MUNICIPAL ENGINEERING FOUNDATION VICTORIA
2010 STUDY TOUR REPORT

PROCUREMENT & DELIVERY OF PUBLIC WORKS

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I would like to acknowledge the support of Moorabool Shire Council. Without its collaboration in terms of allowing me the time to participate, the tour would not have been possible. I hope the experience, findings and exposure will benefit the organisation as a result.

I want to also thank my fellow participants Ms Paula Gardiner – Colac Otway Shire, Mr Raj Manihar - Baw Baw Shire, Mr Sena Abeykoon - Strathbogie Shire and Mr Marcus van Enk - JHL Civil for making the tour both enjoyable and educational.

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- City of San Francisco, California, USA
- City of Napa, California, USA
- City of Toronto, Canada
- City of Warterloo, Canada
- City of Medford, Massachusetts, USA
- Cambridgeshire County Council, UK
- Leicestershire County Council, UK

Finally but certainly not least, a big thanks goes to my family for their support and understanding during my absence.

EXECUTIVE SUMMARY

The Municipal Engineering Foundation Study Tour provides opportunity for local government engineers to travel overseas to pursue topics of interest. The 2010 tour of USA, Canada and UK contained a group of five participants and tour leader. Prior to departure, the group established an itinerary and arranged visits to organisations in those three countries. The topics of interest of the group members were varied however my topic focused on the procurement and delivery of public works.

The tour also provided the opportunity to attend the annual American Public Works Association congress held in Boston. The scale of the event was remarkable and was carried out in true American style.

Although I expected the United States to be world leaders and at the cutting edge of research, asset technology and construction techniques, I found that Australia is on par and in some areas far more advanced, particularly in asset management. Canada and United Kingdom on the other hand are very similar to us with subtle differences that were interesting to note.

One surprising observation was the efforts that some of the organisations are putting into sustainability and climate change. The larger organisations such as San Francisco and Toronto are spending billions on the subject whereas my preconceived expectation was that they would not have taken to the concept as readily. Every organisation we spoke to has this topic as one of their major issues, were addressing it through different ways and takes it into account when considering infrastructure projects.

There were a number of key findings and interesting differences that were observed and recorded during the tour and these are listed in the body of the report. Overall, the encounter was extraordinary and I feel fortunate to have participated in the tour. I would also encourage other local government engineers to make application to obtain a similar experience, one that would never be regretted.

INTRODUCTION

Background & Study Topic

The Municipal Engineering Foundation Victoria has been in existence since 1966 and was established for the purpose of providing opportunities for engineers working in local government in Victoria to enhance their skills. This is achieved by allocating annual scholarship awards to travel overseas to research a particular study topic. Applications for the 2010 tour closed in February 2010 and the tour was in August 2010.

Having been involved in design and delivery of public works in the local government sector for many years, the study topic of Procurement and Delivery of Public Works is a topic of immense interest and was a logical topic choice. Therefore my application to the MEF was framed around obtaining the following key objectives from the tour:

1. Planning and budgeting for public works

To obtain an overview of how asset data is collected, stored and maintained and how this translates to the production of capital works programs and budgets.

2. Design of public works infrastructure

Given the often tight time constraints facing local government in relation to delivery of public works, it would be valuable to gain an understanding of the quantity of engineering design that is undertaken by in-house teams, the timing and how works are designed and documented. Also to gain an understanding of any movements in design standards and construction methods due to sustainability and climate change issues.

3. Procurement & Delivery

To explore various procurement methods being used elsewhere for public works along with project delivery and supervision with the view of comparing to our own methods and identifying possible improvements.

4. Construction materials & techniques

To investigate the various construction techniques that are being employed and what materials are being used including any innovations in terms of recycled material and re-use along with stormwater quality, harvesting and re-use.

5. Land development

To obtain an overview of how the development process is undertaken elsewhere in terms of provision of infrastructure and compare to our own methods.

The study topics chosen by the other awardees of the tour were diverse and covered the following topics:

- Paula Gardiner - Planning and Delivery of Public Works
- Sena Abeykoon - Decision Support System: Proactive identification of maintenance, renewal and upgrade needs of stormwater drainage networks
- Raj Manihar - Climate Change mitigation and adaption for Council's Infrastructure/Property Services and building resilient communities
- Marcus van Enk - Representing Private Industry, Advancements in Civil Construction

During the research and development phase of the tour schedule and after approaches to various local government areas in United States, Canada and United Kingdom, we resolved to visit the following municipalities who offered different specialities but all accommodated our respective areas of interest.

- City of San Francisco, California, USA
- City of Napa, California, USA
- City of Toronto, Canada
- City of Warterloo, Canada
- City of Medford, Massachusetts, USA
- Cambridgeshire County Council, UK
- Leicestershire County Council, UK

In addition, we attended the 2010 American Public Works Association (APWA) Public Works Congress held in Boston.

Victorian Approach to Public Works Delivery

Victorian municipalities are generally similar in terms of their approach to procurement and delivery of public works. For obvious reasons, larger Councils differ slightly to smaller Councils due to resource allocation and available budget but all accord to the following broad principles:

- Development and maintenance of asset management data and systems

- Production of capital renewal programs from asset databases and other pressures
- Design and documentation of projects either in-house or via consultant assistance
- Procurement via verbal or written quotations and formal tender processes
- Project and contract management and surveillance
- Completion and project evaluation

Moorabool Shire Council Approach

Moorabool Shire is predominantly a rural municipality located approximately 70km to the west of Melbourne CBD that also enjoys a healthy residential growth rate due to its proximity to Melbourne and affordable housing. The municipality is made up of 64 localities, hamlets and towns. The shire covers an area of 2110 square kilometres and contains a local road network of approximately 1430km, 820km being sealed and 610 unsealed. In terms of procurement and delivery of public works, the shire generally employs similar principles and processes as other municipalities across the state.

TOUR VISITS & FINDINGS

City and County of San Francisco, California, USA

Organisation Synopsis

The City and County of San Francisco is the fourth most populous city in California and the 12th most populous city in the United States, with an estimated population of 815,000. It encompasses a land area of 121 km^2 with a density of approximately 6,700 people/km^2 and is the most densely populated large city in the state of California and the second most densely populated large city in the United States. San Francisco is the financial, cultural, and transportation centre of the San Francisco Bay Area, a region of more than 7.4 million people.

