

Community engagement approaches to improve waterway management

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Abstract: Waterways hold significant social, cultural, and ecological value for communities, necessitating the involvement of local communities in management interventions to gain social license and ensure long-term waterway health and the associated services and benefits. Ignoring social-ecological connections can lead to less successful waterway interventions and management outcomes that provide little value to people, conflict with community values, or adversely impact the relationship between the waterway manager and the community. Inclusion of the community (individuals, groups, and organizations), therefore, throughout the waterway management process is likely to increase the probability of community acceptance of waterway interventions, including deeper system understanding to underpin management priorities and solutions, increased community acceptance and commitment to co-delivery of actions, and organizational reputation. Through case studies from Australia and the United States – the Melbourne Healthy Waterway Strategy (HWS), Rain to River (R2R) in Texas, and Birrarung's Billabongs in Melbourne – this paper describes various approaches to public participation in waterway management and highlights the benefits as well as challenges associated with community engagement. We provide recommendations for waterway managers centered around the following themes emerging from the case-studies: 1) It helps to approach community engagement with a commitment to transparency, openness, and curiosity; 2) Managing expectations upfront about scope, intentions, decision making authority, constraints and uncertainties can help build trust and understanding; and 3) Repeated, sustained interactions are necessary for building relationships, trust, opportunities for two-way learning and deliberation that can improve problem understanding, clarify objectives, enhance solution design, decision making and governance.

Key words: Community engagement, waterway management, decision making authority, co-design, public participation, engagement process

INTRODUCTION

Healthy waterways provide communities with myriad ecosystem services such as water for drinking, irrigation for agriculture, nutrient cycling, erosion and flood control, as well as amenity, recreation opportunities, and cultural benefits (Chee 2004, Scoggins et al. 2025). In catchments where natural landscapes have been converted to human-centered uses, there will likely be many actors with competing interests and priorities that influence waterway health and the associated services and benefits (Bos and Brown 2015). Waterway managers, therefore, play a vital role in developing an understanding, ideally mutually with catchment stakeholders and communities, of the threats to and conditions of a waterway, identifying interventions, implementing solutions, and monitoring outcomes (e.g. What is the problem? Who benefits from solutions and what are the trade-offs? Who is impacted during implementation? How to learn from the interventions).

Waterway managers, often governmental entities, are tasked with managing these often-complex social-ecological systems. Ignoring social-ecological connections can lead to less successful waterway interventions and management outcomes that provide little value to people, conflict with community values, or adversely impact the relationship between the waterway manager and the community (Hand et al. 2018, Díaz-Pascacio et al. 2022) . As such the waterway manager must balance a community's social, cultural, and economic values with a waterway's health, services, and benefits (Scoggins et al. 2025).

As waterway management complexity increases, engaging with the community in a collaborative governance structure may be increasingly necessary to achieve acceptance of waterway interventions (Herrington and Horndeski 2022, Murphy et al. 2022, Wenger et al. 2025). Further, managers are increasingly including historically excluded communities (i.e., people of color, people who earn low income, people with limited English proficiency, First Nations people) in waterway management engagement efforts and planning processes (Davis et al. 2025). However, critical to that process is understanding the degree to which the waterway manager can share decision authority with local communities to inform the appropriate levels of public participation . Inclusion of the community throughout the waterway management process is likely to increase the probability of community acceptance of waterway interventions (River Network 2024). Furthermore, the inclusion of community interests and expertise may lead to more successful and persistent interventions (Scoggins et al. 2022). Engaging community members through processes such as community-based participatory research (Tidwell et al. 2014, Collins et al. 2012), collaborative learning (Greet et al. 2023), and strategic planning (DEPI 2013) are necessary to inventory discover and characterize these interests.

This paper explores community engagement – the role local communities (individuals, groups, and organizations; Ohmer et al. 2022) can have in participating with waterway managers – in prioritizing, planning, designing, implementing, and monitoring interventions for waterway health. Through case studies, we share collective experiences that help identify themes and supporting examples for successful engagement and participatory processes in waterway management – including both opportunities and challenges. Each case studies highlights: 1) engagement processes and enabling conditions waterway managers can use to build community participation into waterway planning processes and projects, and 2) how managers integrate

participatory input and mutual knowledge exchange into waterway management. The discussion section includes a synthesis of the key themes and lessons learned from the various community engagement approaches applied in each case study.

