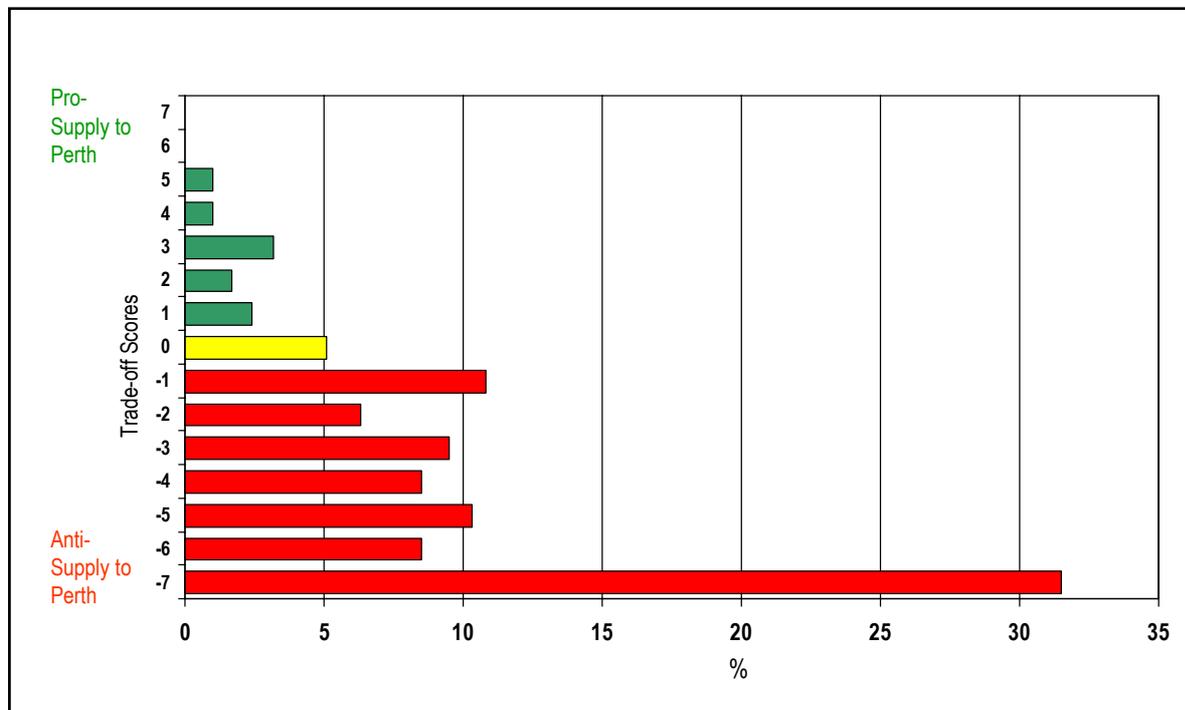


The three areas most likely to reverse people’s refusal to provide Perth with Blackwood groundwater were the inclusion of local people in managing and monitoring the aquifer, being sure there was enough groundwater for the region’s future needs, and knowing that the decision could be reversed if shown to be detrimental to the region. Similar to the previous group, it was the issues associated with certainty and process that most affected people’s decision making. The ability for the region to profit, the possible requirement for Perth people to have stricter restrictions or to pay more for their water had little impact on changing the south-west community’s views about the proposal.

A total trade-off score was calculated for each respondent. To do this the answers to the main question and each of the twelve trade-off questions were recoded. All decisions not to supply Blackwood groundwater to Perth were recoded to the value of “-1”. All “unsure” responses were assigned the value of “0” and all positive responses were assigned the value of “1”. These were then summed to provide an overall trade-off score. Where those who were originally unsure answered twelve trade-off questions rather than six as all other respondents did, the sum of the twelve questions was halved. This

meant that possible trade-off scores could range from “7”, being total support, through “0”, being totally unsure, to “-7” being totally opposed. Figure 5 shows the results.

**Figure 5: Total Trade-off score for decisions related to the proposal to supply Blackwood groundwater to Perth (N=413)
Mean = -3.83**



From the figure above, it is very evident that the proposal to supply Blackwood groundwater to Perth was generally not supported by the south-west community sample, with an overall mean score of -3.83. The proposal was totally opposed by about one-third (31.5%) of respondents, even given a number of adverse consequences of their original decisions or possible positive outcomes of the proposal. A further half of the sample (54.2%) reconsidered their decisions to some extent given some challenges, but were still opposed overall. Only 5% were unsure, and 9.3% were prepared to support the proposal given some trade-off options.

While the various trade-off challenges had little effect on respondents’ decisions regarding the proposal, it should be noted that issues associated with (un)certainly about the future, decision making and ongoing management processes, and water-use (in)efficiency had the greatest potential to change community views.

Comparisons were made between the trade-off scores and geographic area, respondent type (urban or rural), cluster membership and a number of demographic variables (users and non-users of

groundwater, licence and non-licence holders, length of time of residence in the area, age and gender). The only statistically significant differences that were found are as follows.

- Nannup area respondents were statistically significantly less likely ($p < .01$) to support the groundwater to Perth proposal (mean = -5.34) than were respondents from the areas of Busselton (mean = -3.17), Dunsborough (mean = -3.13) and Bunbury (mean = -2.50). However, it should be noted that the difference was in degrees as all groups held negative views.
- Those respondents aged less than 24 years were significantly ($p < .01$) less negative about the proposal (mean = -0.77) than were all other age groups (means ranged from -3.27 to -4.37).

Of interest was that there were *no statistically significant differences in total trade-off scores* between:

- the two fairness clusters (*Regional Development* and *Wider Use*);
- urban and rural respondents;
- groundwater users and non-groundwater users;
- groundwater licence holders and non-licence holders.

That is, despite different views on fairness, as well as different degrees of self-interest in groundwater, there were no differences in decisions regarding the proposal. Of particular importance is the disagreement with the proposal by *both* groups with different ways of judging fairness in water allocation thus signifying that the proposal is considered to be less than fair by the south-west community.

This therefore indicates that the opposition to the proposal of the supply of groundwater from the Blackwood Area to Perth will be widespread in the south-west community. Given the strength of this view, and the values shown in Section 3.1 of this report, it can be confidently stated that this attitude will also apply to the supply of Blackwood groundwater to the whole of the IWSS.

3.4 CONFIDENCE IN SCIENCE, PLANNING AND MANAGEMENT

To gauge the level of trust, confidence and certainty that the south-west community respondents had in the ability of the experts and the authorities to conduct the investigations and make appropriate decisions, six attitudinal statements were designed. Respondents were asked to rate their agreement with them on a five point scale. This scale was recoded so that the higher the score, the greater the certainty and confidence. Table 20 shows the results for each statement.

Table 20: Community trust, confidence and certainty in the ability of the experts and authorities to conduct the investigations and make appropriate decisions

Statement	1 Strongly Disagree %	2 Disagree %	3 Neither %	4 Agree %	5 Strongly Agree %	Mean
I have complete confidence that the experts can monitor and manage the Blackwood Groundwater Area for the future generations.	25.8	45.2	8.0	20.0	1.0	2.25
I believe the government authorities can be trusted to manage WA's water.	29.7	45.2	8.9	15.7	0.5	2.12
I am certain that planners can predict and manage future groundwater demands.	22.7	41.8	11.4	23.7	0.5	2.37
We can solve all our water shortage problems by making sure everyone is using water efficiently.	5.3	22.5	8.0	50.4	13.8	3.45
I am sure the experts understand the future effects of climate change on the region.	15.5	41.1	9.2	31.9	2.4	2.65
I trust the Water Corporation not to put the needs of Perth before the needs of the region.	28.0	42.3	6.3	21.0	2.4	2.28

It can be seen by the mean scores above, levels of trust and certainty were not high in this community sample. Reliability of the statements for use as a scale in future analyses was tested. The following scale (five of the above items) proved to be highly reliable.

Trust and Certainty Scale

- I have complete confidence that the experts can monitor and manage the Blackwood Groundwater Area for the future generations.
- I believe the government authorities can be trusted to manage WA's water
- I am certain that planners can predict and manage future groundwater demands.
- I am sure the experts understand the future effects of climate change on the region.
- I trust the Water Corporation not to put the needs of Perth before the needs of the region.

Standardised item U = .8431

Possible scores on this scale could range from 5 to 25, with higher scores indicating greater trust and certainty generally.

Minimum 5

Maximum 22

Mean 11.69

The mean score for this scale indicates that there is not a lot of community trust and certainty about the authorities' and experts' investigations, planning and management for the future. This is consistent with the issues that had greatest likelihood of changing people's decisions regarding the proposal.

Given that certainty issues were important for community support of the proposal, and these results indicate there is little trust and certainty associated with the ability of the experts and authorities, it is therefore not surprising that respondents were reticent to change their support decisions even given the different challenges and possible consequences.

Again, comparisons were made between the trust and certainty score and geographic area, respondent type (urban or rural), cluster membership, and users and non-users of groundwater, licence and non-licence holders, length of time of residence in the area, age and gender. The following statistically significant differences were found.