The City and County of San Francisco is a consolidated city/county, a status it has held since 1856 and is the only such consolidation in California. The mayor is the county executive, and a county Board of Supervisors acts as the city council. Because of its unique city/county status, it exercises jurisdiction over property that would otherwise be located outside of its boundary. For example, San Francisco International Airport, though located in San Mateo County, is owned and operated by the City and County of San Francisco. San Francisco also has a county jail complex located in San Mateo County along with interests in other surrounding counties.

San Francisco Town Hall

The annual budget for the entire organisation is in the order of $6 billion with approximately $165 million dedicated to the Public Works Department.

Visit & Site Tour Discussion

The group visited the Department of Public Works (DPW) at the City and County of San Francisco on 9 August 2010. We met with staff primarily from the Bureau of Engineering within the DPW. The Bureau of Engineering has more than 150 engineers, landscape architects and support staff and provides services in a wide variety of engineering specialties such as hydraulics, roads and highways, mechanical, structural, electrical, geotechnical engineering, and landscape architecture.

Primarily, the unit is an engineering design group, generating construction contract documents for more than $300 million in city projects annually. The majority of these projects include city-owned facilities and streets and rights-of-way. The unit is also hired by other agencies within the organisation to plan, design and construct a range of city projects. Forty percent of the unit's work is generated from the public utilities agency with approximately 30% from works associated with right-of-ways and streets. Interestingly, the engineering workforce is unionised and this requires design work to be completed in-house.

In terms of asset management practices, we discussed how the unit collects data, prioritises and completes works. They have developed a comprehensive 10 year capital works program based on their asset system however their asset and predictive modelling is not based on condition assessment but concentrates more on the age of the asset. This means that the asset system is primarily used as a broad tool to guide funding and by their own admission there is not a true understanding of the condition of their assets and the funding gap that is faced to keep the infrastructure at acceptable levels. In saying this though, they seem to have a broad understanding of the amount of funding needed to replace their assets. For example, they are currently replacing 4 miles of sewer every year but need to increase this in the short term to approximately 15 miles per annum then reduce to 7 – 8 miles per annum ongoing.

As you would expect from such a large organisation, they have a comprehensive suite of quality documentation and procedures that governs how they go about their duties. This includes their budgeting process that on the surface appears to be a comprehensive process. As previously mentioned, almost all design works are completed in house and for procurement they use a conventional method that they term design-bid-build.

Part of the visit included a site tour of the San Francisco General Hospital Construction. The project consists of the redevelopment of the existing hospital including additional wings of the building at an approximate cost of $800 million. One of the many complexities of the project was the requirement that the existing hospital had to remain operational during the development. The other major hurdle was catering for existing and new services within the building layout and we were given a comprehensive description of the effort the team put in to the modelling and pre-planning of these services using a collaborative approach with the architects, builders and the principle. Instead of the traditional design-bid-build contract arrangement that is usually adopted for projects, San Francisco chose to opt for an alliance type contract where all partners work collaboratively to obtain the desired outcome. They were pleased with the results that this approach had produced to date.

San Francisco General Hospital Construction

As is the case with other large infrastructure projects undertaken in San Francisco, the funding for this project was through a special tax voted for by the public during the election process. Two thirds of the vote is required to pass the special charge tax but it should be noted that it is not compulsary to vote in the United States.

Key Outcomes, Findings & Interesting Facts

- Asset management is not a foreign concept to the city however they are not as advanced as local governments in Victoria specifically in analysing the condition of their asset stock and identifying their associated funding gap.
- The city has a comprehensive suite of policies and procedures incorporated into their operations that covers all aspects of budgeting, procurement and project management.

- Procurement methods are largely similar to local government in Victoria. An alliance contract was used for their hospital project and although not heard of, is not that common in Victorian local government.
- Property owners are responsible for maintenance of the footpath and naturestrip to back of kerb. The City issues a defects notice to properties where a hazard exists and the property owner in turn is required to fund the repairs. It is not certain how active the council is in regard to this as anecdotal evidence suggests that the footpath network contains many "trip hazards".
- Utility companies have easements within the streets and right-of-ways, one of the conditions of allowing utilities in the road reserve is that the utility companies need to relocate their assets at their cost if the city is undertaking works and a conflict exists.
- Some of the city's departments are the largest in San Francisco. For example, their architecture agency has around 40 architects on staff, larger than any private architecture company in San Francisco.
- The property tax/rate system is calculated on the purchase price of an improved property rather than a current valuation. This creates inequity across different land owners who may have recently purchased land versus those who have had their property for many years.
- A 0.5 cent sales tax has been introduced that goes directly to the transport authorities to fund infrastructure projects.
- Climate change is on the forefront of the city's thinking especially because it is a bay side city and the associated impact that sea level rise may have. There was a great deal of work and modelling taking place in this area.
- A fact that I found surprising was that the sewer and stormwater systems are combined systems. There didn't seem to be a program or plan to rectify this other than setting up new properties and developments with different pipe systems that could be connected if a separated network was constructed in the future. Sewer overflow into the bay was a common problem for the city and is primarily caused by storm events.

City of Napa, California, USA

Organisation Synopsis

The City of Napa is the principle City of Napa County in California and is located approximately 80km north east of San Francisco. It is an old City by California standards, founded in 1847 and is a place that was used as a launching point for people bound for the gold rush. The city boasts being the birthplace of famous leather, and neighbour to some of the most prestigious vineyards in the world. The Napa City Council consists of a Mayor and four Council members all elected for terms of four years.

The City of Napa has an estimated population of 76,200 and it encompasses a land area of approximately 46 km^2 with the Napa River traversing the city on its journey to the San Pablo Bay. The city has conducted a variety of waterfront development along the banks of the river. The major town project, the Napa River Flood Project has been in progress since the late 1990s with the goal of mitigating the risk of flooding along a 9.7 km stretch of the River and 1.6 km of Napa Creek. This is due to an extensive history of flooding in the city.

The annual budget for the entire organisation is in the order of $165 million with approximately $15 million dedicated to Capital Improvement.