The ideas and direction of this paper came together during a workshop held at University of Melbourne in Burnley, Victoria, Australia prior to the 6th Symposium on Urbanization and Stream Ecology. Although the workshop initially started as a knowledge sharing exercise, the participants quickly identified commonalities across geographies, programs, challenges, and opportunities. We acknowledge that waterway managers often have access to local engagement frameworks to guide community engagement, and engagement tools for practitioners that exist at an international level, such as IAP2's Spectrum of Public Participation (IAP2 Federation 2024). The Spectrum, which includes five distinct levels 1) "inform", 2) "consult", 3) "involve", 4) "collaborate", and 5) "empower", serves as a guiding tool for organizations to determine and implement the appropriate level of public involvement in decision-making processes and assist with clarifying roles, set expectations, and enhance transparency (IAP2 Federation 2024). We briefly describe the IAP2 Spectrum level of each case study to highlight a connection to a common public participation tool. However, this paper is written from the waterway manager perspective emphasizing three different engagement examples. For that reason, we do not review the literature to explain social science methods or offer insights into public participation tools. We encourage waterway managers to make a concerted effort to foster an ongoing working relationship through all phases of the waterway strategic planning process with social scientists or community engagement practitioners (Herrington and Horndeski 2022) to understand and apply an appropriate community engagement approach that is built on trust, respect, and shared decision making (Coleman et al. this issue).

110 COMMUNITY ENGAGEMENT CASE STUDIES

111 The three case studies are examples of waterway management projects from Australia and the
 112 United States (Table 1) that vary in environmental setting, scope, spatial scale, and project goals
 113 to demonstrate the variety of community engagement approaches and strategies to waterway
 114 management. Using a narrative approach, case-study co-authors (i.e., a subset of this paper's
 115 authors with direct knowledge of the case studies) describe the community engagement approach
 116 and the lessons learned from engaging with the community.

117 *Table 1. Summary of the three case studies.*

<i>Case study name*</i>	<i>Location</i>	<i>Project Driver</i>	<i>IAP2 Spectrum Level of Public Participation**</i>	<i>Project Goal (or Outcome)</i>
Melbourne Healthy Waterway Strategy (HWS) https://healthywaterways.com.au/	Melbourne, AUS	A 10-year strategy for protection of and improvement of the health of Melbourne's waterways	Consult, involve, and collaborate	To co-develop and co-deliver waterway management priorities, including implementation of a formal Monitoring, Evaluation, Reporting and Improvement Framework and associated Monitoring and Evaluation Plans to track progress towards implementation, waterway condition and value targets.
Rain to River (R2R) https://raintoriveratx-austin.hub.arcgis.com/	Texas, USA	An overhaul of the Austin Watershed Protection Department's 10-year strategic plan, which will guide the department's work stewarding watershed health and protecting communities from the	Consult, involve, and collaborate	To co-create a strategic watershed management plan with community that is informed by the priorities and experiences of Austin's diverse residents (with a special focus on historically marginalized communities); that helps the department better serve all Austinites; and that can

		impacts of flooding, erosion, and water pollution.		be implemented and periodically updated in collaboration with community.
Birrarung's Billabongs (Greet et al. 2023)	Melbourne, AUS	Inform adaptive management of urban billabongs.	Collaborate and empower	To: 1) to inform the restoration of urban billabongs, and 2) enhance the role of Traditional Owners, the Wurundjeri Woiwurrung, in the management of their Country.

* Note in each case study, community engagement was project specific, so the term stakeholder is used in combination with or in place of the term 'community.'

** Each of the localities in which the co-authors for this paper reside have an externally-facing community engagement framework, policy, practice or plan, that references the IAP2 Spectrum e.g., Melbourne Water (Melbourne Water's 2019-20 Annual Report; page 12) and City of Austin (City of Austin Community Engagement Current Practices, 2015; page 6).

