Development of a capital works prioritisation tool

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Abstract

In 2023, Lake Macquarie City Council undertook a review of its asset management system. The review identified that prioritisation criteria for capital works varied across asset classes, hindering informed and transparent capital investment decisions.

This paper outlines the development of a prioritisation tool that enables Council to evaluate infrastructure issues using a merit-based framework of standardised criteria. The tool supports transparent, accountable decision-making and provides concise, evidence-based advice to management, finance, insurance, and capital works teams.

The paper details the methodology used to develop the tool and compares it with models from other jurisdictions.

The tool improved the consistency of decisions, transparency, efficiency of resource allocation, and integrity of asset information by providing a standardised and accountable process for prioritising projects. It gave decision-makers confidence that project prioritisation was undertaken in a logical and systematic way, and that proposed investments represented the most cost-effective outcomes for ratepayers. It was instrumental in displaying the asset backlog and ensured that projects proposed in the Long-Term Financial Plan, the Delivery Program, and the Operational Plan are assessed in a transparent and objective manner.

Keywords: Asset Management, Capital Works Planning, Evidence-Based Priority Framework

Introduction

Infrastructure asset management is a cornerstone of sustainable urban development, requiring councils to make informed, transparent, and strategic decisions about capital works investments. Across New South Wales, local governments are increasingly adopting structured prioritisation frameworks to address challenges such as limited budgets, diverse asset portfolios, and community expectations.

Recent innovations in portfolio prioritisation and project ranking have demonstrated the value of data-driven methodologies. Campbelltown City Council, for example, developed a prioritisation model aligned with ISO 55001 standards, integrating predictive modelling, GIS mapping, and stakeholder engagement to categorise projects into “must be done,” “should be done,” and “could be done” tiers (Hossain 2025). Similarly, the City of Canterbury Bankstown implemented a Capital Works Investment Prioritisation Tool that combines asset risk and strategic importance scores to produce a defensible and transparent ranking system (Shearer & Marosevac 2024).

Background

Lake Macquarie City Council, located 90 km north of Sydney, is the third largest regional city in New South Wales, with a population exceeding 217,000. The Council administers a diverse and expansive area of 648 km² and manages an infrastructure portfolio valued at approximately $3.96 billion. This includes:

- 1370 km sealed road network made of 50,000 items valued at $1.99 billion.
- 720 km stormwater pipe network made of 66,000 assets valued at $981 million.
- 559 km of paths made of 7000 items valued at $152 million.
- 88 vehicle and 123 pedestrian bridges valued at $105 million.
- 21,000 roadside assets valued at $70 million.
- 327 retaining walls valued at $41 million.

Much of this infrastructure was developed during the post-war expansion of the 1960s and 1970s. As these assets aged, Council faced mounting challenges in managing their renewal and maintenance. The absence of a consistent and transparent framework for evaluating infrastructure issues between asset classes led to fragmented decision-making. Each asset type

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was assessed using different criteria, making it difficult to compare priorities and allocate resources effectively.

This lack of standardisation created several operational and strategic challenges. Decision makers lacked clear and consistent information on the asset renewal backlog and the rationale behind project priority. Without a unified approach, capital works programming was often reactive, driven by immediate concerns rather than long-term planning or strategic alignment.

In the absence of a centralised evaluation process, information was siloed, duplicated, and difficult to reconcile between departments. This hindered the development of coherent operational plans and reduced confidence in the accuracy and timeliness of asset data. Poor transparency in how projects were selected and prioritised made it challenging to justify funding decisions or advocate for new revenue sources.

These issues were particularly acute where ageing infrastructure and increasing urbanisation placed pressure on service levels. Council recognised that without a systematic and accountable method for evaluating infrastructure needs, it would be unable to meet community expectations, manage risk effectively, or plan for future growth.

Methodology

The methodology for developing the evaluation and prioritisation tool was designed to ensure transparency, reproducibility, and stakeholder confidence in the ranking of infrastructure projects. In June 2022 Council staff identified the need for a unified framework to support capital works planning, insurance documentation, and the proposal to adopt a Stormwater Management Service Charge (SMSC). Initially conceived as a five-step process, the methodology was expanded to eight steps shortly after the first phase commenced. This evolution reflected the complexity of the task and the need for more granular stakeholder engagement, data integration, and iterative validation.

A mixed-methods research approach was adopted, combining qualitative and quantitative techniques to ensure a robust approach. Qualitative methods included structured workshops, stakeholder meetings, and iterative feedback loops, which were essential for defining evaluation criteria, refining scoring systems, and ensuring the tool aligned with operational realities. Quantitative methods such as the Analytic Hierarchy Process (AHP) were used to develop rating scales, apply scoring frameworks, and calculate weighted priorities. This dual approach ensured that the tool was both technically rigorous and contextually grounded, aligning with the principles of methodological triangulation and enhancing the credibility of the findings.

Data collection was comprehensive and multifaceted. Existing evaluation matrices, asset management plans, and project records were reviewed to identify current practices and data gaps. Over 2,100 infrastructure issues were extracted from Council's databases and project management systems. GIS data was incorporated to enable spatial analysis, and all current and proposed projects within Council's project management system were included to ensure alignment with forward planning.

Saff members from engineering, planning, and asset management disciplines participated in the weighting exercise, providing a representative cross-section of internal expertise. Their input was critical in applying the AHP methodology, which involved pairwise comparisons of criteria to derive consensus-based weightings. The tool was then populated with real-world data and re-evaluated to test its practical application, ensuring that the final product was both functional and credible.