Visit & Site Tour Discussion

The group visited the Public Works Department at the City of Napa on 10th August 2010. In comparison to San Francisco, the visit had a less structured approach and a more relaxed “information sharing” atmosphere that included many advantages. Most of the City’s senior public works and engineering staff were involved in the discussions.

The DPW is responsible for all city infrastructure including roads, drainage, sewer and water along with waste management and fleet management functions. The entire unit comprises of approximately 90 staff. In terms of infrastructure, the city maintains approximately 140 miles (225 km) of local streets, 50 traffic signals, water and sewer treatment facilities and around 360 miles (580 km) of pipe network.

The engineering division uses a combination of internal and external resources to design and document its capital improvement projects. Usually, the projects that

require special expertise or are complex are the ones that engage external consultants. At least 0.5 EFT staff member is allocated to external design projects in recognition of the time needed to adequately manage the consultant. Coordination of different authority works was on the forefront of their mind in an attempt to eliminate the age old problem of completing a project and another authority coming 12 months later and excavating recently completed works.

The City sets a 2 year budget instead of the conventional one year budget that most organisations are accustomed to. The staff advised that the organisation is never sure of available funds due to the complicated funding streams that are available through both the state and federal government.

The streets unit of the department were quite proud of the initiative that they implemented whereby the city purchased its own paving equipment and now undertake the majority of their street resurfacing program using in-house staff and equipment. The City endeavours to pave at least 10 miles (16 km) of road every year. They believe that this is the most efficient and cost effective method and they readily promoted their acheivements in relation to the paving works.

The department has also submitted an altenative application to the state government for funding of a sustainability project that involves using an emulsion/bitumen stabilisation process for pavement rehabilitation and this will reduce grennhouse gas emissions rather than the conventional bicycle path projects. Interestingly, this alternative approach seemed to be generating some attraction from the funding body although had not been successful to date.

In terms of asset management practices, the officers recognise the concept and admitted that they have a long way to go to have an adequate system. Their assets are mapped but similar to San Francisco, they don't have a good understanding of the condition of their assets or their funding gap. They are currently planning to prepare a 5 year capital improvement program but are only in the early stages of its development.

Part of the visit included a site tour of the Napa River Flood Protection Project being implemented by the City. This project is being funded by the United States Army Corp of Engineers and will be implemented over a number of years at an approximate cost of $20 million. The project will mitigate a long history of major flooding in the city as well as taking the opportunity to upgrade the river frontage to become a major asset for this tourist destination.

The overall project comprises of many smaller components that will be completed in stages. Some of the smaller components include, construction of wetlands, replacement and raising of road and pedestrian bridges, floodwall and levee construction, detention basins, pump stations, railroad bridge construction, bypass culverts, river frontage improvements and associated works. The project commenced in the late 1990's with many of the components already completed. The overall project is scheduled for completion in 2015.

Napa River Bridge and River Frontage Upgrade

Napa River Frontage Upgrade

It was interesting and comforting to hear that officers implementing the project are experiencing difficulty in regard to the environmental issues being encountered in the design and construction of the various components especially because of the proximity of the river. It appears that environmental issues including flora and fauna are a major consideration for infrastructure projects and it seems as though the requirements have similarities to our own in Australia.

Key Outcomes, Findings & Interesting Facts

- Similar to San Francisco, property owners are responsible for maintenance of the footpath and naturestrip to back of kerb. However, Napa offers a 50% contribution to land owners as an incentive to replace substandard footpaths.
- Same as San Francisco, utility companies have easements within the streets and right-of-ways and one of the conditions of allowing utilities in the road reserve is that the utility companies need to relocate their assets at their cost if the city is undertaking works and a conflict exists. Napa meets regularly with authorities to program and coordinate upcoming works.
- The City recognises the need and benefit of asset management systems but the concept of asset condition and associated funding gaps is only in the early stages of development. The City does have a register of their assets.
- Environmental issues and associated permits are a major consideration for projects.
- Both Napa and San Francisco seem to use asphalt overlay/mill out as the primary pavement rehabilitation technique without considering if there are any underlying factors that is causing pavement failure.
- Consideration for street lighting is only based on road safety factors rather than security or community safety.
- Sustainability is a high priority and an example is a recent retrofit of street lanterns that will reduce power consumption by 10% to 30%. LED lanterns were considered but deemed too expensive and high risk however the adopted lantern allows provision for a future LED retrofit.

Toronto City Council, Ontario, Canada

Organisation Synopsis

Toronto is located in South East Canada and lies on the shore of Lake Ontario, the most eastern of the Great Lakes in North America. Toronto is home to more than 2 million people and the city is the key to one of North America's most vibrant regions known as the Greater Toronto Area. 4.5 million Canadians live in the Greater Toronto Area and this is considered as the cultural, entertainment, and financial capital of Canada. The City of Toronto covers an approximate area of 641 km^2 and boasts approximately 45,000 employees.

Toronto City Council Office

Toronto City Council consists of the Mayor and 44 City Councillors, one representing each of the city's wards. Each councillor represents approximately 55,000 residents. The council is the main governing and legislative body for the city. City councillors also sit on committees and on community councils in the area where they have been elected. Council elections are held every 4 years.

Toronto is on the north shore of Lake Ontario and is the largest of Canada's vibrant urban centres. It is the hub of the nation's commercial, financial, industrial, and cultural life, and is the capital of the Province of Ontario. People have lived in this location for thousands of years although the urban community only dates to 1793 when British colonial officials founded the 'Town of York' on what then was the Upper Canadian frontier. That village grew to become the 'City of Toronto' in 1834.

The annual operating budget for the organisation is in the order of $8.7 billion. The Capital Budget forms part of a $25.9 billion 10 year capital plan that includes sewer, water and solid waste and is expected to create or protect approximately 300,000

new jobs over 10 years. The Capital Plan focuses on development, maintenance and/or improvement of City assets such as transport, roads, bridges, community centres and libraries.