- Respondents from the Augusta and Nannup areas were significantly less trusting ($p < .01$) and certain about the ability of experts and authorities (means = 9.83 and 10.29) than were respondents from the Busselton area (mean = 12.50), who were significantly less trusting and certain again from respondents in the Bunbury area (mean = 14.26).
- Special rural respondents (mean = 10.06) and rural respondents (mean = 10.79) were significantly less trusting and certain ($p < .01$) than were urban respondents (mean = 12.65).
- Respondents aged less than 24 years⁶ (mean = 15.11) were significantly more trusting and certain ($p < .01$) than were respondents aged 24-39 years (mean = 11.66), 40-55 years (mean = 11.54) and 56-65 years (mean = 11.04).
- *Wider Use* cluster members were significantly less trusting and certain (mean = 10.05) than were *Regional Development* cluster members (mean = 11.89). However, this difference tended to be in degrees only. Both means indicate a lack of trust and certainty.

⁶ This is consistent with the finding that this age group was less negative about the water export proposal than other age groups.

3.5 WATER USE INFORMATION

Respondents were asked if their properties were using groundwater. One-third (33.8%; N = 140) said they were and when asked how many bores they had, 91 said they had one bore, 16 said they had two, 3 had six bores, 7 had a well, 17 had a soak-dam, and 3 had a soak-dam and a well⁷. Respondents were then asked details about their groundwater usage. Table 21 shows information as provided by respondents in the different geographic areas. Two respondents did not know if they had a groundwater licence or not.

Table 21: Details of groundwater usage in the study area by geographic location (N=140)

Geographic Area	Use Groundwater N=140	Rural/Special Rural N=96	Groundwater Licence N=26	Domestic Use N=77	Stock Use N=50	Irrigate Crops N=25
Bunbury	17	1	1	6	1	1
Busselton	39	19	11	19	14	9
Dunsborough	5	2	1	3	0	0
Blackwood Groundwater Area						
Margaret River	24	20	4	10	13	3
Augusta	17	16	4	9	11	6
Nannup	38	38	5	30	11	6

The total reported number of stock watered was 25,065, while the total reported area of crops irrigated was 829 ha. One respondent in the Blackwood Groundwater Area, who reported watering 200 beef cattle and irrigating 300 ha of crops, also reported not having a groundwater licence and allocation and didn't know the estimated usage.

Those who said they had groundwater licences were asked what their allocations were. Fourteen of the twenty-six respondents said they did not know their allocations. Details of those who knew their allocations are shown in Table 22, and those who didn't know in Table 23.

Of the 25 respondents who thought they would increase their groundwater consumption in the next twenty years, 12 said it would be from the superficial aquifer, 5 from the Leederville, 5 from the Yarragadee, and 5 were uncertain⁸.

It would appear from the groundwater usage information collected in this survey, that groundwater users do not have a lot of knowledge of their licence details, allocation and current usage. This may be an issue for the future sustainable allocation and management of groundwater in the south-west.

⁷ Comments noted by the interviewers indicated considerable concern by those with wells and soaks that any changes in the groundwater tables could have adverse effects on their groundwater supplies.

⁸ More than one option allowed.

Table 22: Details of known groundwater allocations by geographic location (N=12)

Geographic Area	Allocation (kLs)	Usage (kLs)	Years had Licence	Domestic Use	No. Stock	Type Stock	Crops	Total Area (ha)	Increase Usage by ?kLs
Bunbury	55,000	55,000	8	No	150	Beef	Vines Vege.	18	0
Busselton	1,500	?	1	Yes		-	-	-	5
	26,000	26,000	14	Yes	50	Beef	Flowers	10	52,000
	46,000	8,000	5	Yes	50	Sheep Farm cows	Vines	6	16,000
	80,000	40,000	5	Yes	1,000	Dairy	-	0	160,000
	160,000	160,000	18	No	2,500	Sheep Beef	Vege.	40	0
Blackwood Groundwater Area									
Margaret River	65,000	50,000	10	No	0	-	Vines	22	130,000
	800,000	800,000	6	No	0	-	Clover	100	0
Augusta	50	45	4	No	800	Sheep	Vines Olives	15	90
	600	350	20	Yes	-	-	-	-	0
	2,000	1,500	1	Yes	2,000	Dairy	Clover	210	50
	200,000	200,000	10	No	0	-	**	**	200,000

** Refused to provide information

? = Don't know

Table 23: Details of unknown groundwater allocations by geographic location (N=14)

Geographic Area	Usage (kLs)	Years had Licence	Domestic Use	No. Stock	Type Stock	Crops	Total Area (ha)	Increase Usage by ?kLs
Busselton	?	?	Yes	0	-	-	0	0
	?	?	Yes	300	Dairy	Vines	12	?
	?	2	Yes	0	-	-	0	0
	200	2	No	0	-	-	0	0
	?	10	Yes	100	Dairy	Flowers	8	?
	140	4	No	150	Beef	Olives	10	140
Dunsborough	?	?	Yes	0	-	-	0	0
Blackwood Groundwater Area								
Margaret River	?	5	No	800	Dairy	-	0	?
	?	5	No	100	Beef	Olives	5	?
Nannup	100	?	Yes	0	-	-	0	50
	?	2	Yes	0	-	-	0	0
	?	?	Yes	0	-	-	0	0
	?	5	No	0	-	Vines	3	0
	?	5	Yes	0	-	Fruit trees	1	0

? = Don't know

3.6 AWARENESS AND KNOWLEDGE OF THE PROPOSAL AND PROCESS

After the interviewers' introduction explaining the survey and issues, respondents were asked to rate how aware they were of the proposal to supply Perth with groundwater from the Blackwood Groundwater Area (on a four point scale from "not at all aware" to "very aware"). Two-thirds of respondents (66.7%) said they were either aware or very aware of the proposal, with a further 20.5% who said they were vaguely aware. Only 12.8% said they were not at all aware of the proposal.

Respondents were asked near the completion of the survey how aware they were of the process and investigations being led by the Water and Rivers Commission to develop the Groundwater Management Plan for the Blackwood Groundwater Area. The same four point awareness scale was used as detailed above. Forty-five per cent of respondents said they were either very aware or aware of the process and investigation with a further 37.4% being vaguely aware. Only 17.6% said they were not at all aware. Those who were at least vaguely aware (N = 341) were asked if they would like to make any comments about the process. Two-thirds of these respondents answered in the affirmative and were allowed up to three responses. Many and varied responses were received. Table 24 shows the details of those comments most often nominated.

Table 24: Main unprompted comments about the process of investigation lead by the Water and Rivers Commission

Comments	% (N=223)
Need more information/keep public informed	43.1
Need more time for more investigations	19.7
Investigate alternative sources/efficiencies	19.7
Process seems OK/fair	14.8
Need certainty for future generations	10.3
Don't touch the water	9.9
Listen to the community	6.3
Decision is already made	5.4
Don't trust the Water Corporation	5.4

At the end of the survey, respondents were asked to rate how confident they had felt in answering the questionnaire on a four point scale. Nearly three-quarters of respondents (70.8%) said they had felt either confident or extremely confident. Only 5.6% said they felt not at all confident.

3.7 CLOSENESS TO THE INTERESTS OF DIFFERENT GROUNDWATER USERS

Respondents were asked to rate on a seven point scale (from 1 = extremely close through to 7 = extremely distant) how close they thought their personal interests were to the interests of eleven different groups which had some association with groundwater. For easier interpretation, the scale was recoded so that the higher the score, the closer were the interests. Table 25 shows the results of this question in order of the closest interests to those least close.

Perhaps surprisingly, the perceived distance between the respondents' interests and those of Perth water users was not as great as for three other groups, with industrial users having the least in common with respondents. One would assume, therefore, that the refusal to supply Perth with Blackwood Groundwater does not necessarily stem from basic personal differences. Although it must be noted that just over half the sample felt their interests were very or extremely distant from Perth water users.

Table 25: Rated Closeness of respondents' interests to the interests of different groups associated with groundwater (N=412)

Groundwater Interest Group	1 Extremely Distant %	2 Very Distant %	3 Slightly Distant %	4 Neither %	5 Slightly Close %	6 Very Close %	5 Extremely Close %	Mean Score
urban water users	10.9	11.9	8.5	4.1	15.5	21.4	27.7	4.76
conservationists	12.1	12.6	8.5	6.0	26.3	24.6	9.9	4.36
recreational fisher-people	13.5	16.7	9.7	3.9	19.8	22.9	13.5	4.23
stock & domestic groundwater users	16.7	15.2	8.0	3.4	18.6	25.1	13.0	4.20
environmental groups	15.5	13.8	11.1	8.0	22.2	21.0	8.5	4.05
tourists	15.9	17.1	12.8	7.0	19.6	18.8	8.7	3.88
tourism & recreational businesses	17.7	17.2	10.7	5.8	22.5	18.4	7.7	3.85
Perth water users	30.4	23.2	7.2	2.9	15.9	14.0	6.3	3.17
commercial irrigators	23.9	28.7	12.3	4.1	15.5	8.9	6.5	3.11
indigenous peoples	27.7	23.3	11.7	12.6	14.1	9.0	1.7	2.96
industrial users	30.2	33.3	10.9	5.8	10.1	8.0	1.7	2.63

Comparisons were made between closeness to the interests of different groups and the overall decision trade-off score for the proposal. However, no statistically significant differences were found. This again shows the consistency of decision making across all interest groups in the study region.