The methodology was designed to be replicable and transparent, in line with best practices outlined in academic literature. It provided sufficient detail to allow others to reproduce the process, while also capturing the lived experience of participants involved in the tool's development. Each methodological choice—from the selection of core criteria to the weighting process—was explicitly aligned with the research objectives and supported by relevant literature and practice-based reasoning.

Ethical considerations were addressed through adherence to Council's internal governance and privacy protocols. All stakeholder participation was voluntary, and data handling complied with established information management standards. As the project was conducted entirely within a local government context using internal data and personnel, formal ethics approval was not required. Nonetheless, the methodology respected principles of informed consent, data confidentiality, and participant anonymity, consistent with ethical research practice.

This methodology ensured that the evaluation and prioritisation tool, formally recorded as the *Priority Evaluation Matrix and Forward Work Plan*, was developed with integrity, precision, and accountability. It reflects a commitment to methodological rigor, stakeholder engagement, and practical application. The final methodology was structured around an eight-step process that evolved from an initial five-step concept. These eight steps were: (1) produce a proof-of-concept matrix for stakeholder consultation; (2) select the types of issues to be evaluated; (3) select the core and asset-specific criteria; (4) determine the rating levels and scores for each criterion; (5) determine the weighting of the criteria using the AHP; (6) produce a concept matrix for further stakeholder review; (7) populate the matrix with known issues from existing records; and

(8) re-evaluate the known issues using the finalised framework. This structured, iterative process enabled the development of a robust and transparent tool that supports evidence-based decision-making and long-term infrastructure planning.

Step 1: Develop Proof-of-Concept

The first step in developing the evaluation and prioritisation tool was the creation of a proof-of-concept matrix, completed in January 2023. This initial version was designed to test the feasibility of a unified framework for assessing infrastructure issues requiring capital expenditure. The proof-of-concept was not intended to be a final product, but rather a functional prototype to demonstrate the tool's core logic and operational structure, and to facilitate early stakeholder feedback.

The project team agreed on the following principles to guide the development of the tool: enable a merit-based evaluation, provide a transparent and accountable record of evidence-based decision-making, and support the prioritisation of projects with clear advice to management, finance, insurance, and capital works teams, serve as a single source of information, independent of external documentation or linked files, and to meet the requirements for recording projects under the proposed SMSC.

The tool was designed to evaluate only those issues that required capital expenditure to create, renew, or dispose of infrastructure assets. Issues resolvable entirely through operational expenditure were excluded, although those requiring both operational and capital expenditure were included.

The *Proof of Concept* served as the primary demonstration of the tool's functionality. At its core was a calculation engine that combined three components: the core criteria score, the asset-specific criteria score, and a multiple-assets score for work that address multiple-assets, as shown in Equation 1.

$$\boldsymbol{Core\ criteria\ score} + \boldsymbol{Asset\ specific\ criteria\ score} + \boldsymbol{Multiple\ assets\ score} = \boldsymbol{Total\ Score}$$

Equation 1: Calculation using three components

The calculation results in a total score between 0 and 1. This score represented the relative priority of each issue.

To support this calculation, each issue was required to nominate a primary asset issue type; such as road, stormwater, or retaining wall; which determined the applicable asset-specific criteria.

Each criterion score was calculated by multiplying the rating value by its corresponding weighting. The spreadsheet included a data sheet containing all dropdown lists, rating scores, and weighting values, which could be modified dynamically, with the matrix recalculating automatically to reflect changes. To enhance transparency, a section of check calculations was included to show intermediate values used in the scoring process.

Feedback from the team during this phase led to the inclusion of dummy criteria to future-proof the matrix. This allowed for the seamless addition of new criteria without requiring the tool to be taken offline for structural changes. The proof-of-concept successfully demonstrated the viability of a structured, merit-based evaluation system and laid the foundation for the subsequent development steps.

Step 2: Define Issue Types

The second step involved defining the types of infrastructure issues to be assessed. This process was completed in January 2023 and began with a comprehensive review of the existing evaluation matrices used across Council. The Infrastructure Asset Management (IAM) team, responsible for producing and maintaining Asset Management Plans (AMPs), had developed matrices for five asset classes: stormwater, retaining walls, bridges, roads, and footpaths/shared paths. In total, the IAM team managed eight evaluation matrices across these classes. In parallel, the Infrastructure Asset Strategy (IAS) team, a sister team to IAM, had developed five evaluation matrices for two asset classes: footpaths/shared paths and roadside assets.

The division of responsibilities between the IAM and IAS teams reflected a historical separation of asset classes across previously distinct teams and departments. For example, within the footpaths/shared paths asset class, the IAM team managed renewal and replacement projects, while the IAS team was responsible for new works. This split extended to budget programs, with each team managing separate subprograms for new and renewal works. These programs were directly linked to Council's Long-Term Financial Plan (LTFP) and formed part of the Integrated Planning and Reporting (IP&R) framework.

To ensure the new tool aligned with existing planning and financial structures, the team mapped the relationships between the AMPs, evaluation matrices, and forward works programs. This mapping exercise revealed that the IAM team's responsibilities spanned six asset classes: stormwater, retaining walls, bridges, roads, footpaths/shared paths, and roadside assets. However, due to the limited number of bridge assets, the infrequency of bridge-related capital projects, and the recent development of a standalone bridge matrix incorporating Level 1 and Level 2 inspection data, it was decided that bridge issues would remain outside the scope of the new tool.

Consequently, the team selected five issue types for inclusion in the new evaluation and prioritisation tool:

- Stormwater
- Retaining wall
- Road
- Path (including footpaths and shared paths)
- Roadside

The existing eight evaluation matrices (excluding the bridge matrix) were mapped to these five issue types, as shown in Figure 1.

Although the IAM team was not responsible for the existing roadside asset matrices or the associated budget programs, it was agreed that roadside issues would be included in the new tool.