Case Study 1: Melbourne Healthy Waterway Strategy

The Healthy Waterways Strategy 2018-2028 (HWS) is a 10-year strategy to protect and improve the health of Melbourne's waterways with a 50-year planning horizon (Figure 1). Development of the HWS was led by Melbourne Water, the waterway and catchment management authority for the Greater Melbourne region, covering around 25,000km of waterways. The strategy was co-designed and currently is being co-delivered with stakeholders, including State government, local government, Traditional Owners, and local communities. Melbourne Water's engagement integrated a broad range of stakeholder perspectives to develop a vision and goals for our waterways, create a shared understanding of major waterway health issues and management opportunities, agree on priorities for investment, as well as fostering shared ownership and commitment to deliver the strategy. In recognition of the complexity of waterway health issues and contrasting stakeholder management roles and responsibilities, it was considered essential that the strategy be owned across all stakeholders to collectively guide waterway health protection and improvement activities.



Figure 1. Developing the HWS(Source: Melbourne Water 2018)

Engagement Process

The strategy development process included collective sharing of past lessons, scientific data and expertise, and stakeholder knowledge to understand waterway conditions, values, issues, and management opportunities. Co-design workshops commenced in September 2016 and concluded with formal consultation on the draft in July 2018.

Initial regional workshops or 'co-design labs' set a 50-year vision, and informed design of the co-design and co-implementation process. Then, co-design workshops for each of the five major catchments in the region brought together stakeholders to agree on the vision, goals, priority management actions and targets for that catchment. The co-design approach was trialed in one major catchment, where participants jointly designed the strategy development process.

Workshops for the other four catchments were held in parallel following the trial process, which allowed for the adaptation and improvement of the process. The catchment workshops happened

in a sequence - starting with developing a shared vision and goals, sharing waterway health science and building collective knowledge, and then agreeing on priorities and targets.

The process combined local knowledge and expertise with scientific evidence that was presented and discussed at the workshops to agree on priority actions during the life of the strategy and long-term management targets. This included the incorporation of Habitat Suitability Models (HSMs) for aquatic macroinvertebrates, fish and platypus to predict current habitat suitability across all waterway reaches in the region, as well as predictions of likely changes in habitat suitability under urban growth and climate change and prioritization of actions based on cost effectiveness with the conservation software Zonation (Scoggins et al., this issue). HSMs can be used as a communication tool with stakeholders to describe the likely benefits of management actions (e.g. revegetation, stormwater management, and removal of fish barriers) in isolation and in combination with urban growth and climate change.

In total, over 630 individuals representing more than 220 organizations via 23 facilitated workshops participated in shaping the HWS. The engagement process also included volunteer working groups that further refined the vision and goals for each major catchment, multiple rounds of formal consultation on draft catchment visions, goals, targets and actions, community 'listening posts' throughout the region to hear what the general public values about its waterways, and a digital engagement website (>16,000 visits, regular communication to nearly 900 mailing list). The HWS also developed a formal monitoring, evaluation, reporting and improvement framework and associated monitoring and evaluation plans to track implementation progress and waterway health. This tracking has informed the recent mid-term review of the HWS and will inform the final review of the strategy and is used to provide annual reporting to stakeholders.

175 *Enabling Conditions for Engagement and Participation*

176 The approach to developing the HWS was enabled through high level management support
177 within Melbourne Water. This included a dedicated strategy development team, formation of an
178 independently-chaired project leadership team with representation from key government
179 organizations, and establishment of a science panel to oversee use of data, planning tools and
180 assumptions. Resources were provided for professional facilitators at the community workshops,
181 and voluntary attendance and goodwill of community stakeholders was critical to the success of
182 the HWS. Researchers from the Melbourne Waterway Research-Practice Partnership (Coleman
183 et al, this issue) played a key role in the synthesis and communication of relevant research
184 (Scoggins et al., this issue). The involvement of academia in the workshops and overall strategy
185 process, including researchers from multiple institutions on the science panel, added a 'trusted
186 voice' along the way and ultimately credibility to the HWS.