Visit & Site Tour Discussion

The group visited the City of Toronto on 12th August 2010. Through a structured approach, we received presentations from various senior staff on environment, infrastructure delivery, project delivery strategies and development engineering

The City of Toronto is an enormous organisation and is responsible for all infrastructure requirements. Some of its statistics and responsibilities are listed below:

- North America's largest public transit system after New York City. GO Transit moves people in and out of the city, while two airports service the skies above.
- Toronto gets its water from Lake Ontario, 8th largest fresh-water lake in the world.
- there are 10,033 different streets or 5,365 km of road (streets, expressways, ramps and laneways) covering 27.4 per cent of the city's area
- there are 20,371 street intersections in Toronto
- there are 7100 km of footpath
- 530 bridges
- there are 2,007 traffic control signals and 158,890 streetlights
- 337 km of railway, rapid transit rails and hydro corridors make up 2.3 per cent of the city's area
- 8,000 hectares - or 18.1 per cent of Toronto's area - is parkland (ravines, valleys, woodlots, waterfront natural areas, parks and farmland)
- average annual demand of water per day is 1.24 million cubic metres.
- 18 water pumping stations, 10 water storage reservoirs and 4 filtration plants clean and hold the water
- there are 10,002 km of sewers (sanitary, combined and storm) under the city
- 44,000 water hydrants
- residential water usage accounts for 51 per cent of water used in Toronto; average household use is 315 cu. metres/year

The organisation is extremely serious about sustainability and climate change. It is backing this initiative by allocating $1 billion in the 5 year capital budget for initiatives that help reduce greenhouse gas emissions. This is also supported by a unit

comprising 26 staff and a goal to reduce greenhouse gas emissions by 30% below 1990 levels by 2020 and 80% by 2050. There are numerous climate change initiatives that the city has adopted and are implementing including education and grant programs, increasing the tree canopy from the current 17% coverage to a nominal 60% target, subsidising insulation upgrades for private property, green roof programs, choosing renewable energy sources, sustainable transport programs etc. Toronto has modelled many of its environmental programs from New York City and would be one of the world leaders in sustainability issues. As you would expect, the City has published a myriad of documentation and web based information in regard to climate change and its actions.

We also received a presentation from the City's Water and Waste Water Director who revealed that stormwater quality is also a major focus of the City. The main reason for this is that the City controls a number of beaches, many of which have received accreditation for water quality. This has resulted in the development of a wet weather flow master plan and management guidelines along with modelling of the various creeks and rivers throughout the City. All stormwater initiatives are funded from water sales and it was interesting to note that there are some reservations in regard to future maintenance requirements and asset life in relation to water sensitive urban design.

Model of Toronto City

Similar to the United States, the sewer and stormwater systems are the same systems with only approximately 10% to 15% of the stormwater system not connected. This presents a major challenge for their stormwater quality objectives and one of the main strategies to combat this is through a 'downspout disconnection program'. The goal is to have all building downpipes disconnected from the underground sewer system by 2016. The program simply disconnects the downpipe

and discharges stormwater to the ground surface however it seems that the ramifications of this program haven't been fully considered, especially in terms of backyard flooding and the possible effects on footings and structures. Although they acknowledge the potential issues and problems that will be encountered, the program is primarily for stormwater quantity and quality control in the underground network.

In terms of project delivery, the city separates programs into what they term linear (underground, pipes, ROW's, transport etc) and vertical (water and sewer treatment plants etc). There are many challenges that they face to deliver the capital program, the main ones being the size of the program, limited construction season due to weather conditions and the time it takes to physically design, tender and construct the program. A significant focus of the capital program is projects that reduce basement flooding. They face the same issues we do in terms of residents wanting their problems solved immediately and the lack of understanding or patience for the project design and delivery process and the time it takes.

To expedite the process, the City is moving away from the traditional design-bid-build concept for like programs and opting for what is termed 'General Services Contracting' which is effectively what we know as schedule of rates contracting. Nevertheless the staff were quite pleased with the results that were being acheived by the initiative with less projects requiring carry forward to future years. Most works procured through this method are priced based on preliminary designs only and although there is an element of risk at this stage of the design, the projects such as underground pipe installation are not experiencing major variations due to this. Ideally, the City would like to bid the works at 60% to 90% design completion but in the interests of time are bidding projects earlier and this is resulting in paying a premium of 6% to 8% in cost escalation. They are willing to accept this to get the works completed.

Delivery of Municipal Infrastructure through Development Engineering was another topic of discussion. Toronto assesses between $4-$6 billion in development applications per year. Most of this comprises commercial and high rise development rather than residential. The process for engineering requirements for development is very similar to Victoria in that the City's department of over 60 staff review planning applications and engineering reports, set conditions, approve engineering designs, oversee construction, developer maintenance and securities. One of the challenges such a large organisation faces is communicating with other service units to ensure

water and sewer supply along with associated plant is adequately considered and planned and the process of ensuring inherited assets are placed on ongoing maintenance programs.

Key Outcomes, Findings & Interesting Facts

- Climate change and sustainability are not just catch phrases they are major priorities. The organisation is committing enormous funds and resources to combat the phenomenon.
- The City is willing to pay a premium in the cost of delivering the capital program through alternative procurement strategies to ensure programs are delivered in a timely manner.
- A two year maintenance period is required for infrastructure that will be inherited by the City through development compared to the three months that Victoria is accustomed to.
- The control of stormwater quality and quantity is a major focus of the City due to changes in regulations and a change in what is now acceptable to residents.
- Toronto has introduced a 'Green Standard' that is now required for developers. Part of this standard offers a 2% refund on development charges if targets of the standard are met.
- The operating budget is automatically increased when new infrastructure is introduced. For example, the tree planting program to 'green' the city has significantly increased but so has the operational budget to establish and maintain them.
- To award a contract, projects less than $25 million are sent to a committee to approve. Projects over $25 million need to go to Council to determine who only meet six times per year.
- The development process used in Canada appeared to be very similar to the Victorian system.

City of Waterloo, Ontario, Canada

Organisation Synopsis

Waterloo is a city situated in Southern Ontario, Canada approximately 100km West of Toronto. It is the smallest of the three cities in the Regional Municipality of Waterloo, and is adjacent to the larger city of Kitchener. Waterloo city council consists of seven councillors and a mayor, each representing a ward in the City and is elected on a 4 year cycle.

The City of Waterloo has an estimated population of 121,700 that includes approximately 20,000 university students as temporary residents and it encompasses a land area of approximately 64 km^2. Waterloo and the adjoining Kitchener are often jointly referred to as Kitchener-Waterloo or "the twin cities", although they have separate city governments. There have been several attempts to amalgamate the two cities but none have been successful.