3.8 DEMOGRAPHICS

Finally, a number of demographic questions were asked.

- 94.4% of respondents had relatives or friends who lived in Perth.
 - 79.5% of this group had both friends and relatives;
 - 10.5% had relatives only;
 - 10.0% had friends only.

Tables 26 and 27 provide details of the length of residence in the region and the age groups of the sample.

Table 26: Length of residence in the region

No. of Years	% N=414
less than 5 years	15.5
5 – 10 years	22.0
10 – 20 years	20.3
20 – 30 years	15.9
More than 30 years	26.3

Table 27: Age groups

Age in Years	South West sample N=414 %	ABS 2001 Census Data %
Less than 24 years	2.2	8.7
24 – 39 years	19.1	30.8
40 – 55 years	37.9	30.7
56 – 65 years	22.2	12.2
66 – 75 years	9.2	9.3
More than 75 years	9.4	8.2

On comparing the age of the survey sample with that of the ABS⁹ 2001 census data, it can be seen that the survey sample was not representative. However, very few statistically significant differences were shown in respect to the different age groups, and as has been constantly shown throughout these analyses, any differences that have occurred in respect to demographics have been in degrees rather than opposing views.

⁹ Australian Bureau of Statistics

4.0 WHAT PREDICTS RESPONDENTS' SUPPORT FOR THE PROPOSAL?

In an attempt to find which variables had the greatest influence on people's considered support for the groundwater export proposal, a stepwise regression analysis was used with the trade-off decision score (see Section 3.3) as the dependent variable and the following predictor variables:

- standardised importance ratings of the seven groundwater use categories;
- fairness cluster membership;
- the intrinsic environmental values scale;
- the intrinsic groundwater values scale;
- the trust and certainty scale;
- awareness of the groundwater export proposal;
- groundwater user or not;
- closeness to the interests of the eleven groundwater interest groups.

Examination of the correlations between the dependent and independent variables showed only one strong correlation ($r = 0.47$; *the importance of regional household use*).

Five variables emerged as the major predictors of respondents' trade-off decision scores (Adj. $R^2 = .27$; $p < .001$). These were as follows:

- *the trust and certainty scale* - the greater the trust and certainty in the authorities and experts, the greater the support for the proposal;
- *the intrinsic groundwater values scale* - the greater the intrinsic value of groundwater, the less the support for the proposal;
- *the importance of groundwater for household use outside the region* - the greater the rated importance of groundwater for household use outside the region, the greater the support for the proposal;
- *whether a groundwater user or not* - groundwater users were less likely to support the proposal;
- *closeness to the interests of indigenous peoples* - the closer the respondents' interests to those of indigenous peoples, the less the support for the proposal.¹⁰

The major predictor of people's support for the proposal was the degree of trust and certainty that they had in the ability of experts and authorities to plan for the future of the region and to sustainably manage the groundwater. Secondly was the degree to which people intrinsically valued the groundwater (i.e. value its "being there"). The mean scores of both these scales indicated low certainty and confidence and high intrinsic value of groundwater by the sample as a whole.

¹⁰ It will be interesting to compare the results of the aboriginal cultural study currently being conducted for the WRC investigations, especially given the high environmental intrinsic values displayed by the white community.

Previous analytical comparisons between these scales and a variety of demographic variables showed few statistically significant differences, and those that did exhibited differences in degree only. This therefore indicates wide-spread, strong intrinsic groundwater values in the region's community and low trust and certainty associated with future planning and management of the regional and environmental needs for groundwater.

If South-West community support for the proposal of groundwater export from the region is to be increased, these issues in particular need to be addressed in association with the community.

5.0 SUMMARY AND DISCUSSION – SOUTH WEST SURVEY

The results of the South West survey were consistent and clear. People have very strong environmental values, are highly concerned about the ability of the authorities and experts to plan for the future of the region and the sustainable management of the groundwater, and are opposed to the current proposal to export groundwater from the South West Yarragadee to Perth's IWSS.

When considering the relative importance of consumptive and non-consumptive uses of groundwater in the Blackwood Groundwater Area (based on Multi-Attribute Utility Theory), three distinctive groupings emerged. Those of primary importance included household and stock uses for towns and rural properties in the study area (both current and future growth needs except for Bunbury), irrigation of fruit and vegetables and pasture for dairy cattle, and all current and future environmental needs.

The uses of secondary importance included household use for Bunbury, irrigation of broadscale crops (eg. grains and legumes) and vines, a variety of recreational activities, and household use for other southern towns outside the study area. Finally, of least importance were various industrial uses and household use in Perth's IWSS.

When considering various aspects of the natural environment, repeated comments from respondents were that it was all inter-related and equally important. It was difficult for people to separate out the different environmental uses for consideration. This was consistent with the high mean scores on the intrinsic environmental and groundwater values attitudinal scales. That is, people highly value the environment and the groundwater just "being there".

On measuring the different ways in which people judged fair water allocation decisions, it was evident that there were two different ways of viewing fairness. These were labelled *Regional Development* and *Wider Use*, as general descriptions of the different views. However, it was shown that, even though the two groups judged allocation fairness differently, there was no difference in their decisions in relation to the current groundwater export proposal and the circumstances under which they might change their views.

There was strong opposition to the proposal to supply Perth with Blackwood groundwater and, in spite of a number of challenges to and possible consequences of their decisions, few people were prepared to change their stand on the issue. It was evident though, that issues associated with (un)certainly about the future, decision making and ongoing management processes, and water-use (in)efficiency had the greatest potential to change community views, both in support and opposition. Issues

associated with threats to existing allocations, consequences for decentralisation, total sprinkler bans and the requirement to pay more for water in Perth had little effect on positive or negative decisions.

Consistent with these decision-making criteria were the results of the *trust and certainty* attitudinal scale. The mean score on this scale showed that people had little trust and certainty associated with the experts' and authorities' ability to sustainably manage the groundwater or plan for the future needs of the region. This was reinforced by people's unprompted comments about the current process and investigations. The requirement for more information and more time for the investigations were most often mentioned by respondents.

The *trust and certainty* attitudinal scale was also the major predictor of respondents' decisions associated with the groundwater export proposal. That is, if people were confident that the authorities and experts could ensure that the future needs of the region would be met and the groundwater would be managed sustainably, they might be more inclined to support the proposal.

Of some concern however, was the apparent lack of knowledge or understanding by a number of groundwater users of their allocations, the licence requirements, and indeed how much groundwater they were currently using. If this situation is widespread in groundwater users, it will need some attention by the managers and planners.

Finally, of note were the relatively few statistically significant differences in attitudes and considerations between the different geographic and demographic groups. Any differences were mostly associated with degree rather than being opposing views. Therefore, even though this survey was sampled to allow for the identification of any outlying groups and to ensure that no group was marginalised by the decision-making process, the lack of differences between groups indicates that the results can be confidently applied to the south-west population at large.

6.0 METHODOLOGY – PERTH SURVEY

As mentioned in Section 1, a separate survey of Perth residents was conducted to briefly examine their views and attitudes to supplying Perth with Blackwood groundwater.

A 5-minute telephone survey was administered to households living in the Perth metropolitan area. These households were randomly chosen from telephone listings in the metropolitan area. As in the South West survey, the potential respondents were called at least three times at different times of the day and on different days before they were recorded as ‘no contact’. The interviewers were further asked to recruit an equal number of males and females.

The target sample size was set at 300 to allow statistical comparisons to be made within the sample and with the South West sample.

A total of 316 survey interviews were achieved. This included 50.6% of males (N = 160) and 49.4% of females (N = 156). The refusal rate was 52.5% which is standard for telephone surveys. The following table provides the refusal reasons given by the householders contacted.

Table 28: Refusal data for Perth survey

Refusal reason	N	%
Not interested	191	54.6
Too busy	103	29.4
Too old/unwell	29	8.3
No English	14	4.0
Not enough knowledge	12	3.4
Other	1	0.3

6.1 THE QUESTIONNAIRE

The Perth questionnaire included similar questions to those in the South West survey. The questionnaire was structured as follows and can be found in Appendix 2.

- Background information about the proposal and description of the Blackwood Groundwater Area.
- Familiarity with the proposal.
- Acceptability of different water source options for Perth’s water future.

- Views on the proposal and specific circumstances that may change their views.
- Perceived fairness of the proposal.
- Any close relatives or friends who live in the south-west region.
- Ownership of a holiday home, or regular visits to the region.
- Age and gender.