187 *Integrating Community Input*

188 Stakeholders co-designed the process for developing the HWS, articulated regional and
189 catchment specific visions and goals, and agreed on priority actions. Melbourne Water regularly
190 sought feedback from participants throughout the process on the workshops, and a summary of
191 findings were provided to participants following each workshop to inform subsequent
192 workshops. The priority management actions using HSMs and Zonation generally aligned well
193 with the priorities of the community. Importantly, systematic, data driven priorities from the
194 HSMs and data-driven prioritization of candidate management actions did not dictate the final
195 list of priorities. Instead, they were inputs during the co-design workshops that were tested and
196 refined based on local knowledge and priorities of stakeholders (i.e., IAP2 Spectrum level

“involve” and “collaborate”). Agreed priority actions then formed the basis of 50-year management targets that were predicted using the HSMs.

Case Study 2: Rain to River

Rain to River (R2R) is an overhaul to the strategic plan that guides the Watershed Protection Department (WPD) of the City of Austin, Texas, USA. WPD’s mission is to protect lives, property, and the environment by reducing the impact of flooding, erosion, and water pollution. The department carries out its mission through infrastructure projects, programs, and development and land use regulations. The R2R planning process is in progress, due for completion in March 2026. An initial phase of community engagement has been completed and two more are planned during 2025 and early 2026.

WPD's staff scoped R2R to incorporate community voices in a more integral way than the department had attempted previously. They sought to define “the community” with an eye to advancing equity and involving the members of historically excluded communities in the design and implementation of the engagement effort. The planning process also includes a broader goal of expanding WPD’s capacity and enthusiasm for collaborating with community in the long term. It sets out to create internal structures that support listening to and collaborating with community. It also seeks to build relationships and trust with community leaders whose communication networks reach historically underserved segments of the community, to be sustained after the plan is complete. The process expands WPD staff and leadership’s experience collaborating meaningfully and fruitfully with community members, hopefully mitigating some of the fear and resistance that often holds government staff back from this type of partnership and power sharing. WPD also began to break out of the current paradigm of engaging with

community primarily on a project-specific basis, which, anecdotally, can frustrate community members and erode trust. This paradigm also inhibits a deeper understanding of community-specific priorities and how WPD might address them.

Engagement Process

During the first phase of R2R community engagement, WPD primarily listened to the community (Table 2). Staff gathered input to inform the department’s work through two sets of methods, one intended to involve the broader public, and one intended to more deeply engage with a subset of priority stakeholders. Priority stakeholders included: 1) historically underserved or excluded residents, including people of color, people who earn low incomes, people with limited English proficiency, and others; 2) “watershed impacted” residents, who are at an increased risk of experiencing negative impacts from flooding, erosion, or water pollution; and 3) organizations and individuals with expertise in the environment, health, and disaster preparedness and relief. During this phase of engagement, we gathered input related to people’s values, priorities, and experiences related to flooding, erosion, water quality, and Austin’s waterways and natural areas (Figure 2).

Table 2. Engagement methods used in R2R

Rain to River Engagement Method	Stakeholder/Community Member	Method Description
Web-based Community Vision Survey	All Austin-area residents	All Austin-area residents were invited to complete a web-based survey that included multiple choice and long-answer questions and a map where pins could be dropped and comments shared related to specific watershed-related sites. WPD promoted the survey via advertising on the radio and social media, community events, and community networks, with special efforts to reach priority stakeholders.
Community Ambassador program	Priority stakeholders	Ten ambassadors—individuals from historically underserved/excluded communities—gathered input from members of their communities via one-on-one interviews. Ambassadors were compensated and participated in a training to learn about WPD’s work.

Partner Organization Mini-Grant program	Priority stakeholders	Six local grassroots organizations that represent and serve historically underserved/excluded residents and/or “watershed impacted” residents gathered input from the community members they work with, using engagement methods of their choosing. The partner organizations were awarded small grants and participated in training about WPD’s work.
Focus Groups	Priority stakeholders	WPD partnered with organizations that serve historically underserved/excluded residents and/or “watershed impacted” residents to conduct 16 focus groups with members of those communities. Five of these focus groups were designed and facilitated by a local Black woman-led research and data activism organization. The remaining 11 focus groups were facilitated by WPD staff and conducted in partnership with organizations serving specific priority stakeholder subgroups, including youth of color, people with disabilities, refugees with limited English proficiency, and residents of flood-prone areas of the city.