Waterloo was traditionally a manufacturing city but now has a strong knowledge and service based economy with significant insurance and high-tech sectors as well as two universities. The city is relatively unique in that it is the fourth tier of government after federal, state and a local municipal district that surrounding cities are also part of.

The annual operating budget for the organisation is in the order of $133 million and approximately $35 million dedicated to Capital projects.

Visit & Site Tour Discussion

The group visited the Public Works Department at the City of Waterloo on 13th August 2010. The staff were extremely sociable and pleasant which made for an enjoyable visit. Many of the Public Works Department senior staff attended the presentations and discussions that ensued.

The Public Works Department is divided into four service unit areas as follows:

Capital Projects & Services

- Fleet, Drafting, Surveying & Inspection, Design and Project Management, and Infrastructure management

Environment and Park Services

- Environmental Initiatives, Waterloo Park, Small Parks and Trails, Playground Structures and Playing Fields, and Forestry and Horticulture

Transportation Services

- Transportation Planning, Traffic Operations, Traffic Calming, Pavement and Footpath Maintenance and Rehabilitation, Street Lights, Parking Management and Winter Control Operations

Utility Services - Water and Sewer

- Water Distribution System, Wastewater Collection System, Storm Water Management and After Hours Dispatch System.

Like the other North American municipalities we visited, Waterloo also had a strong focus on environmental issues. In particular, stormwater quality was an issue with rivers and streams being tested weekly on a seasonal basis for water quality. The local university is used for a fee to collect and report on the data collected. It was interesting to note that the use of salt during the winter period to treat snow has a large effect on the water quality objectives. To combat this, new methods are being utilised including the use of beet juice to reduce the amount of salt required. The City uses approximately 7,000 to 10,000 tonnes of salt annually to melt snow which causes damage to infrastructure including cars and other vehicles.

The City is well advanced in regard to asset management especially in comparison to municipalities in the United States. The base asset data is known and plotted in the GIS along with condition data that is collected on a three year cycle (one third every year). Consultants are used for asset condition data collection. Their maintenance system is also linked to the asset system and maintenance data is mapped and recorded electronically although the system is still paper based for field staff and is transferred to the electronic system in the office.

The City has adopted a 10 year capital program that is reviewed annually along with adopting a three year budget instead of the conventional one year budget that most organisations are accustom to. The staff advised that although they are looking to implement a prioritisation model for ranking of capital projects in the capital program, officers currently rank projects from their own opinion however the GIS system is used to map projects to assist coordinate works.

In terms of residential development, the City experiences a healthy growth rate and the systems that are used to assess and oversee development are very similar to Victorian practices. Also they are looking at implementing what is termed 'Low Impact' sensitive urban design principles. The officers expressed some concern in regard to the future maintenance requirements of these systems.

Aerial View of Grey Silo Golf Course

The visit included a site tour of the Grey Silo Golf Course which is a major park development for the City. The project primarily consisted of converting vacant land to a golf course also incorporating a function centre, walking trails, bicycle paths and stormwater harvesting, retention and irrigation ponds. The project has been constructed along the Grand River, the main river traversing the City.

Group Tour of Grey Silo Golf Course

Waterloo was a major partner in the development of this area that is now an important asset and attraction for the City. During the tour, staff advised of some of the difficulties that were encountered particularly in the planning stages where environmental issues and permits were a major consideration and took some time to

work through. The project contained some interesting initiatives including stormwater harvesting and incorporating signage along the tracks and trails to be used as an educational tool containing environmental and historical information.

Key Outcomes, Findings & Interesting Facts

- The organisation has adopted a three year operational and capital budget. Legislation introduced in 2007 allows municipalities to adopt multi-year budgets that can be subject to adustments. This is in contrast to the annual budgets that local government in Victoria adopt. Waterloo officers see many advantages in this approach including greater efficiency in administration, alignment of Council terms and strategies with budget cycles and certainty in the preplanning and delivery of capital projects.
- Waterloo seems relatively advanced in asset management in particular knowing what they have and its condition. A program of inspections is in place with a third of all assets inspected for condition every year. The maintenance system is also linked to the asset system.
- Stormwater quality is an emerging area with creek and river water monitored regularly. New developments are also required to consider water quality through 'Low Impact Development' measures.
- Waterloo is looking to implement a new stormwater rate as a further revenue source to help fund infrastructure upgrades and maintenance. The proposal will be similar to water and sewer charges and could raise in excess of $2.1 million/year from the charge. The City feels that the introduction of a new charge will be better than increasing rates and taxes because of the political sensitivity surrounding this.
- The City's operations are significantly affected by the extreme weather experienced in winter months. Capital projects only have a set window for construction while snow operations dominate the winter activities.

City of Medford, Massachusetts, USA

Organisation Synopsis

Medford is a city in Middlesex County, Massachusetts, in the United States, eight kilometres northwest of downtown Boston. Medford was founded in 1630 and is the fourth oldest English settlement in America. It was established as a City in 1892 and Medford is one of the oldest settlements of the Commonwealth and the US. The Mystic River runs through the centre of Medford on its way to Boston Harbour.

Medford was known as a leader in the Clipper Ship (sailing ship) building industry and also has a history in manufacturing brick and tile. In addition, Medford was famous for its "Medford Rum" and "Medford Crackers." Medford contains many historic sites, monuments, and houses, some of which date back to the 17th century.

We were advised that Medford is the location where the song Jingle Bells was written and this was readily promoted by the organisation. The song comes from an annual sled race from the adjoining city of Malvern to Medford and they are quite proud of the fact that they are associated with the song's origins.

Medford has a population of just over 55,000 with around 22,000 households and a population density of approximately 2,645/km². Medford is also the home of Tufts University. Medford City Council consists of seven Councillors and a Mayor.

The annual budget for the organisation is in the order of $81 million with approximately $26 million dedicated to Public Works.

Visit & Site Tour Discussion

The group visited the engineering and environmental officers at the City of Medford on 13th August 2010. The Mayor spent time with the group at the beginning of the visit, providing information about him and the organisation and accompanied us in the first part of the visits which was to the local school. The organisation of approximately 1250 staff seemed to be closely managed by the Mayor who was clearly the decision maker for the organisation. The visit had a strong environmental focus.