This decision reflected a strategic intent to eventually share or consolidate asset planning, evaluation, and budgeting responsibilities with the IAS team.

This step established a clear and practical framework for categorising infrastructure issues, ensuring that the tool would be compatible with Council's asset management structure and financial planning processes. It also laid the groundwork for future collaboration between teams and the potential integration of responsibilities across asset classes.

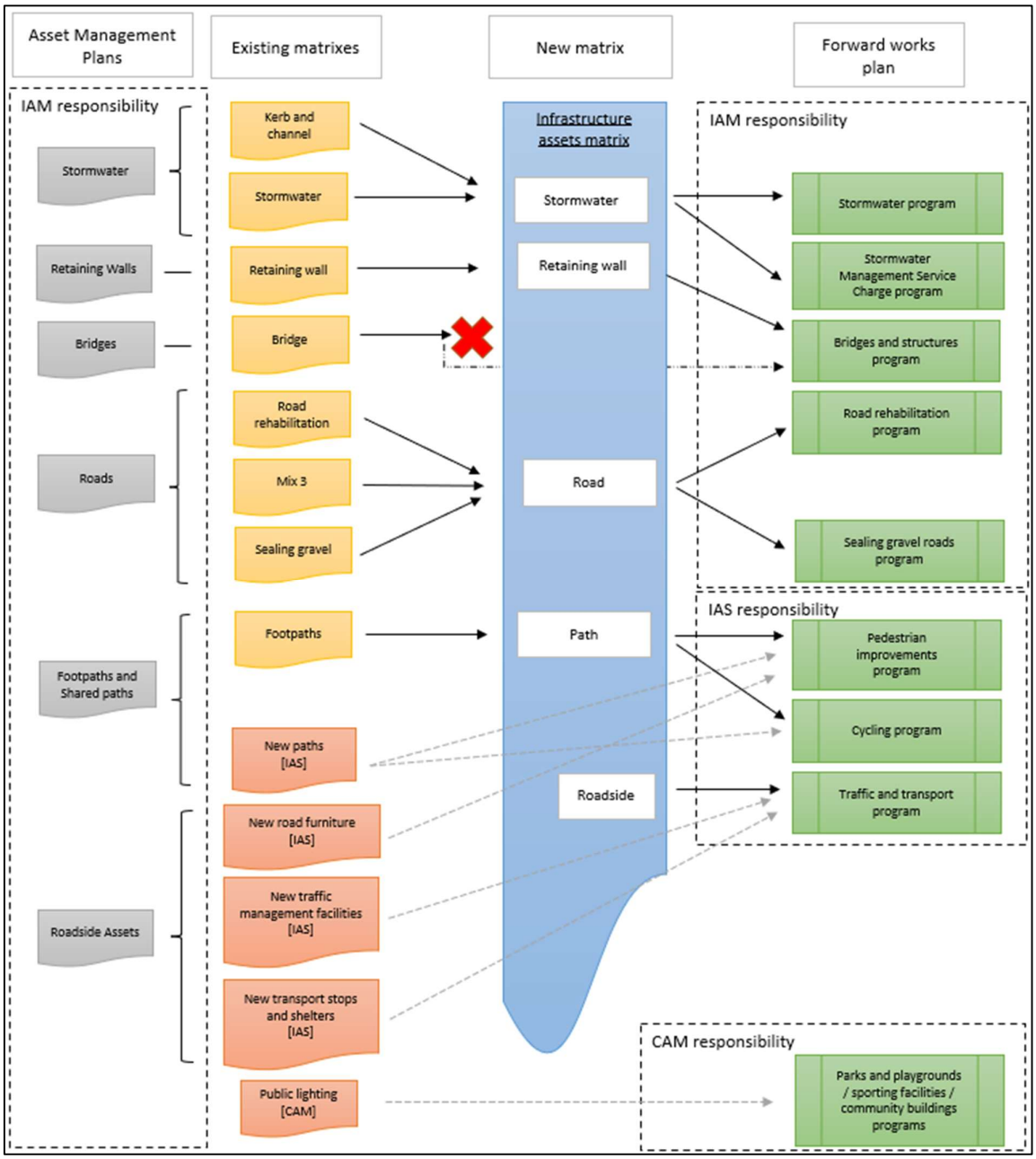

Figure 1: Asset Management responsibility map

Step 3: Select Evaluation Criteria

The third step focused on selecting the criteria that would underpin the merit-based assessment of infrastructure issues. This step was undertaken in February 2023 and involved a detailed review of the criteria used in the existing evaluation matrices managed by the IAM team. The outcome is summarised in Table 1. The previously developed eight matrices were applied across five asset classes, which used 41 distinct criteria. Of these, 17 criteria appeared in more than one matrix, but notably, no single criterion was common across all eight.

Table 1: Existing criteria

Existing criteria	Stormwater	Kerb and channel	Retaining wall	Bridge	Road rehabilitation	Mix 3	Sealing gravel roads	Footpaths
Safety	x				x			x
Performance	x			x			x	
Condition	x		x	x			x	x
Criticality	x		x	x				
Legal	x							
Requests	x	x	x					
Flood Hazard	x	x						
Properties	x							
Requirement to manage stormwater flow		x						
Existing operating and maintenance costs		x					x	
Traffic hierarchy		x	x	x	x	x		
Critical path				x	x	x	x	
Nearby future development		x			x			
Nearby future road renewals		x						
Pedestrian usage and criticality		x						x
Impact to other infrastructure			x					
Wall height			x					
Drainage issues			x					
Tree intrusion			x					
Vehicle damage			x					
Erosion and settlement			x					
Heavy vehicle route					x	x		
Industrial road					x	x		
Town centre					x	x		
Property density					x	x		
Road accidents					x			
Pavement condition index (PCI)					x			
Programmed works in PMS					x			
List of 50 worst roads					x			
Insurance claims						x		x
Hazard						x		
Material volatility						x		
Defects present						x		
Capacity / Utilisation							x	
Disability access and usage issues							x	x
Proximity to aged								x
Proximity to schools								x
Proximity to community facilities								x
Proximity to activity facilities								x
Transport hub								x
Principle pedestrian network (PPN)								x

Analysis of the existing matrices revealed that several had been created by replicating the structure of older tools, often retaining legacy criteria that were not necessarily relevant to the new context. This practice had led to inconsistencies in how asset issues were evaluated and prioritised. This lack of consistency highlighted the need for a unified and rationalised approach to criteria selection.