Figure 2. A R2R Community Ambassador gathers input from a member of her community.

Following the completion of this first phase of engagement, WPD convened the Rain to River Community Activation Group (CAG), an advisory group comprised of community leaders who are members of one or more of the priority stakeholder groups (Figure 3). Recruitment for the CAG built upon relationships developed during the first phase of R2R engagement. With the launch of the CAG, WPD has moved from primarily listening to community to active co-creation

245 with community. Through the CAG, diverse community leaders with relevant subject matter
246 expertise are: 1) Helping to synthesize community input into a set of community priorities and
247 actions that will be included in the R2R plan and inform the rest of the planning process; 2)
248 Leading a community asset mapping exercise to uncover potential strategies for inclusion in the
249 R2R plan and which will highlight opportunities for WPD to collaborate with the community in
250 implementing the plan; 3) Co-designing a survey tool through which, in the second phase of R2R
251 engagement, the broader Austin community will be invited to evaluate potential R2R plan
252 strategies and weigh in about how WPD should prioritize resources between existing and
253 potential future services; 4) Collaborating with WPD staff to identify potential risks and issues
254 that could stand in the way of the successful implementation of the R2R plan; and 5) Reviewing
255 R2R plan drafts to ensure that the final plan is readable and accessible for Austin's diverse
256 community.



Figure 3. Watershed Protection Department leaders and Austin City Council Member Vanessa Fuentes honored R2R Community Ambassadors and partner organizations at a reception in May 2023.

Two more phases of Rain to River community engagement remain. During the second phase, WPD will invite the community to provide further input using the co-designed survey tool described above. WPD will promote this survey broadly and will dedicate extra time and resources to engaging priority stakeholder groups. The final phase of engagement will use an online tool and other methods to invite community members to review the draft Rain to River plan and provide feedback. Staff will incorporate this feedback into final edits before bringing the plan to Austin's City Council for adoption in 2026.

Enabling Conditions for Engagement and Participation

The most important factor enabling this extensive community engagement effort has been strong support from WPD's leadership. This made it possible to allocate sufficient funding and staff

capacity, permitted a longer timeline, and made it possible to compensate community members even though doing so is not straightforward within the City's administrative system. R2R's emphasis on equity and inclusivity was enabled by WPD's previous work to advance racial equity within the department's operations, including through an internal equity assessment in 2018 and the adoption of an Equity Action Plan in 2019. The R2R engagement process also built upon years of work by staff across the department cultivating relationships with organizations that serve a broad diversity of residents. Finally, Austin's strong and diverse network of community organizations has been instrumental in reaching members of all three R2R priority stakeholder groups.

Integrating Community Input

The community input from the initial phase of R2R engagement has served as the starting place for identifying strategies and a decision-making framework for the R2R plan. Drawing from this input, we have identified a set of community priorities and supporting actions. These are being refined into aspirational but actionable strategies through an iterative dialogue between the CAG and WPD subject matter experts. Decision-making protocols will be developed by WPD staff, informed by community input. Further community input to be gathered during Phase 2 of engagement will be integrated into this process.

While planning remains in progress, WPD staff have sought opportunities to take prompt action on community recommendations. For example, WPD followed up on community recommendations by updating its flood safety website to include mental health resources for flood survivors and began a dialogue with Austin's library system that resulted in them offering vital document storage for unhoused residents. Finally, the R2R engagement process is setting the stage for ongoing collaboration with community as the plan is implemented. For example,

294 funded partnerships could make space for community organizations to help carry out plan
295 strategies they co-created.

296 **Case Study 3: Birrarung's Billabongs**

297 This project is centered along the lower Birrarung (Yarra River) in Melbourne, Australia, within
298 the traditional lands of the Wurundjeri Woi-wurrung people. Many of its former billabongs
299 (floodplain wetlands) have been lost since colonisation (c. 1740). The few remaining billabongs
300 along the lower Birrarung retain important ecological, social and Indigenous cultural values, yet
301 are threatened by disconnection via channel modification and flow regulation, and urbanisation
302 (Leahy et al 2005).