The environmental officers gave us a renewable energy presentation that highlighted the commitment and work that the city is doing in this area. The focus of the

presentation was a project that has been undertaken at the local school incorporating the installation of a wind turbine as a demonstration project. At the school the Mayor advised that 90% of the funding for the construction of the new schools were funded from the state and 10% from the City. The City actually sold the old schools and profited from the construction of the new schools within the City.

The organisation is currently in the process of implementing a GIS system to store their sewer, water and stormwater asset information to replace the hard copy and notation documents that currently exist. Interestingly, approximately 50% of the City's 170 to 180 miles (274 to 290km) of roads are 'private ways' as opposed to a public right of way. The City still provides basic services to the private ways such as waste collection, snow ploughing and emergency services but road maintenance and upgrades are funded by residents.

Engineering officers advised that the organisation has not developed a long term capital improvement program and admitted that the selection of projects is sometimes ad hoc and the Mayor of the City has the final say in regard to what is funded. Officers also noted that the organisation has not undertaken a gap analysis of their asset stock but they do know that the funding gap is huge. In addition, it was interesting to hear that Medford had a separate stormwater and sewer system which is the only organisation we visited in the North American leg of the tour that had separate systems.

Medford Wind Turbine

Medford Officers took us to two locations during the visit. The first was to a local secondary college where we recieved an interesting presentation on a renewable energy project that has been implemented at the school. The project involved the installation of a 135 foot (41m) wind turbine to power part of the school. The turbine is located in the school grounds and only produces electricity for approximately 10% of the school's energy use and

came at a cost of around $640,000. This cost also includes instant energy use readings and is an educational tool used by the school.

Site of Rivers Edge Commercial Development

The permit process required for the turbine installation seemed relatively easy for a residential area but this was put down to the size of the turbine and the fact that it had a reasonable buffer zone to houses. To suppliment this project, the City is also implementing an energy retrofit program in school buildings. One of the aims of this project is bringing sustainability to the forefront of the younger generation's thought process.

Completed Stage of Rivers Edge Development

The next part of the visit was to a private development that is converting a former industrial site that was contaminated and used as a dumping ground into a multi story residential and commercial site incorporating open space and parkland along the banks of the adjoining river. The developer along with his environmental and engineering consultants gave us a tour of the site as well as describing how the site was converted from the former contaminated ugly site to the current impressive landscape. The site is well located being in close proximity to rail.

The project basically consisted of a major clean up operation and extensive capping of the contaminated areas which was almost the entire site. The capping material ranged from 900mm to 2100mmin depth and was placed on a marker membrane. The capping material used was not necessarily clay but clean fill and I wasn't convinced that this material would have the permeaility qualities to contain contamination. The project also involved the removal of an old barge loading dock on the bank of the river and the difficulties encountered. The stormwater from the site goes through a three phase treatment process before it is discharged into the river. This was the first real example of stormwater quality treatment that we witnessed on the tour. The area is also watered by wells on the site but there was no mention of testing for leachate in the wells given the history of the site.

Key Outcomes, Findings & Interesting Facts

- Because of its age and history, Medford contains many marked and unmarked graves within the right of way boundary. This presents many challenges for works associated with services and even street light installation and pole locations.
- Asset management practices and principles are virtually nonexistent within the organisation although they are beginning to compile a register of what they control.
- There is no long term capital program and selection of capital projects is ad hoc. This would make it easy for the decision makers to manipulate where funds are spent.
- Again, sustainability and environmental issues was high on the organisation's agenda and funds and resources were being allocated to it.
- Medford was the only city in the North American leg of the tour that claimed to have separate stormwater and sewer systems.

Cambridgeshire County Council, United Kingdom

Organisation Synopsis

Cambridgeshire is a County Council in England located approximately 100km north of London. Within the area covered by the Cambridgeshire County Council, there are five District/City Councils covering Cambridge City, East Cambridgeshire, Fenland, Huntingdonshire and South Cambridgeshire that are responsible for the provision of District functions. The functions of the County Council and of the 5 District/city councils are detailed below:

County Council

- Education
- Libraries and Heritage
- Social Services
- Roads and Traffic
- Environment
- Strategic Planning
- Trading Standards
- Waste Disposal
- County Farms Estate

City and District Councils

- Housing
- Leisure and Recreation
- Waste Collection
- Local Planning
- Council Tax Collection
- Environmental Health

Cambridgeshire County is made up of five districts, containing a total of 60 wards. A total of 69 County Councillors represent the people of Cambridgeshire for four years at a time. The last election was held in 2009 and the next election will take place in 2013.

Since 1998, the County Council has been responsible for the provision of County functions throughout the Shire County of Cambridgeshire, excluding the Peterborough area (Peterborough City Council is a separate unitary council). Cambridgeshire is also home to a number of tertiary institutions, the most notable

being Cambridge University that is the second oldest university in the English speaking world and one of the most prestigious academic institutions in the world.

The annual operating budget for the organisation is in the order of £328 million and approximately £164 million dedicated to capital.

Visit & Site Tour Discussion

The group spent time with engineering officers from Cambridgeshire County Council on 24th August 2010. The visit consisted of an initial tour and site visits followed by a series of presentations and discussions in the office. The staff were very accommodating and pleasant which made for an informative visit.

Cambridgeshire is a county council rather than city council which means its responsibilities extend to things like public transport, education, arterial roads and waste disposal as opposed to waste collection. However it still has responsibility for road and drainage management and thus encounters the same issues that are confronted by city councils. The area has a two tier local government system split between regional and city councils and the regional councils are the planning authority.

Model of the Historic City

Cambridgeshire has an overall population of around 560,000 with Cambridge itself having approximately 110,000 people. It is generally regarded as a well educated and affluent area. The region is expected to experience a high level of residential growth between 2001 and 2020 with approximately 70,000 new houses and 75,000 jobs.

To help manage this growth, the county has developed overall structure plan requirements for new development areas and from this, development management plans and local structure plans are prepared by the local government authorities to manage the growth. Infrastrucutre requirements for new developments are considered by various authorities through the development and struture planning process.