To address this, the team resolved to establish a new set of criteria that would be directly relevant to the merit-based evaluation of infrastructure issues and aligned with both asset management principles and organisational priorities.

The new tool incorporated two categories of criteria: core criteria and asset-specific criteria. Core criteria were defined as those essential for evaluating any infrastructure issue, regardless of asset class. These criteria reflected fundamental properties of asset management and enterprise governance, ensuring that the tool could be applied consistently across diverse issue types. The six core criteria selected were:

- Safety risk: The potential harm to the community caused by the issue, assessed using Council's Enterprise Risk Management Framework.
- Performance: The asset's ability to meet its intended performance objectives, including functionality, reliability, and capacity.
- Condition: The physical state of the asset, including structural integrity and estimated useful life consumed.
- Criticality: The potential impact of asset failure on broader infrastructure systems or critical services.
- Legal: The presence of actual or potential legal risks associated with the issue.
- Requests: The number of unique customer requests received regarding the issue.

To support the principles of transparency and consistency, each criterion was accompanied by a detailed description and a structured rating framework. These frameworks were designed to standardise assessments, minimise bias, and facilitate data-driven decision-making. For core criteria, both general definitions and asset-specific interpretations were developed to ensure relevance across the five issue types identified in Step 2: stormwater, retaining walls, roads, paths, and roadside assets.

In addition to the core criteria, it was decided that the new evaluation matrix would include 14 asset-specific criteria (this was later expanded to 15 in the next step). These criteria were tailored to the unique characteristics of each asset class and were intended to enhance the precision of the evaluation process. Importantly, not all asset-specific criteria were designed to contribute to the weighted evaluation score. Some were included as non-weighted fields to support filtering and categorisation of issues and projects. This functionality was essential for enabling the tool to meet its broader objectives—providing targeted, structured advice to management, finance, insurance, and capital works teams. The outcome is summarised in Table 2.

Step 4: Set Rating Scales

The fourth step involved determining the rating levels and scores for each criterion selected in the previous step. This work was completed by May 2023. The objective of this step was to establish a structured, consistent, and transparent framework for evaluating each criterion, ensuring that the tool could support reliable and data-driven decision-making.

Table 2: Proposed criteria

Proposed criteria	Stormwater	Retaining wall	Road	Path	Roadside
Safety	x	x	x	x	x
Performance	x	x	x	x	x
Condition	x	x	x	x	x
Criticality	x	x	x	x	x
Legal	x	x	x	x	x
Requests	x	x	x	x	x
Flood Hazard	x				
Properties	x				
Stormwater management service charge	x				
Wall height		x			
Wall length		x			
Sealed			x		
Critical path			x		
Mix 3			x		
Modelled replacement			x		
Recommended treatment			x		
Road hierarchy			x		x
Land use density and growth			x		
Pavement condition index (PCI)			x		
Proximity to special location				x	
Path usage				x	x

Each criterion was reviewed to define its rating framework, description, and data entry method. For most criteria, a five-level rating scale was adopted, reflecting a gradation from least to most significant impact or priority. This structure allowed for nuanced assessments and aligned with established asset management practices. However, some criteria required fewer or more rating levels depending on the nature of the data available and the specificity of the rating framework. For example, criteria designed as non-weighted fields, used primarily for filtering or categorisation, typically employed binary ratings (e.g. Yes/No) with only two levels.

Each criterion was assigned a minimum raw score of 0 (indicating no weighting in the evaluation) and a maximum raw score of 1 (indicating full weighting). This scoring system provided a clear and scalable method for integrating criteria into the overall prioritisation calculation.

To ensure consistency across the matrix, all rating levels were ordered from least to most weight for evaluation purposes. Each rating level was assigned an initial raw score, with level 1 typically receiving a score of 0 and level 5 receiving a score of 1. Intermediate levels were generally scored using a uniform grading scale (e.g. 0.25, 0.5, 0.75), although this could be adjusted if a non-linear weighting was required to reflect the relative significance of certain ratings. This flexibility allowed the matrix to accommodate both standardised and context-sensitive scoring approaches.

The rating frameworks were supported by references to relevant standards and guidelines, including IPWEA Practice Notes, Council's Enterprise Risk Management Framework, and other technical documents. These references ensured that the rating scales were grounded in best practice and could be consistently applied across asset classes.

For the core criteria, asset-specific definitions for each rating level were developed and documented. These definitions referenced the relevant rating frameworks and were tailored to the characteristics of each of the five issue types. To enhance clarity and support consistent application, each rating level was accompanied by a written description illustrated with visual examples. These images illustrated typical conditions or scenarios corresponding to each rating level, helping to improve objectivity and inter-rater reliability.

The detailed definitions and visual examples for all rating levels across all criteria were required to be finalised before proceeding to the next step of determine the weighting of the criteria. This ensured that all participants in the weighting exercise would have a shared understanding of the criteria and their implications, thereby supporting a more robust and defensible prioritisation framework.