7.0 RESULTS – PERTH SURVEY

The following reports the results of the Perth survey. As in Section 3, analytical comparisons were made with the responses to all major questions and where these resulted in a statistically significant difference ($p < .01$), it is reported in the text.

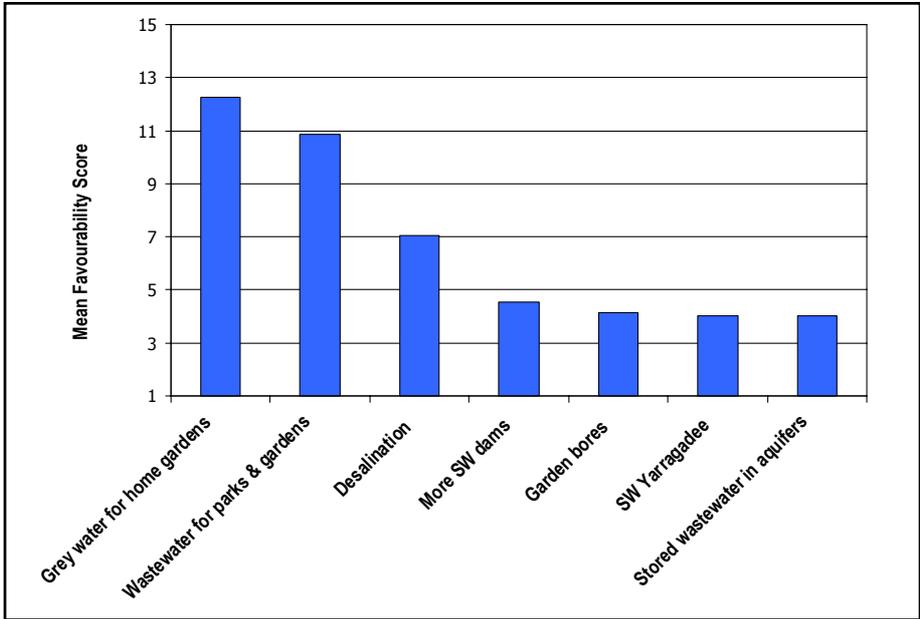
7.1 PREFERRED WATER SOURCES

Respondents were firstly asked to rate how much they favoured seven different water sources for meeting Perth’s future water needs, using a five point scale from 1 = extremely unfavourable through to 5 = extremely favourable. The water sources were:

- reusing grey water for garden watering
- reusing treated wastewater for parks and gardens
- storing treated wastewater in groundwater aquifers for later use
- desalination of sea water
- piping groundwater from the south-west Yarragadee aquifer
- building more dams on rivers in the south-west
- everyone installing their own garden bores.

Respondents were then asked to rank their first three preferences from their favourable sources. A favourability weighting of each source was then calculated by the product of the rating and the ranking (the ranking having been recoded so that the most preferred was 4, the second choice was 3, the third choice was 2 and “not ranked” was 1). Therefore, favourability weightings of each source could range from 20 through to 1. Figure 6 shows the results of Perth respondents’ preferences for future water sources.

Figure 6: Preferences for water sources to meet Perth’s future needs



It is evident from Figure 6 that Perth respondents favoured reuse followed by desalination as sources to meet the city’s future needs. Groundwater imported from the south-west Yarragadee aquifer was equally least favoured with that of aquifer storage of treated wastewater.

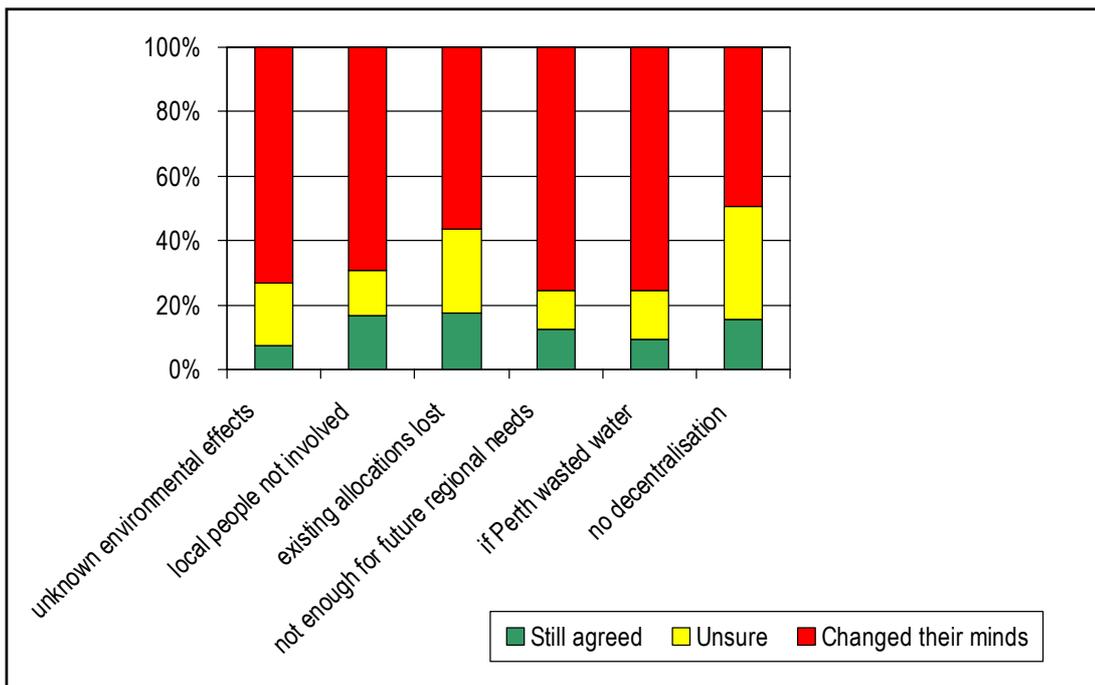
7.2 CONSIDERATIONS OF SUPPLYING PERTH WITH SW YARRAGADEE GROUNDWATER

A similar question was asked of the Perth sample as was asked in the South West survey (see Section 3.3) so that comparisons could be made. The wording was very similar and changed only in places where it was made applicable to Perth respondents rather than to those of the south-west.

The aim of this question was to ascertain the strength of the respondents’ views and the limits to their allocation decisions. That is, they were firstly asked if they agreed with the proposal in general to export groundwater from the Blackwood Groundwater Area. Almost a third of Perth respondents (30.4%; N = 96) agreed with the proposal, 20.6% (N = 65) were unsure and 49.1% (N = 155) disagreed. This greater agreement by the Perth respondents than that of the south-west respondents (30% compared with 12%) was a statistically significant difference ($p < .01$).

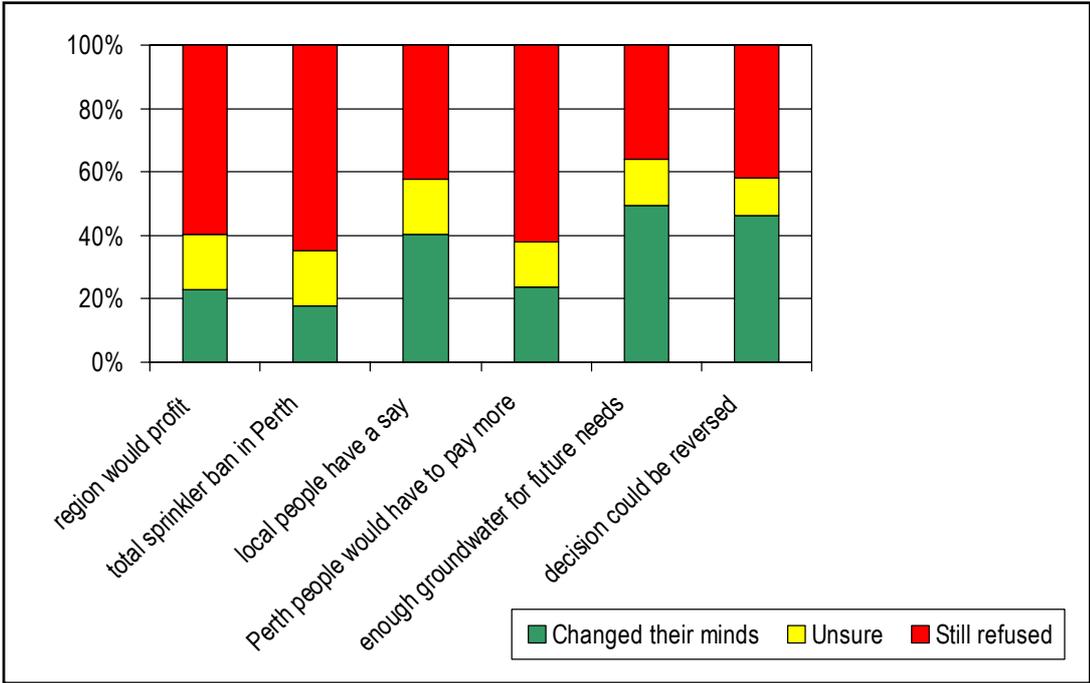
As in the South West survey, depending on their answers, respondents were then challenged by being asked to consider a number of possible consequences or outcomes. Figures 7 and 8 show the responses of the Perth sample. These can be compared with Figures 3 and 4 in Section 3.3 of this report.