The overall development process does not seem too disimilar to Victoria and in terms of engineering, 7.5% of estimated construction cost is collected by the city for engineering design checking and supervision of construction. Due to the age of the area and the history, heritage controls are in place that infuence new construction standards although it seems that archaeological requirements are not a major issue and this was surprising given some of the oldest buildings date back to the 1200's. It appears that flora and fauna issues are similar to our own and that disability discrimination has become an issue in recent years.

Asset management seems to be a focus for the organisation as expected. Condition assessments are currently undertaken on road infrastructure on an annual basis and the organisation is currently shifting its focus on the financial reporting of its assets. The organisation has prepared a 5 year capital program and operates under an annual budget cycle. It spends in excess of £20 million in capital expenditure on road infrastructure which is split almost 50/50 on renewal and new works.

We also discussed the work the organisation is undertaking in its flood risk management program. Approximately 60% of Cambridgeshire is below sea level and the area has experienced extensive flooding in recent times (2001 and 2007) that has included loss of life. Legislation has been introduced in England that dictates a process to lower the risk of flooding. One of the measures that has been introduced in Cambridgeshire is Sustainable Urban Drainage (SUDS). The concept is similar to our water sensitive urban design but the focus is lowering the water quantity rather than quality. Inherent in the measures though are things like permeable paving, swales, filtration strips, underground swales and detention and wetland basins. These components will no doubt improve water quality but it is not the main focus of the concept. It is anticipated that the requirement for SUDS will become mandatory for all developments nationally through the enactment of new legislation. Interestingly, all new developments in Cambridgeshire must contain permeable paving driveways as one of the measures.

The highway maintenance team also advised us of the initiative that the county has implemented that reuses asphalt and pavement millings that are recovered during maintenance activities. Previously all excavated material from road maintenance activities ended up in landfill but now all material is completely recycled. This is done through all millings being delivered to the local depot where it put through a crusher and screening plant, bitumen and new material added and then reused for minor patching work. Currently the mix that is used contains 90% of recycled material. They also use the material for road sub base and base material below footpaths thus reducing the reliance on raw materials.

The tour contained site visits to three main locations to higlight some areas of interest that the organisation is currently working on as follows:

Addingbrooks Access Road

This major £24 million project consists of the construction of a new link road for the City of Cambridge to alleviate traffic congestion in the City. The road is anticipated to carry approximately 20,000 vehicles per day and is being funded by developer and government with no contribution from the city. The road was one of the requirements of the approval of a new 3,000 lot development for the city and contains bicycle and bus routes. An agreement was put in place for the road construction through the Planning act and sounds the same as our own Section173 agreements.

Addingbrooks Access Road

Park and Ride Facilities

Due to a combination of narrow streets and laneways in the City along with large numbers of people commuting to London for work and the fact that the area is a tourist and visitor location, the County has constructed a number of park and ride facilities to reduce the traffic in the city centre. They are strategically located on the outskirts of the City and regular bus services are provided to the city centre and rail station thus reducing the number of vehicles in the town centre. The park and ride facilities are extremely popular and gets in excess of 4 million users per year across 4 locations. The initiative has been very successful and other counties are looking to replicate the system.

Park & Ride Stop

Waste Facility

We were also treated to a tour of a new waste facility that the County has constructed in partnership with private industry. The facility cost £41 million to construct and has been set up as a 28 year contract to ensure the project is viable for private industry to finance up front. The facility receives 200,000 tonnes of waste annually and the facility diverts around 30,000 tonnes to recycle and also provides a 50% reduction in waste to landfill. This is largely acheived by separating the organinc material and composting it to be used as landfill capping. In the future, this material may be burnt and used to generate electricity but this option was not chosen in the initial contract. The waste facility is

Inside Waste Facility

also used as an educational tool with tours of the site attracting around 2000 people as well as visits from school groups.

Key Outcomes, Findings & Interesting Facts

- The planning processes in place for new development is very similar to the system in Victoria.
- Heritage controls are prominant in the decision making process for planning and new works however archaeological issues are not as dominating.
- Cambridgeshire is experiencing high level of residential growth and approximately 70,000 new houses and 75,000 jobs are expected between 2001 and 2020. This requires a high degree of strategic planning.
- Large areas of the County are low lying with approximately 60% of the county below sea level. Holme Fen within the County boundary contains the UK's lowest physical point at 2.75m below sea level.
- Flood mitigation is an emerging area in England due to the introduction of new legislation. Currently the measures concentrate largely on stormwater quantity measures but inherent in the adopted measures is stormwater quality although this is currently not the objective.
- Waste minimisation seems to be a major focus in the UK and reduction of waste to landfill is well ahead of Australian practices.
- Cambridgeshire recycles all excavated material from road seal and pavement maintenance activities and reuses recovered material in its minor patching and pavement repairs. The County has purchased plant to crush, screen and produce the cold mix material and is committed to the reduction in the use of raw materials.

Leicestershire County Council, United Kingdom

Organisation Synopsis

Leicestershire is a County Council in England located approximately 165km North West of London and is the county council for the English non-metropolitan county of Leicestershire. It provides a wide range of services to over 600,000 people in Leicestershire and spends over £570 million a year. It was originally formed in 1889 and is divided into 52 electoral divisions, which return a total of 55 councillors. The headquarters of the council is County Hall at Glenfield, just outside the city of Leicester.

Leicestershire has three tiers of local government. These tiers are the county council, seven district or borough councils and parish councils. In urban areas the work of the parish council is likely to be undertaken by the county or district council. The seven district councils in Leicestershire are:

- Blaby District Council
- Charnwood Borough Council
- Harborough District Council
- Hinckley & Bosworth Borough Council
- Melton Borough Council
- North West Leicestershire District Council
- Oadby & Wigston Borough Council

The district councils are responsible for local planning and building control, local roads, council housing, environmental health, markets and fairs, refuse collection and recycling, cemeteries and crematoria, leisure services, parks, and tourism.

The county council on the other hand controls education, social services, libraries, main roads, public transport policy, fire services, trading standards, waste disposal and strategic planning for Leicestershire. The organisation has approximately 15,000 employees to deliver these services.

The annual budget for the organisation is in the order of £574 million and approximately 10% of the budget is dedicated to roads and transport.

Visit & Site Tour Discussion

The group joined the national study tour and visited Leicestershire County Council officers on 25th August 2010. Many senior staff from Leicestershire were involved in

the discussions and gave presentations on various topics. The visit consisted of the initial office presentations followed by a site visit largely conducted by contractors. The Chairman of the Council also spoke shortly to the entire group.