Step 5: Weight the Criteria

The fifth step involved determining the weighting of each criterion using a structured and participatory approach. This step was undertaken through a series of workshops held in July 2023, where the AHP was implemented to derive relative weights for the core criteria, asset-specific criteria, and the three components of the tool's core calculation. The AHP methodology was facilitated using a Microsoft Excel template developed by Goepel (2013), which allowed for multiple participant inputs and consolidated outputs, while also incorporating consistency checks to ensure the reliability of the results.

AHP is a multi-criteria decision-making method that decomposes complex and unstructured problems into a set of components organized in a hierarchical structure. Developed by Saaty (1980), it enables decision-makers to express subjective judgments about the relative importance of criteria by assigning numerical values through pairwise comparisons. These comparisons are typically made using a nine-point scale, standard rating system used for the AHP (Saaty 2000), where a score of 1 indicates equal importance between two criteria, and a score of 9 indicates that one criterion is extremely more important than the other. Intermediate values (3, 5, 7) allow for finer gradations of preference.

The application of AHP for weighting criteria aligns with its successful use in diverse contexts, including prioritising performance measures in manufacturing (Dulange, Pundir & Ganapathy 2014), evaluating logistics (Ismoyo & Setyadi 2019), and green infrastructure services (May et al. 2020). These

examples demonstrate AHP's versatility in structuring complex decisions, eliciting stakeholder preferences, and supporting evidence-based prioritisation.

The Excel workbook developed by Goepel is designed to support group decision-making and includes up to 20 input sheets for pairwise comparisons, a consolidation sheet for aggregating judgments, a summary sheet for displaying results, and reference tables for consistency indices. It calculates priorities, and evaluates to assess whether the level of inconsistency in judgments is acceptable.

The workshops brought together a diverse cross-section of Council staff involved in infrastructure asset management. Participants included members of the asset management team responsible for planning and maintaining infrastructure assets, management, operational staff who maintain the assets, project management staff overseeing construction and renewal works, and members of the capital works team responsible for coordinating projects within Council's project management framework and integrating this with the financial planning functions of Council as part of the IP&R framework. This diversity ensured that the weighting process reflected a broad range of perspectives and operational realities.

The AHP exercise was divided into several components. Participants completed pairwise comparisons for the six core criteria, followed by separate weighting exercises for each of the five asset-specific criteria sets (stormwater, retaining walls, roads, paths, and roadside assets). A final exercise was conducted to determine the relative weighting of the three components of the tool's core calculation: the core criteria score, the asset-specific criteria score, and the multiple-assets score. Responses by each participant were entered into the AHP Excel template, which calculated individual and aggregated weights and provided visual feedback on consistency and degrees of consensus.

The results of the workshops were compiled into a consolidated spreadsheet and visualised using graphs to support analysis. An example of these results in shown in Figure 2.

The team examined the distribution of weightings across participants, identifying both the spread of values within each criterion set and patterns between different staff groups prioritised criteria. For example, safety was consistently weighted highest across all participants, while requests were consistently weighted lowest. Moderate variation was observed in the weighting of performance, condition, criticality, and legal criteria, reflecting the differing priorities of staff based on their functional roles and experience with infrastructure assets.

To ensure the adopted weights were both technically sound and operationally relevant, the team conducted a detailed review of the results. This included analysing whether variations in weighting were attributable to role-based perspectives, and whether any outliers or inconsistencies required further investigation. The findings were then shared with workshop participants to validate the interpretations and gather additional feedback. This collaborative process helped to build consensus and ensure that the final weightings reflected both professional asset management principles and the practical needs of respective Council teams.

Following this review, the team adopted a set of weights for all criteria and for the core calculation of the tool. These weightings were documented within the tool, along with explanatory notes to guide future re-evaluation workshops. The notes highlighted the rationale behind the adopted weightings and identified areas for potential refinement, such as expanding the tool's scope to additional asset classes or incorporating changes in Council policy. This forward-looking approach ensures that the tool remains adaptable and relevant over time.

The adopted weights were then used to develop a concept version of the matrix for stakeholder consultation.

Figure 2: Example of visualised weighting workshop results

Step 6: Build Concept Matrix

The sixth step involved producing a concept version of the matrix for stakeholder consultation. This milestone was reached in August 2023, when the concept matrix was completed and populated with a small sample of data to demonstrate its functionality and gather feedback. The concept matrix was designed to showcase the full range of features and capabilities of the tool, while also allowing stakeholders to interact with a working version and provide input on usability, structure, and content.

The matrix was structured into several key sections, each serving a distinct purpose in the evaluation and project management workflow. The first section focused on issue identification, capturing essential details such as the road and suburb, a description of the issue, the date it was identified, reference records, and the asset types involved. This was followed by the multiple-criteria decision analysis section, which included data entry fields for all relevant criteria and calculated the priority score at the core of the tool. This section also displayed the global priority score and a relative rank, which could be used to sort and filter issues based on any data fields.

Subsequent sections supported geographic mapping and project management. Location data including latitude, longitude, with a hyperlink to a web mapping platform that enabled each issue to be visualised spatially. The investigation and project sections captured background information, initial investigations, treatments undertaken, and proposed future works. These sections also recorded project details such as title, description, rationale, estimated costs for each project phase, and project status within Council's project management system. Issues could be flagged as duplicates, either due to multiple nominations from different sources or because they had been merged into a larger project.