Figure 7: Trade-off decisions by those Perth respondents who originally agreed with or were unsure about supplying Blackwood groundwater to Perth (N=161)



Even though there was a significantly different response between the south-west and the Perth samples in the initial support for the groundwater export proposal, there were no statistically significant differences in the proportions of respondents who continued to support the proposal and those who changed their minds as a result of each of the six challenges (see Figures 7 and 3). Again, it was the issues of (un)certainty (environmental effects and future regional uses), water use efficiency and the decision making process that had greatest effect on people’s decisions. Issues of prior allocations and decentralisation had less of an effect.

Figure 8: Trade-off decisions by Perth respondents who originally disagreed with or were unsure about supplying Blackwood groundwater to Perth (N=220)



A similar pattern also occurred as with the South West survey sample in terms of the items most likely to cause people to change their minds from opposition to approval of the proposal (see Figures 8 and 4). Again these were the issues associated with certainty and process. A total sprinkler ban, Perth people having to pay more and the south-west region profiting were least likely to cause people to change their minds from opposing the proposal. However, when comparing the two samples, the statistically significant differences that emerged were as follows. It should be noted that, again, these differences tended to mostly be in degree rather than absolute opposition.

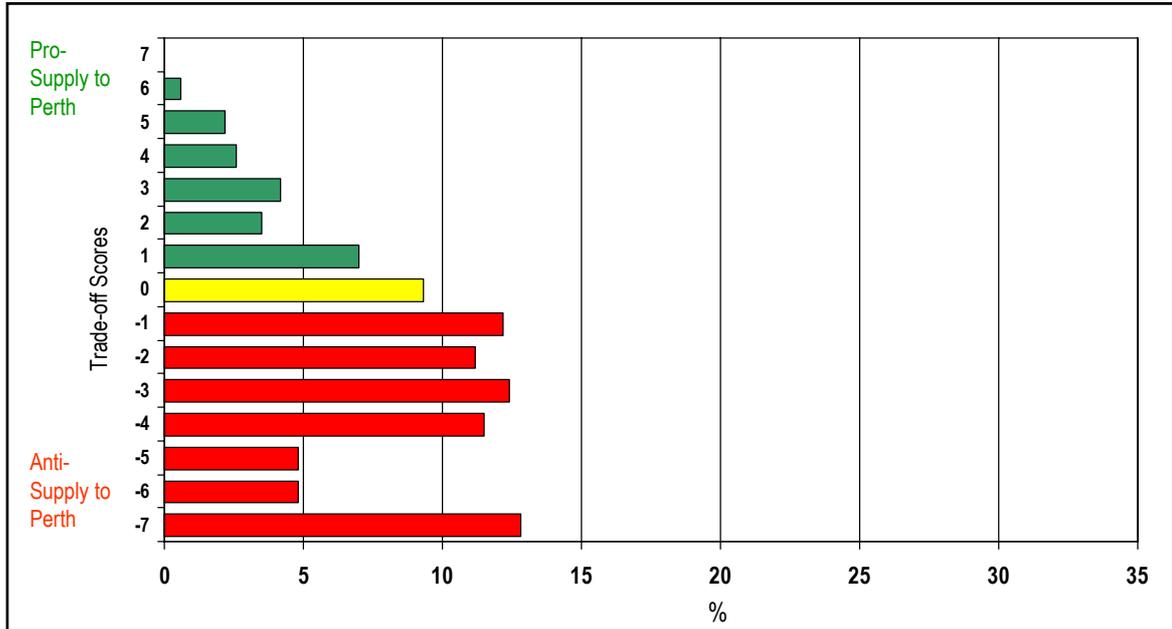
- A greater proportion of Perth respondents (22.8%) would change their minds to approving the proposal if the south-west region would profit by selling water to Perth than would the south-west respondents (9.6%).

- A greater proportion of south-west respondents (81.7%) continued to oppose the proposal than did Perth respondents (64.8%) if it meant total sprinkler bans for Perth.
- A greater proportion of Perth respondents (40.2%) would change their minds to approving the proposal if south-west people had a say in the management and monitoring of the aquifer than would the south-west respondents (21.8%).
- A greater proportion of south-west respondents (83.5%) continued to oppose the proposal than did Perth respondents (61.9%) if it meant Perth people would have to pay more for their water.
- A greater proportion of Perth respondents (49.3%) would change their minds to approving the proposal if it could be shown that future regional needs could be met than would the south-west respondents (29.3%).
- A greater proportion of Perth respondents (46.1%) would change their minds to approving the proposal if it could be guaranteed to reverse the decision if detrimental to the region than would the south-west respondents (31.4%).

A total trade-off score was again calculated for each respondent. To do this the answers to the main question and each of the twelve trade-off questions were recoded. All decisions not to supply Blackwood groundwater to Perth were recoded to the value of “-1”. All “unsure” responses were assigned the value of “0” and all positive responses were assigned the value of “1”. These were then summed to provide an overall trade-off score. Where those who were originally unsure and answered twelve trade-off questions rather than six as all other respondents did, the sum of the twelve questions was halved to provide consistency. This meant that possible trade-off scores could range from “7”, being total support, through “0”, being totally unsure, to “-7” being totally opposed. Figure 9 shows the results.

The maximum unit on the X-axis has been retained at 35 to allow easy comparison with Figure 5 in Section 3.3, the south-west respondents’ trade-off scores. It can be seen that, although there was a statistically significant difference ($p < .001$) between the mean trade-off scores of both samples (South West mean = -3.83; Perth mean = -2.05), Perth respondents, overall, were opposed to the proposal of the export of Blackwood groundwater to supply Perth. Of further note is the group (13%) of Perth respondents totally opposed to the proposal. That is, ***one in eight Perth people totally oppose importing water from the Blackwood Groundwater Area.***

**Figure 9: Total Trade-off score for Perth respondents' decisions related to the proposal to supply Blackwood groundwater to Perth (N=313)
Mean = -2.05**



7.3 FAIRNESS OF THE PROPOSAL

Perth respondents were asked to rate how fair they believed the groundwater export proposal was to the people of the south-west, on a five point scale from 1 being less than fair and 5 being more than fair. For easier interpretation, the scale was recoded so that -2 was less than fair, 0 was fair and +2 was more than fair. Table 29 shows the results of this question and it can be seen that Perth respondents considered the proposal to be less than fair to the people of the south-west, with 60% rating it on the negative end of the scale.

Table 29: Perth respondents' considerations of the fairness of the groundwater export proposal to the people of the south-west

-2 Less than fair %	-1 %	0 Fair %	1 %	2 More than fair %	Mean (N=314)
43.6	16.6	33.8	3.8	2.2	-0.96

7.4 DEMOGRAPHICS

Perth respondents were asked at the start of the survey how familiar they were with the study region as described to them. Over half (55.4%) said they were either familiar or very familiar, while only 13.9% said they were not at all familiar. They were later asked if they had any relatives or friends who lived in the south-west region of the study, or if they had a holiday home in the area or holidayed regularly there. Almost half the sample (46.2%) said they had relatives or friends who lived there, and 38.3% said they holidayed there. Details of these responses were as follows.

Table 30: Details of Perth respondents' associations with the south-west study area

	Relatives %	Friends %	Both %
Relatives or Friends (N=146)	27.4	41.1	31.5
	Holiday Home %	Holiday Regularly %	Both %
Holiday home or holiday (N=121)	1.7	92.6	5.8

The age group of the sample compared with that of ABS Census Statistics 2001 are shown in Table 31.

Table 31: Age groups - Perth Sample

Age in Years	Perth Sample N=316 %	ABS 2001 Census Data %
Less than 24 years	5.7	10.1
24 – 39 years	24.7	30.9
40 – 55 years	40.2	30.8
56 – 65 years	15.2	12.4
66 – 75 years	10.8	8.5
More than 75 years	3.5	7.3

It would appear that the Perth survey sample is somewhat older than a representative Perth sample. However, statistical comparisons were made with the range of demographic variables (age, gender and association with the study area) and principal findings (preferred sources, decisional trade-off scores, and perceptions of fairness of the proposal) and no significant differences occurred. Therefore, it is not expected that any significant difference in major findings would eventuate with a representative Perth sample than occurred with this sample.

8.0 SUMMARY AND DISCUSSION – PERTH SURVEY

The findings of this short survey were both clear and consistent. Perth respondents considered the export of Blackwood groundwater for Perth use to be less than fair to the people of the south-west and to be a least favoured source, along with storing wastewater in aquifers for future use. Reuse options and desalination were the most favoured sources of the seven offered for consideration. These findings were consistent with previous studies (eg. Nancarrow, Kaercher and Po, 2002). While it is acknowledged that these results can only be taken as an indication of source preferences, as the full range of information about the sources was not provided (eg. comparative cost), it is important to understand that this represents the values of the Perth community. It is a statement that sources “closer to home” are preferred over taking “other people’s water”, which is not seen to be fair.