303 Despite being increasingly promoted, the inclusion of First Nations people in the research and
304 management of wetland ecosystems in Australia remains limited, particularly in urban contexts
305 (Moggridge et al 2022). In a collaboration between waterway manager Melbourne Water, The
306 University of Melbourne, and the Wurundjeri Woi-wurrung's Narrap (meaning 'Country') Unit,
307 this project aims to demonstrate the importance and efficacy of genuine decision-making
308 partnerships and formal collaboration (i.e., IAP2 Spectrum level "collaborate") with Traditional
309 Owners for the improved management and restoration of billabongs along the lower Birrarung.

310 *Engagement Process*

311 Wurundjeri Woi-wurrung's Narrap Rangers together with The University of Melbourne
312 researchers have been jointly monitoring vegetation and faunal responses to natural and managed
313 flooding at several billabongs along the lower Birrarung for the past six years. Additionally,
314 annual 'On Country' knowledge sharing days are held involving Narrap Rangers, researchers and
315 land and water managers, to share research findings and broader knowledge about the lower

Birrarung's cultural and ecological significance, and to collaboratively develop the project (Figure 4).

Annual On Country days help to strengthen Wurundjeri Woi-wurrung participation and leadership in project development and management of Country. These On Country days typically see robust discussion on a broad range of concerns regarding billabong health and management. For example, in these discussions, the potential reintroduction of traditional fire management practices ('cultural burning') to reduce weeds and restore floodplain health has been a frequent theme of discussion (Figure 5).



Figure 4. On Country knowledge sharing day at Montpellier billabong in 2023. Attendees included local Traditional Owners, university researchers and waterway and land managers.

Respectful relationships with Australia's First Nations people underpin appropriate management of Country, including waterways. This has only recently (particularly in the last decade or two) been recognized within the policies of Australian government entities including waterway managers such as Melbourne Water. Melbourne Water's promoted ethos of 'Walking Country Together' has been championed by individuals within the organization, making the project possible. To their credit, given historical discrimination and warranted distrust of government entities, Wurundjeri Woi-wurrung people have welcomed the opportunity to contribute to better waterway management.

Funding by Melbourne Water for Narrap Ranger involvement in flora and fauna monitoring, and participation in On Country knowledge sharing days have proved integral to developing respectful relationships and improving project outcomes. Furthermore, Narrap Rangers have reported wanting to be involved in the project, because of the learning opportunities it provides, and for the wellbeing benefits of working on Country and carrying out cultural responsibilities to care for Country.

Integrating Community Input

The project has highlighted the benefits of regular flooding for billabong biota to Melbourne Water informing its environmental water management and demonstrated the benefits of collaborative learning (Greet et al. 2023). Joint monitoring and knowledge sharing during annual On Country days have helped develop respectful relationships as well as highlight broader concerns regarding billabong health and identify useful complementary management approaches. Importantly, the relationship has resulted in opportunities for Wurundjeri Woi-wurrung led management of the billabongs (i.e., IAP2 Spectrum level "empower"). For example, cultural fire,

identified as a potentially useful management tool for weed control and improving the health of Country, is now being reintroduced to restore billabong floodplains.

DISCUSSION

In each of the presented case studies, community engagement was founded on a values-based decision by the waterway manager. Communities affected by a decision should be given the opportunity to be involved in the decision making process, and better still, in shaping and implementing solutions (Melbourne HWS). Further, historical exclusion should be redressed (City of Austin R2R) and Traditional Owners who had sustainably cared for and managed lands and waterways for tens of thousands of years should have a greater role in waterway management (Birrarung's Billabongs). All the case studies represented a shift towards more inclusive participation than previous engagement processes, and in some cases, greater community influence over decision making (e.g., use of fire in Birrarung's Billabongs).

Importantly, the motivation to do so is enabled by a broader social-political environment where there is a top-down policy or legislative environment that gives organizations and individuals license to pursue and invest in collaborative processes. For instance, the need for community engagement in water planning and management decision making (including Traditional Owners specifically) in both of the Melbourne case studies is supported through State policies, strategies and plans such as the Victorian Waterway Management Strategy (DEPI 2013), State water plan (Water for Victoria; DELWP 2016), and Water is Life Traditional Owner Access to Water Roadmap (DELWP 2022). Institutional commitment to these policies is vital, as designing and sustaining meaningful community engagement and participation in each of these case studies (spanning close to 10 years and continuing) requires long-term resourcing.