To enhance usability, the matrix incorporated several features to assist users with data entry. Fields not required for a given issue were automatically greyed out, and a link to a web mapping platform allowed users to verify location data. A comprehensive glossary was included, detailing each column's purpose, data type, format, and guidance for data entry. The matrix also included a data tab containing all dropdown list values, criteria, weighting values, and rating scores. This tab featured charts that visually represented these values, helping users understand the relationships and impacts of their inputs. Any value in the data tab could be modified, with changes instantly reflected throughout the matrix. An example of the criteria ratings, values, and visualisation within the data tab is shown in Figure 3.

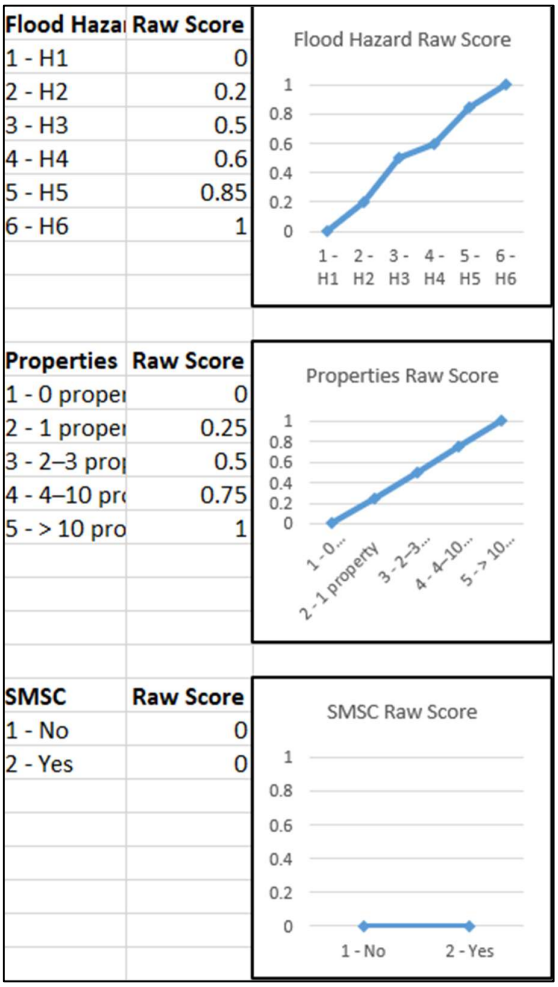

Figure 3: Example of data tab criteria ratings and weightings

Additional functionality included a statistics tab that tracked the number and type of issues and projects opened and closed, and a mapping feature that displayed all issues or filtered subsets on a map of the City.

The concept matrix was populated with a sample of ten issues representing a range of asset types and project maturity stages. This sample was used to test the tool's features and provide a basis for stakeholder feedback.

The concept matrix demonstrated the integration of evaluation, mapping, and project planning into a single, user-friendly platform. It provided a tangible example of how the tool could support transparent, evidence-based decision-making and facilitate collaboration across Council teams. The feedback gathered from stakeholders during this phase informed refinements to the tool and prepared the groundwork for its broader implementation.

Step 7: Populate with Known Issues

Following the stakeholder consultation and feedback on the concept matrix, the seventh step focused on populating the matrix with known issues sourced from

existing Council records. This process was completed by early September 2023 and marked a significant transition from prototype to operational tool. The objective was to consolidate disparate datasets into a unified framework that could support strategic planning and prioritisation across Council departments.

Over 2,200 issues and projects were imported into the matrix from various legacy systems and spreadsheets. During this process, it was discovered that for some sets of existing matrixes, multiple versions of the same matrix had been stored in different locations across Council's digital infrastructure. These versions had been used concurrently by different teams, resulting in duplicated entries and inconsistencies. To address this, each dataset was carefully reviewed to identify and eliminate duplicate records, ensuring that only verified and unique issues were added to the new matrix.

As the data was integrated, it became evident that some subsets, particularly those related to footpaths and shared paths, contained unreliable or incomplete information. These datasets were excluded from the initial population phase until data quality concerns could be resolved. In contrast, the tool successfully incorporated all current and proposed projects from Council's project management system, as well as those listed in the delivery program and LTFP.

The matrix was further refined to reflect the status of issues already being addressed through Council's project management framework. This included identifying issues that were in various stages of project development—from proposed to active construction—and those that had been resolved through completed capital works. By the end of this phase, the matrix contained over 50 issues linked to active projects, nearly 20 marked as completed, and more than 2,100 open issues awaiting allocation.

During this stage, the tool itself continued to evolve. A version control cover sheet was added to support document governance, and collaboration with Council's information and technology team was initiated to address data security and governance requirements. These enhancements were essential for preparing the tool for broader organisational use, including integration with customer service systems to support inquiries and with construction and maintenance teams for forward planning and job analysis.

Once successfully populated with verified data, the matrix was circulated to stakeholders for review and evaluation.

Step 8: Re-Evaluate and Finalise

The eighth step focused on a comprehensive re-evaluation of known issues using the newly developed matrix tool. This step was critical in refining the accuracy and relevance of the issue prioritisation and aligning it with Council's strategic planning and operational capabilities. The re-evaluation incorporated geographic information system (GIS) data and feedback from previous steps, ensuring that spatial relationships and stakeholder insights were fully integrated into the decision-making framework.

A significant component of this step involved the additional analysis of thousands of issues that had been migrated into the new matrix. This analysis revealed numerous instances where issues from different asset-specific matrices were physically adjacent or co-located. By identifying these spatial clusters, the team was able to consolidate separate issues into unified projects. The dominant asset type at each site was reassessed to incorporate secondary asset concerns, resulting in a more holistic and efficient project proposal. Non-dominant entries were reclassified as duplicates and subsequently closed in the matrix, streamlining the dataset and reducing redundancy.