When support for the proposal was examined in detail, less than a third of the Perth sample absolutely agreed with the water export proposal and less than half the total sample supported the proposal even given the possibility of total sprinkler bans (43% of the total sample) or increased water prices (47%). Support for the proposal markedly increased to almost two-thirds of the total sample if the future needs of the south-west could be guaranteed. On the other hand, a majority of those who originally supported the proposal, reversed this support if the ability to meet future south-west needs was in doubt, or if it could be shown that Perth people were wasting water. There was also an indication that more people would agree with the proposal if the south-west people benefited or had a say in the decision and the management of the aquifer.

Despite the various challenges to decision making, the mean overall trade-off decision score for the Perth sample was -2.05 (from possible scores that ranged from 7 being total agreement to -7 being total disagreement), thus denoting general disagreement with the proposal.

There were no statistically significant differences in the trade-off decision scores between respondents of different age groups, different genders, and those with personal association with the south-west study area and those without. This was also the case for favoured water sources and perceptions of fairness to the south-west people. This provides confidence in these values being wide spread throughout the Perth community.

9.0 DISCUSSION AND CONCLUSIONS – TWO SURVEYS

Frequently, community decisions in the allocation of water are dismissed by planners and water managers as being purely “self interest” (see Nancarrow and Syme, 2001b). This interpretation could easily be the case when considering the results of the South West survey where very few respondents agreed with the export of Blackwood groundwater for Perth use or other locations in the IWSS. However, the findings of the Perth survey dismiss the possibility that self-interest was the prime motivator for decisions. Although there was a statistically significant difference¹¹ in the mean decision scores of the two surveys (South West: -3.83 and Perth: -2.05), the outcome was still an unequivocal rejection of the proposal by both community samples. In fact, about two-thirds of the Perth sample who were originally opposed to the groundwater export proposal did not change their minds in the face of total sprinkler bans or having to pay more for their water. These numbers translated to less than half the *total* sample agreeing with the proposal even given the possibility of these two consequences of their decisions. The proposal was also rated *less than fair* to the south-west community by the Perth respondents.

Of particular interest was the similarity of the patterns of decision making between the two samples. Although there were some statistically significant differences in responses, the challenges to respondents’ approval or rejection of the proposal that were more likely to reverse their decisions were the same for both samples. That is, challenges associated with certainty about the future of the south-west, water use efficiency, and decision making and management processes were likely to change decisions in both cases. Perth people were more inclined to favour the proposal if they saw some benefit to the south-west than were the south-west respondents. However, the possibility of detrimental effects for the Perth residents had little effect on the south-west respondents’ views, and failed to obtain a majority of Perth respondents favouring the proposal.

It was also evident that Perth people favoured reuse and desalination as future water sources over the importing of water from the south-west. There were no statistically significant differences in the Perth findings when compared between different demographic groups or association with the study area, thus signifying, as with the south-west sample, community-wide views.

Of further note, was the considered lack of appropriateness of economics in water allocation decision making. That is, the principle of water markets was opposed for allocating water, as was the analysis of the costs and benefits in dollars (see Section 3.2). The possibility of current groundwater users losing future allocations failed to be a factor in changing people’s current support of the proposal. Having to

¹¹ This difference can probably be attributed to a degree of self-interest by each of the two samples.

pay more for water was also of little consideration in changing opposition to the proposal. This is consistent with findings of previous studies nationally (eg. Nancarrow, McCreddin and Syme, 1998; Nancarrow and Syme, 2001a). Water markets and economics are considered to be business tools and have little place in deciding how water should be allocated in the first place¹². Issues of *water use efficiency* and *equality of opportunity*¹³ have been shown previously to predominate in communities' decision making in water allocation. This is also the case here. If the south-west people feel that their future needs are not being guaranteed, while providing for the future needs of Perth, then this can not be considered to be *equality of opportunity* for the two samples.

Two distinct groups that viewed fairness in water allocation differently were found in the south-west sample. These groups were described as *Regional Development* and *Wider Use*. That is, the former group emphasised the allocation of water primarily for the development of the region and its economy, while the other group was more inclined to place importance on a wider use of water to environmental needs and uses outside the region. While these groups viewed fairness differently, and showed statistically significant differences in environmental values, the importance of groundwater use for industries, and in the degree of trust and certainty in the ability of the authorities, there was no difference in their trade-off decision scores in relation to the proposal. That is, both groups considered it to be less than fair. This is an important finding given that one group was more externally focussed than the other. This is another consistency with the Perth results.

Trust and certainty in the authorities' and experts' abilities to plan for the future and sustainably manage the Blackwood groundwater aquifer was the major predictor of south-west respondents' overall decision trade-off score. The *Groundwater intrinsic values* score was the second prominent predictor of respondents' decisions. It was also shown that there is currently **little trust and certainty** in the authorities and experts and **high groundwater intrinsic values** in the south-west community. Therefore, it is not surprising that people were as opposed to the groundwater export proposal as they were. This was further supported by the unprompted comments by south-west community members that the decision making process was too fast, that investigations needed more time, more information was required by the community and there was a need for certainty for future generations. It would therefore appear that community confidence in the experts and authorities could be improved if "sufficient" time could be provided for careful scientific investigations and the information is communicated to the

¹² This is not to say that economic analyses do not have a place in the overall decision making process. But the issue here is that addressing the fairness implications in allocating water have primary importance for people. This will need to be addressed by the economic investigations associated with this proposal.

¹³ This should not be confused with equal *treatment* (or equal *allocations*) as expressed in the statement in Table 8 which resulted in a split opinion.

community. This may also assist in increasing community support for exporting Blackwood groundwater, at least in the short term.

Of particular note here was the high degree of awareness by the south-west community sample of the groundwater export proposal and the process and investigations being led by the WRC to develop the Groundwater Management Plan. Only 13% were unaware of the proposal, and 18% were unaware of the WRC process and investigations. These are relatively high levels of community awareness of a planning topic and it is therefore not surprising that only 6% of the sample felt they were not confident in providing their answers to the questionnaire. This high degree of confidence is borne out in the consistency of findings throughout both surveys. However, while it could be argued that this community awareness is subjective, and that a full understanding of the proposal and its implications is not possible at a community-wide level, it should be remembered that people are fully able to express their values without an understanding of the scientific and planning complexities. Communities therefore expect the planners and experts to make considered decisions, based on community values, expectations and concerns. In fact, these values will be the criteria for community judgement of the final decision once all the investigations have been completed.

It was very evident where people placed their importance in the allocation and use of groundwater from the Blackwood area. Uses associated with supporting regional life were clearly shown to be of greatest importance to the south-west community. That is, use for supporting regional human and animal life (household, stock and agricultural food production), and uses to support all aspects of the environment and its future needs (especially those of the wetlands, such as Lake Jasper). These environmental values were further supported by the high mean scores on the *environmental intrinsic values* and the *groundwater intrinsic values* scales. That is, the environment and the groundwater are highly valued for just “being there”. These values cannot be easily dismissed. Even though there were statistically significant differences between various demographic groups, the differences were in degrees only. All groups through the south-west community showed high mean scores for these intrinsic values scales.¹⁴

Finally, the results of the importance ratings (based on Multi-attribute Utility Theory) clearly showed least importance for using Blackwood groundwater in Perth’s IWSS (Towns east of Perth, Towns in the goldfields, Mandurah and Perth). There was greater acceptance of providing the water for household use in other southern towns outside the region than for Perth’s IWSS.

¹⁴ This finding has implications for the environmental studies being conducted as a part of the WRC investigations. The south-west community will need to be confident that environmental impacts will not eventuate by the proposed groundwater extraction. This also means that the economic study will need to at least identify the externalities in its analyses even if it can’t confidently value them.

The results of both the South West and the Perth surveys are consistent and send an unequivocal message to the planners and decision makers. There is a high degree of reluctance to agreeing with supplying Perth's IWSS with groundwater from the Blackwood Groundwater Area by both the south-west community and the Perth community. Even given additional time for investigations and decision making, and possible efforts to reassure the south-west community that their future needs and those of the environment will be met, the community's basic groundwater use and environmental values are not in support of exporting groundwater.

Early research in WA in relation to water allocation and licensing indicated that, if there are no alternative sources available, people are more likely to share their resources. If, however, there are available alternatives, people question the need to share. And in this case, both the south-west and the Perth communities are aware of water source alternatives and Perth people have been very clear in favouring the use of alternatives before the resources of the Blackwood Groundwater Area.