390 In terms of engagement and participatory processes, we share the following lessons learned.

391 Firstly, there is inevitably history in an institution's interactions (or lack thereof) with the
392 community or particular sectors of the community that it seeks to engage (Díaz-Pascacio et al.
393 2022, Davis et al. 2025). This was a major focus in City of Austin R2R and planning for
394 engagement and participatory processes explicitly anticipated issues and prepared City staff to
395 build relationships and trust with community leaders and members in phases.

396 Second, for institutions that typically operate in a single decision-making authority context,
397 substantive community engagement with a view to incorporating community priorities and
398 expertise in decision making, could lead to feelings of institutional and project vulnerability
399 associated with perceived risks such as time, cost and predictability of outcomes (Murphy et al.
400 2022). If the process involves inviting the community to help design the participatory process as
401 the Melbourne HWS did, it is important to acknowledge potential initial barriers associated with
402 increased vulnerability and uncertainty for organizations that place more decision-making power
403 in the hands of the community. Navigating this during HWS development was aided by the use
404 of professional facilitators to support a structured, open and constructive dialogue.

405 In our experiences, the additional resources and willingness to share decision making through
406 community engagement led to greater rewards than previous approaches – including deeper
407 system understanding to underpin management priorities and solutions, increased community
408 acceptance and commitment to co-delivery of actions, and organizational reputation.

409 Through our case studies, the following themes emerged most strongly for waterway managers
410 to consider in engagement approaches:

- It helps to approach community engagement with a commitment to transparency, openness, and curiosity.
- Managing expectations upfront about scope, intentions, decision making authority, constraints and uncertainties can help build trust and understanding.
- Repeated, sustained interactions are necessary for building relationships, trust, opportunities for two-way learning and deliberation that can improve problem understanding, clarify objectives, enhance solution design, decision making and governance.

These engagement approaches often require substantial resourcing such as expert input to designing the community participation process, professional facilitation, website design and maintenance, frequent reporting, and a targeted communications strategy (e.g. place-based community fora). Institutions that devote adequate resources to these steps demonstrate a commitment to the process and can show accountability in doing what was agreed to and clearly communicating it – without which trust may be eroded and community willingness to participate in future engagement may decline. For long-term endeavours such as the 10-year Melbourne HWS, regular community engagement is also critical for communicating progress, disruptions and any other developments that impact targets and goals.

Engagement that is intended to build collaborative partnerships such as that in the Birrarung's Billabongs case study, requires sustained interactions with a stable team to build trusting relationships. For instance, 'On Country' days are an effective format that resonates with Traditional Owner participants who appreciate knowledge-sharing days that open with a cultural ceremony performed on Country, hearing Elders and other knowledge-holders share history and

433 knowledge about Country, and to generate ideas and discuss priorities in the process of ‘walking
434 Country together’.

435 Each engagement approach relies on the premise that 1) “those who are affected by a decision
436 have a right to be involved in the decision-making process” (IAP2 Core Value 1; IAP2
437 Federation 2017); 2) that complex issues where technical (e.g., scientific) uncertainty exists with
438 competing social values may require more collaborative governance structures (Herrington and
439 Horndeski 2022, Wenger et al. 2025); and 3) management of a waterway should ideally be a
440 shared responsibility between the managing institutions (government agencies) and the
441 community (individuals and organizations; Hand et al. 2018, Hatty and Boulet 2024).

442 **CLOSING THOUGHTS**

443 Community engagement varies based on the scope and complexity of the project or decision, the
444 willingness for the waterway manager to yield decision authority to the community, and the
445 unique cultural, social, economic, ecological, and political conditions and values of the waterway
446 and its community. Thus community engagement should not be considered a ‘one size fits all’
447 approach (Herrington and Horndeski 2022). It is important for waterway managers to be
448 creative, adaptable, and tailor engagement and participatory processes for each particular
449 context.

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