Parallel to this, existing proposed and active projects were reviewed to identify any unresolved issues within their boundaries. Where feasible and based on the lifecycle phase of each project, the scope was amended to include these outstanding issues. This allowed for their reclassification as duplicates and removal from the active matrix. In cases where inclusion was not feasible, the issues were retained with updated annotations indicating potential changes in priority due to adjacent capital works. These entries were flagged for review upon project completion.

The dual analysis led to the closure of over 100 issues and the allocation of an additional 50 issues to active or proposed projects. Consequently, the number of unallocated issues in the matrix was reduced to approximately 2,000. This marked a substantial improvement in data clarity and project alignment.

Following this refinement, the new tool was formally adopted. Legacy matrices were archived and locked to prevent further use, ensuring consistency and data integrity across Council operations. Enhanced data security protocols were implemented, restricting issue entry and assessment modifications. Furthermore, only selected managerial roles were granted access to modify criteria weightings and scoring values, safeguarding the integrity of the prioritisation process.

As the tool's value became evident to Council management, several future initiatives were identified. These included planning to integrate the bridge matrix to leverage the tool's capital planning and financial forecasting capabilities, accelerating improvements in path asset assessments, and mandating preliminary cost estimates for all high-priority issues and allocated projects. These estimates are essential for inclusion in Council's forward planning documents and for enabling Council's decision makers to forecast future capital expenditure demands.

Results

The implementation of the evaluation and prioritisation tool delivered measurable and strategic benefits to Council across financial and strategic planning, operational efficiency, and asset management maturity.

For financial and strategic planning, the tool directly supported the introduction of a new revenue stream through the SMSC, generating approximately $2.2 million annually.

Council was able to prepare its Delivery Program and Operational Plan approximately 60 % faster for infrastructure assets.

For the first time since the introduction of the IP&R framework, Council was able to present a capital works program alongside the delivery plan that included individual budgets and action descriptors for each project over the four-year horizon. The tool also enabled Council to support prioritisation for the LTFP spanning ten years.

For operational efficiency, Council achieved 100 % of its infrastructure asset project delivery action key performance indicators (KPIs) in the 2024–2025 Operational Plan.

Beyond quantitative outcomes, the tool delivered benefits to Council by advancing its asset management maturity. It provided a single source of truth for tracking known asset issues and proposed projects, improving data governance, transparency, and ensuring evidence-based decisions.

Importantly, the tool has also supported decision-making by the Council Executive and Elected Councillors. At the Ordinary Council Meeting, the tool was used to present the backlog of stormwater-specific projects and their prioritisation assessments, underpinning the recommendation to adopt the SMSC Policy for implementation in the 2025–2026 Financial Year. Councillors engaged with the tool's outputs during the meeting, raising questions about the prioritisation process and receiving detailed responses from staff. An alternate motion to hold workshops on project derivation was debated but ultimately not supported, as Councillors were satisfied that the prioritisation process was robust and professionally managed.

Discussion

The development and implementation of the evaluation and prioritisation tool has yielded significant operational, financial, and strategic benefits. The tool enabled the consolidation of over 2,200 infrastructure issues into a single, transparent framework, facilitating more consistent and accountable decision-making.

It supported the introduction of a new revenue stream through the SMSC. This revenue was enabled by the tool's capacity to transparently display the backlog of stormwater projects, their prioritisation scores, and supporting project data, which provided Councillors with confidence in the proposed capital works program.

It accelerated the preparation of the Delivery Program and Operational Plan by approximately 60 %. This acceleration was attributed to the tool's ability to consolidate project data, prioritisation scores, and cost estimates into a single source of truth. The tool also enabled Council to forecast its capital works program with increased confidence, extending to four years in detail. This alignment between strategic planning and operational delivery was a direct outcome of the tool's structured evaluation framework.

It assisted Council to achieve 100 % of its infrastructure asset project delivery action KPIs in the Operational Plan. This result reflects the improved clarity and confidence in project prioritisation and resource allocation enabled by the tool.

The tool also improved internal coordination and external communication, allowing staff to respond to customer requests and Councillor inquiries with greater confidence and clarity. This centralisation enabled more consistent and transparent decision-making across asset classes and departments. These outcomes reflect the tool's success in addressing previously identified challenges, including fragmented data, inconsistent prioritisation, and limited visibility across asset classes.

Importantly, the tool aligned with key principles of asset management maturity, including improved integration between planning and delivery, enhanced visibility of asset condition and risk, and the ability to forecast future capital needs with greater confidence. These capabilities contributed to more strategic resource allocation, better alignment with service level objectives, and increased organisational confidence in infrastructure investment decisions. The tool's structured and transparent methodology provided Councillors with confidence in the logical and systematic ranking of projects, and demonstrated the tool's value in fostering trust and informed decision-making at the governance level.

Comparison

Campbelltown City Council

Campbelltown City Council's prioritisation framework (Hossain 2025), offers a structured and ISO 55001 aligned approach to capital works prioritisation. Their model distinguishes between three categories of capital works each with tailored prioritisation parameters: Renewal, Upgrade, and New Projects.

Capital Renewal Projects are prioritised using three parameters:

- Community Importance/Satisfaction: Reflects the community's reliance on and satisfaction with the asset. Five-level rating scale from Very Low to Very High.
- Asset Condition: Assessed via Remaining Useful Life, Five-level rating scale from Excellent to Very Poor.
- Asset Criticality: Evaluated using a risk matrix, ten-level rating scale from Non-Critical to Extremely Critical.