10.0 REFERENCES

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APPENDIX 1
SOUTH WEST SURVEY QUESTIONNAIRE



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SOCIAL VALUES AND IMPACT STUDY SOUTH WEST YARRAGADEE BLACKWOOD GROUNDWATER AREA

SW COMMUNITY SURVEY May 2003

Respondent Details

Name: _____

Phone: _____

<u>Area:</u>	Bunbury	1	<u>Location:</u> (ask the respondent)	
(from the	Busselton	2	Urban	1
Phone List)	Dunsborough	3	Rural	2
	Margaret River	4	Special Rural	3
	Augusta	5		
	Nannup	6		

Interviewer: _____

1. I am going to read to you a number of ways in which the groundwater from the Blackwood Groundwater Area could be used. I would like you to consider how important these uses are to you.

☛ **Step 1: Start at Category A only**, read out the ways in which groundwater could be used and ask the respondent to choose the use that he/she thinks is the *least important* in that Category.

Mark this use "10" on the line next to it.

Step 2: Read the remaining uses in Category A and ask the respondent to choose the one that he/she thinks is *next in importance* and ask how much more important than the last one it is.

Write down the importance according to the scale below (ie. if it is twice as important and the previous issue, write "20" on the line opposite the use.)

Step 3: Continue in the same way until all the uses in Category A have been rated. Ask the respondent if he/she has any comments to make about the Category.

☛ **Repeat Steps 1 to 3** for all the Categories individually.

Rating scale

10 = least important use

20 = twice as important as the use rated 10

30 = three times more important than the use rated 10

and so on --- up to

100 = ten times more important than the use rated 10

or five times more important than the use rated 20

☛ **NB:** You must start with 10, and all numbers must be multiples of 10. If any issues are of equal importance, use the same rating number.

CATEGORY A: GROUNDWATER FOR IRRIGATION

- Fruit (including nuts) and vegetables _____
- Grapevines _____
- Pasture for feeding dairy cattle _____
- Broadscale crops (eg. grains, legumes) _____
- Plant nurseries _____

Comments:

CATEGORY B: GROUNDWATER FOR THE NATURAL ENVIRONMENT

- Forests in conservation areas _____
- Wetlands, including Lake Jasper _____
- Natural vegetation _____
- Blackwood River _____
- Animals and birds in the wild _____

Comments:

CATEGORY C: GROUNDWATER FOR RECREATIONAL USE

- Swimming in fresh water bodies (eg. lakes & rivers) _____
- Fishing in fresh water bodies _____
- Bushwalking in the forests _____
- Picnicking or relaxing by springs and waterways _____
- Viewing natural scenery _____

Comments:

CATEGORY D: GROUNDWATER FOR REGIONAL HOUSEHOLD USE

- Household use for towns in the Blackwood Groundwater area
(eg. Nannup; Margaret River; Augusta) _____
- Household use for Busselton and Dunsborough _____
- Household use for Bunbury _____
- Household and stock use for *special rural* properties in the region _____
- Household and stock use for *rural* properties in the region _____

Comments:

CATEGORY E: GROUNDWATER FOR HOUSEHOLD USE OUTSIDE THE REGION

- Household use for other southern towns
(eg. Manjimup; Bridgetown and Katanning) _____
- Household use for Mandurah _____
- Household use for Perth _____
- Household use for towns east of Perth (eg. Northam & Merredin) _____
- Household use for towns in the goldfields _____

Comments:

Rating scale

10 = least important use

20 = twice as important as the use rated 10

30 = three times more important than the use rated 10

and so on --- up to

**100 = ten times more important than the use rated 10
or five times more important than the use rated 20**

CATEGORY F: GROUNDWATER FOR INDUSTRIAL USE IN THE REGION

Mining industry _____

Agriculture generally _____

Tourism industry _____

Forestry industry _____

Dairy-based industries (eg. cheese manufacturing) _____

Comments:

CATEGORY G: GROUNDWATER FOR FUTURE USE IN THE REGION

Future population growth of towns in the region _____

Future needs of existing industries _____

Future needs of new industries _____

Future environmental needs if there is climate change _____

Future needs of increased tourist and visitor numbers _____

Comments:

☛ Now ask the respondent to *rate the Categories as a whole* in the same way using the same rating scale.
Read the Category names (below) to the respondent again, and ask which category is of least importance, and mark this "10" on the line next to the Category. Continue the same way as before using the rating scale at the top of the page.

CATEGORY A: GROUNDWATER FOR IRRIGATION _____

CATEGORY B: GROUNDWATER FOR THE NATURAL ENVIRONMENT _____

CATEGORY C: GROUNDWATER FOR RECREATIONAL USE _____

CATEGORY D: GROUNDWATER FOR REGIONAL HOUSEHOLD USE _____

CATEGORY E: GROUNDWATER FOR HOUSEHOLD USE OUTSIDE THE REGION _____

CATEGORY F: GROUNDWATER FOR INDUSTRIAL USE IN THE REGION _____

CATEGORY G: GROUNDWATER FOR FUTURE USE IN THE REGION _____

2. Groundwater supports many aspects of the natural environment in the Blackwood Groundwater Area, such as forests, lakes, wildlife, etc. What is most important to you when you think about the natural environment that is supported by this groundwater?

3. There are a lot of activities that people enjoy or are important to them that are associated with the natural environment supported by groundwater. What activities are most important to you?

☛ If you need to prompt, suggest swimming and fishing in lakes and rivers or viewing enjoyable scenery.

4. I'm going to read you a number of statements and I would like you to tell me how much you agree or disagree with each of them.

Scale:

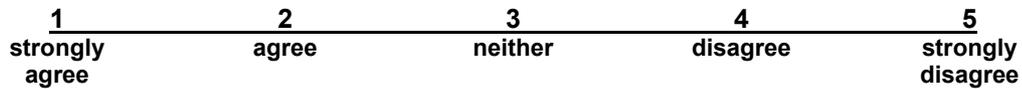
1	2	3	4	5
strongly agree	agree	neither	disagree	strongly disagree

☛ Use the scale above to record answers, **but DO NOT READ OUT THE NUMBERS**. When the respondent agrees (or disagrees), say
"would that be strongly agree (or disagree)?".
 Then note the correct number next to each statement.

- Personally, the protection of the natural environment is beyond question. _____
- I believe the protection of the natural environment is vital for future generations. _____
- Ancient groundwater should not be touched by humans. _____
- I feel a moral obligation to protect the natural environment. _____
- In the end, the only value of protecting groundwater is in its use for human welfare. _____
- To me, the protection of natural groundwater is vital. _____
- Human welfare is more important than the natural environment. _____
- We need to protect ancient groundwater to avoid running out of water in the future. _____
- I feel a moral obligation to protect natural and ancient groundwater. _____

5. I'm going to read you a number of statements which describe the different ways that people think about sharing, or allocating water in general. Could you tell me how much you agree or disagree with each of them.

Scale:



☛ Use the scale above to record answers, **but DO NOT READ OUT THE NUMBERS**. When the respondent agrees (or disagrees), say
"would that be strongly agree (or disagree)?".
 Then note the correct number next to each statement.

- All sections of the community have a right to have a say on allocating water. _____
- You can't really solve water sharing problems by analysing the costs and benefits in dollars. _____
- Everyone should recognise that they may have to make some personal sacrifices if we are going to have effective long term planning. _____
- In water allocation, everyone should be treated equally. _____
- It would be highly unfair to take water away from those who already have allocations. _____
- Priority for water should be given to those who need it to make a living. _____
- Since the environment was the original "user" of water, it should always have higher priority than other possible users. _____
- All water should be put on the market and sold to those who will pay most, regardless of what it is used for. _____
- If the decision making process is fair, people should accept the final water allocation decisions. _____
- Water should be allocated for long term sustainability even if it reduces the short term profits of local businesses. _____
- Groundwater under land is naturally the property of the local communities. _____
- The natural environment has the same rights to water as people have. _____
- There are no general rules about how to share water, it depends on the situation. _____
- Water allocations should be made to maximise the overall economic income of the regional community. _____
- Water can only be allocated out of the region after the basic needs of the regional communities have been met. _____
- Water has a value other than its dollar value. _____
- Water is owned by everyone and therefore it should be managed for the overall public good. _____
- Landholders have the right to use groundwater under their land as they see fit. _____
- Saving water for the future is more important than making money now. _____

People should only be allocated water if they can show it is being used efficiently on their properties. _____

Those who have had water allocations in the past have a greater right to water than newcomers. _____

Water should only be allocated to those who work hardest to use it most productively. _____

6. Water use in the Blackwood and surrounding regions is going to grow in the future. Over the next 20 years alone, irrigated agriculture is expected to grow by 60% to 80%. It is likely there will also be increased demand due to mining, tourism and population growth.

Similar growth is expected in the Vasse and Preston regions, with a similar increase in demand for water.

The population of Perth is increasing and hence the demand for water will also grow. While there are a number of alternative sources and technological solutions available, most mean higher costs of water (eg. desalination).

Do you believe water should be supplied for Perth use from the Blackwood Groundwater area?

YES 1	NOT SURE 2	NO 3
↓	↓	↓
Answer Q. 7	Answer Q. 7 & 8	Answer Q. 8

7. Would you still believe in providing Blackwood Groundwater to Perth

- (a) if it was not known what effects taking water from the area would have on the regional environment?

YES 1	NOT SURE 2	NO 3
--------------------	-------------------------	-------------------

- (b) if local people were not involved in making the decision?

YES 1	NOT SURE 2	NO 3
--------------------	-------------------------	-------------------

- (c) if it meant that people with existing groundwater allocations could lose some of their water in the future?

YES 1	NOT SURE 2	NO 3
--------------------	-------------------------	-------------------

- (d) if there was insufficient groundwater to meet future regional development needs?

YES 1	NOT SURE 2	NO 3
--------------------	-------------------------	-------------------

- (e) if it could be shown that Perth people were wasting water?

YES 1	NOT SURE 2	NO 3
--------------------	-------------------------	-------------------

- (f) if it was not helpful in promoting a policy of decentralisation?

YES 1	NOT SURE 2	NO 3
--------------------	-------------------------	-------------------

8. Would you still refuse to provide Blackwood Groundwater to Perth

(a) if it meant that the region could profit by selling the water to Perth?

YES 1 NOT SURE 2 NO 3

(b) if it meant that Perth people would have increased water restrictions to total sprinkler bans?

YES 1 NOT SURE 2 NO 3

(c) if local people had a say in the management and monitoring of the aquifer?

YES 1 NOT SURE 2 NO 3

(d) if it meant that Perth people would have to pay more for other sources of water?

YES 1 NOT SURE 2 NO 3

(e) if it could be shown there was sufficient groundwater to meet future development needs in the region?

YES 1 NOT SURE 2 NO 3

(f) if it could be guaranteed that the decision would be reversed if it became detrimental to the region in any way?

YES 1 NOT SURE 2 NO 3

9. I'm going to read you a number of statements and I would like you to tell me how much you agree or disagree with each of them.

Scale:

1 2 3 4 5
strongly agree agree neither disagree strongly disagree

☛ Use the scale above to record answers, **but DO NOT READ OUT THE NUMBERS.** When the respondent *agrees (or disagrees)*, say *"would that be strongly agree (or disagree)?"*. Then note the correct number next to each statement.

- I have complete confidence that the experts can monitor and manage the Blackwood Groundwater Area for the future generations. _____
- I believe the government authorities can be trusted to manage WA's water. _____
- I am certain that the planners can predict and manage future groundwater demands. _____
- We can solve all our water shortage problems by making sure everyone is using water efficiently. _____
- I am sure the experts understand the future effects of climate change on the region. _____
- I trust the Water Corporation not to put the needs of Perth before the needs of the region. _____

10. Is your property currently using groundwater?

YES 1 NO 2 → Go to Q. 19



How many bores do you have? _____

11. Do you have a groundwater licence?

YES 1 NO 2 → Go to Q. 13



What is your allocation? _____ kLs

12. How long have you had your licence? _____ years

13. What is your estimated usage ? _____ kLs

14. Do you use groundwater for domestic purposes?

YES 1 NO 2

15. Do you use groundwater for stock watering?

YES 1 NO 2 → Go to Q. 16



How many stock do you have? _____

What type of stock do you have? _____

16. Do you irrigate crops or pasture with groundwater?

YES 1 NO 2 → Go to Q. 17



What do you irrigate and what area?

Crop/Pasture Type	Area (Hectares)

17. Do you expect to increase your groundwater consumption in the next 20 years?

YES 1 NO 2 → Go to Q. 19



How much *more* groundwater do you expect to need? _____ kLs

18. From which aquifers would you expect to take your future groundwater needs?

☛ Tick as many as apply

- Superficial**
Leederville
Southern Yarragadee

19. How aware are you of the process and investigations that are being lead by the Water and Rivers Commission to develop the Groundwater Management Plan for the Blackwood Groundwater Area?



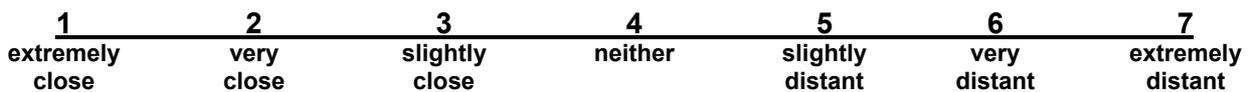
20. Do you have any comments you would like to make about the process?

YES 1 NO 2

If YES, what? _____

21. Finally I'd like to ask you a couple of questions about yourself. I will read you a list of groups and I'd like to know whether **your personal interests** are **close to** or **distant from the interests** of these groups.

Scale:



☛ Use the scale above to record answers, but **DO NOT READ OUT THE NUMBERS**. When the respondent says *close (or distant)*, say "*would that be extremely close; very close or slightly close (or distant)?*". Then note the correct number next to each group of users.

VARY THE ORDER IN WHICH YOU READ THE STATEMENTS EACH TIME.

- | | |
|------------------------------------------|-----------------------------------------|
| urban water users _____ | tourism & recreational businesses _____ |
| commercial irrigators _____ | recreational fisher-people _____ |
| conservationists _____ | environmental groups _____ |
| indigenous peoples _____ | tourists _____ |
| industrial users _____ | Perth water users _____ |
| stock & domestic groundwater users _____ | |

APPENDIX 2
PERTH SURVEY QUESTIONNAIRE



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**SOCIAL VALUES AND IMPACT STUDY
SOUTH WEST YARRAGADEE
BLACKWOOD GROUNDWATER AREA**

**PERTH COMMUNITY SURVEY
May 2003**

Interviewer: _____

1. When considering other sources of water to meet future needs in Perth, how favourable would each of the following water sources be to you personally? I would like you to rate them using a scale with 1 being extremely unfavourable; 2 being unfavourable; 3 neutral, 4 favourable and 5 extremely favourable. When doing this, please keep in mind that some sources of water will cost more than you currently pay (eg. re-use and desalination).

Rating scale:

- 1 = extremely unfavourable
 2 = unfavourable
 3 = neutral
 4 = favourable
 5 = extremely favourable

☛ Write the number nominated by the respondent next to each statement in **Column 1**.

VARY THE ORDER IN WHICH YOU READ THE STATEMENTS EACH TIME

	Column	
	1	2
Reusing your grey water for garden watering	_____	_____
Reusing treated wastewater for parks and gardens	_____	_____
Storing treated wastewater in groundwater aquifers for later use	_____	_____
Desalination of sea water	_____	_____
Piping groundwater from the south-west Yarragadee aquifer	_____	_____
Building more dams on rivers in the south-west	_____	_____
Everyone installing their own garden bores	_____	_____

I will read you the options that you thought were favourable. Could you please choose three of them that would be your first, second and third choices of future water sources.

☛ Read the options rated 4 or 5 in **Column 1**. Mark **1, 2 & 3** in **Column 2** opposite the three options that the respondent says are first, second and third choices.

2. Water use in the Blackwood and surrounding regions is going to grow in the future. Over the next 20 years, irrigated agriculture is expected to grow by 60% to 80%. It is likely there will also be increased demand due to mining, tourism and population growth.

The population of Perth is increasing and hence the demand for water will also grow. While there are a number of alternative sources and technological solutions available, most mean higher costs of water (eg. desalination).

Do you believe water should be supplied for Perth use from the Blackwood Groundwater area?

- | | | |
|--------------------|----------------------------|--------------------|
| YES 1 | NOT SURE 2 | NO 3 |
| ↓ | ↓ | ↓ |
| Answer Q. 3 | Answer Q. 3 & 4 | Answer Q. 4 |

If YES or NOT SURE:

3. Would you still believe in providing Blackwood Groundwater to Perth

- (a) if it was not known what effects taking water from the area would have on the regional environment?

YES 1 NOT SURE 2 NO 3

- (b) if the south-west people were not involved in making the decision?

YES 1 NOT SURE 2 NO 3

- (c) if it meant that south-west people with existing groundwater allocations could lose some of their water in the future?

YES 1 NOT SURE 2 NO 3

- (d) if there was insufficient groundwater to meet future south-west regional development needs?

YES 1 NOT SURE 2 NO 3

- (e) if it could be shown that Perth people were wasting water?

YES 1 NOT SURE 2 NO 3

- (f) if it was not helpful in promoting a policy of decentralisation?

YES 1 NOT SURE 2 NO 3

If NO or NOT SURE:

4. Would you still oppose providing Blackwood Groundwater to Perth

- (a) if it meant that the south-west region could profit by selling the water to Perth?

YES 1 NOT SURE 2 NO 3

- (b) if it meant that Perth people would have increased water restrictions to total sprinkler bans?

YES 1 NOT SURE 2 NO 3

- (c) if local people had a say in the management and monitoring of the aquifer?

YES 1 NOT SURE 2 NO 3

- (d) if it meant that Perth people would have to pay more for other sources of water?

YES 1 NOT SURE 2 NO 3

- (e) if it could be shown there was sufficient groundwater to meet future development needs in the south-west region?

YES 1 NOT SURE 2 NO 3

- (f) if it could be guaranteed that the decision would be reversed if it became detrimental to the region in any way?

YES 1 NOT SURE 2 NO 3