Capital Upgrade Projects expand the evaluation to six parameters:

- Community Importance.
- Asset Condition.
- Capacity: Ability to meet current and future demand. Five-level rating scale from Very Low to Very High.
- Functionality: Effectiveness in fulfilling its intended purpose. Five-level rating scale from Very Low to Very High.
- Obsolescence: Relevance and modernity of the asset. Five-level rating scale from Up-to-date to Redundant.
- Asset Criticality

Capital New Projects are assessed using:

- Strategic Alignment
- Economic Efficiency
- Capacity
- Major Risk
- Community/Stakeholder Engagement

Each project is scored and categorised as "Must be done," "Should be done," or "Could be done," based on its total priority score. This tiered approach ensures that resources are allocated to projects that deliver the greatest strategic and community value. Their use of predictive modelling, GIS mapping, and Power BI dashboards enhances transparency and supports real-time decision-making.

Compared to Lake Macquarie's tool, Campbelltown's model offers a more granular differentiation between project types and includes parameters such as economic efficiency, which are not explicitly scored in Lake Macquarie's framework. While stakeholder engagement is not scored as a standalone criterion, Lake Macquarie's tool incorporates the number of unique customer requests as a core criterion, serving as a practical proxy for community input and engagement.

While Lake Macquarie's tool does not yet incorporate predictive modelling or live dashboards, its integration with Council's project management system and its ability to track project status and capital expenditure estimates provides a strong foundation for future enhancements. Both models demonstrate the value of structured, data-driven prioritisation in improving service delivery and resource allocation.

City of Canterbury Bankstown

The City of Canterbury Bankstown developed a Capital Works Project / Investment Prioritisation Guideline, which includes a Prioritisation Tool that combines asset risk and strategic importance scores to produce a defensible and transparent ranking system. The tool, which shortly to be implemented (Shearer & Marosevac 2024), offers a comprehensive and accessible framework. Their tool categorises projects into renewal and new works, with a strong emphasis on transparency and accessibility. Their prioritisation framework calculates a Total Output Score as the sum of:

- Asset Risk Calculation: Includes parameters such as current condition, compliance risk, risk of inaction, and functionality.
- Strategic Importance Calculation: Includes anticipated benefits and alignment with planning priorities.

In addition to scoring criteria, Canterbury Bankstown's tool incorporates non-scoring quality project criteria such as:

- Project Phase
- Project Urgency
- Funding Source
- Estimated Cost

The tool is designed to be accessible to both technical staff and the broader community, with data captured via Microsoft Forms and processed through a consultant-developed backend. This approach ensures consistency across asset types and supports defensible, replicable prioritisation outcomes.

Lake Macquarie's tool shares Canterbury Bankstown's emphasis on transparency and cross-asset applicability. However, Lake Macquarie's model uses a fixed set of six core criteria and a tailored set of asset-specific criteria for each asset class.

While Canterbury Bankstown's model includes broader strategic and financial parameters, Lake Macquarie's tool integrates directly with Council's project management system and includes governance protocols to control data integrity and access.

Limitations

Despite its strengths, Lake Macquarie's tool has limitations. The exclusion of path asset data due to reliability concerns highlights the need for improved data quality and assessment frameworks. Additionally, while the tool supports project tracking and prioritisation, it currently lacks advanced features such as predictive modelling and dynamic dashboards, which could further enhance decision-making and stakeholder engagement.

The tool's reliance on manual data entry and periodic updates may also limit its scalability and responsiveness. Addressing these limitations will be essential to ensure the tool remains effective as Council's asset base and planning needs evolve.

Future Directions

Several future improvements have been identified. These include:

- Integrating the bridge matrix to extend the tool's coverage and leverage its capital planning capabilities.
- Accelerating a business improvement project to enhance path asset assessments and enable their inclusion in the tool.
- Requiring initial cost estimates for all high-priority issues and allocated projects to support financial forecasting and executive decision-making.

These enhancements will strengthen the tool's role in strategic planning and ensure it continues to support Council's objectives under the IP&R framework.

Conclusion

This paper has presented the development and implementation of Lake Macquarie City Council's capital works evaluation and prioritisation tool, a structured, merit-based framework designed to improve transparency, consistency, and strategic alignment in infrastructure planning. The tool successfully consolidated over 2,200 known issues across multiple asset classes, introduced a new revenue stream through the Stormwater Management Services Charge, and enabled more efficient preparation of the Delivery Program and Operational Plan.

The findings demonstrate that the tool has significantly enhanced Council's ability to forecast capital works, prioritise projects, and respond to stakeholder inquiries with confidence. It has also supported the achievement of 100 % delivery of infrastructure asset KPIs in the 2024–2025 Operational Plan. These outcomes underscore the tool's value in improving operational efficiency, financial planning, and asset management maturity.

While the tool has delivered measurable benefits, limitations remain. The exclusion of path asset data due to reliability concerns highlights the need for improved data collection and assessment frameworks. Additionally, the absence of predictive modelling and dynamic dashboards limits the tool's responsiveness and analytical depth. Addressing these limitations will be essential to ensure the tool's continued relevance and scalability.

Comparative analysis with other councils reinforces the strength of Lake Macquarie's approach. Campbelltown City Council's model distinguishes between renewal, upgrade, and new projects, using tailored parameters such as community importance, asset condition, functionality, and strategic alignment. City of Canterbury Bankstown's tool calculates a Total Output Score by combining Asset Risk and Strategic Importance, and includes non-scoring criteria such as project phase and funding source. Each model reflects the priorities and operational contexts of its respective council. While these models offer broader strategic and financial insights, Lake Macquarie's tool excels in integration with internal systems, governance protocols, and operational usability.

Lake Macquarie City Council's evaluation matrix represents a significant advancement in local government infrastructure planning. It provides a replicable model for other councils seeking to improve asset management practices, align capital investment with strategic goals, improve accountable infrastructure decisions, and deliver better outcomes for their communities.

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