Same as Cambridgeshire, Leicestershire is a slightly higher authority than a standard municipality in Australia which means its responsibilities extend to things like public transport, education, arterial roads and waste disposal as opposed to waste collection. However it still has responsibility for road and drainage management and thus encounters similar issues but has greater resources.

Leicestershire's Environment and Transport Department has approximately 1,000 staff managing around £105 million in funds incorporating road, transport and waste expenditure. The organisation has adopted a number of service plans such as for transport and waste services and staff advise that these documents are one of the factors why Leicestershire is a high performing organisation. They are quite proud of the fact that they are the highest performing County in England based on annual National Highway satisfaction surveys. In addition to this, they receive around 30,000 customer requests and enquiries every year. The County also works very hard to get a proactive message out in an attempt to mitigate the number of enquiries received. A number of methods are used for this including information sheets, bullitons and sessions with Councillors to discuss their area.

Efficiency is a key focus and target of the organisation. Not only are they concentrating on staff efficiency, especially in light of the recent global financial crisis but it extends to other areas as well. An example of the efficiency program is through street lighting where they have reduced the costs by £700k and thier carbon footprint by 13,000 tonnes per annum through measures such as dimming, part night lighting and turn off. Interestingly, staff advised that where street lighting has been switched off in England, crime rates have decreased but there is no explanation for this.

In terms of Asset Management, the County is well informed in this area and was by far the most advanced of all the organisations we visited during the tour. The County manages 4,200km of road incorporating 680 structures. England has adpoted a national code for asset management for infrastructure that sets the following requirements:

- Comprehensive inventory of assets
- Asset life assumption

- Cost information
- Condition data
- Deterioration modelling
- End of historic budget allocation

The County is highly organised in this regard and has clear direction and policy in place. Asset management plans have been developed, they know what assets they own, there is an ongoing data collection regime, all assets have condition ratings and costings, an IT system is in place (Pitney Bowes Confirm) and various scenarios have been modelled in terms of where the available funding is best spent.

Leicestershire staff also gave presentations on topics of interest such as waste management and the large volume of work that is being done on education, waste treatment, flood mitigation (requirements of a draft national bill) as well as sustainability and the initiatives that are being undertaken in this area.

The visit to Leicestershire contained a tour of the A46 Highway upgrade that was one of the largest infrastructure projects being undertaken in the United Kingdom. The tour was conducted by Balfour Beatty who is the main contractor appointed to the project.

Aerial View of A46 Construction

The A46 is an important regional trunk road connecting the East and West Midlands. The highway carries between 16,200 and 25,300 vehicles per day, of which up to 15% are heavy goods vehicles and suffers from frequent congestion and delay. The road also has a poor safety record. As a result of the Department of Transport's £1 billion fiscal stimulus package, delivery of the A46 Scheme was accelerated and works commenced in 2009 and are scheduled for completion in 2012. The project

consists of constructing a new 27 km long two-lane dual carriageway road including a number of structures.

The procurement of this design and construct project is similar to what we term an alliance contract where a target cost is set and all parties share in the over or under expenditure. A three stage tender process was undertaken with a major focus on quality and only around 20% on cost in the evaluation. Given the relatively tight timeframes, 140 design staff is working on the project with 7,310 deliverables in 18 months being a target for the team.

Environmental and archaeological issues are a major focus of the contract especially because this road was a route for the Roman soldiers and the high chance of finding artefacts. In terms of flora and fauna, the challenges that are being faced are similar to those we encounter and also require careful management. Surveys are frequently undertaken and management plans are in place to help mitigate possible breaches of the permits and approvals that are in place.

Pre-cast Kerb Construction

A number of initiatives are being used during construction, one being the use of GPS equipment on machinery for level control for the entire project. We were advised that this is the first time this method has been used in the UK. Other examples are the use of cardboard column formwork in bridge construction, use of open swales rather than concrete channel in some sections and alternate pavement profiles that reduce the volumes of raw materials but don't compromise the life of the pavement.

Key Outcomes, Findings & Interesting Facts

- It was claimed that where a reduction in street lighting levels had been implemented in the UK, this had not necessarily corresponded to an increase in crime rates.
- Asset management is a major focus for the organisation with policies and strategies in place and they would be equivelent to or even further advanced than many local government areas in Australia.
- Again, waste minimisation seems to be a major focus in the UK and reduction of waste to landfill is very advanced however they see themselves as the “dirty cousin” in Europe in this regard.
- As expected, the County allocates much time and resources into educational documentation for its various key functions as a proactive tool.
- Flood and Water Management Bill introduced in 2009 has various requirements for managing surface water runoff including management and mitigation plans. The focus is largely stormwater quantity rather than quality but some of the measures inherently contain both. This is consistant with discussions at Cambridgeshire.
- The use of low temperature asphalt appears to be common in the UK along with re-use of pavement materials. This is primarily to reduce carbon footprints and for sustainability reasons with up to 50% reduction in green house gas emissions being reported.

APWA 2010 INTERNATIONAL PUBLIC WORKS CONGRESS & EXPOSITION, BOSTON, USA

The 2010 American Public Works Association (APWA) Congress & Exposition was held in Boston, Massachusetts. The theme of this five day event was “Revolution” and the Congress was used to celebrate the many accomplishments of the public works sector in the past and to chart a new pathway forward for the industry. The size and scale of the event had to be seen to be believed and was carried out in true American style.

The APWA International Public Works Congress & Exposition has been held for more than 100 years and has drawn thousands of public works professionals from all over the world. The 2010 event was attended by more than 5,000 participants. The organisers of the event outline the benefits of this congress as follows:

- Outstanding education sessions that address current public works issues, as well as ongoing challenges.
- The chance to see an extensive gathering of exhibitors that will showcase the latest products, services and technologies specific to public works.
- Opportunities to network with peers, hone your leadership abilities and learn new job skills.

Opening Ceremony of APWA Congress

The event featured more than 125 technical and professional development sessions presented by industry practitioners and vendors and whilst I took advantage of attending the limited number of sessions relevant to my study topic, I also took the opportunity to attend sessions that covered other areas of interest. Some of the many sessions attended are listed below:

- Small Budget, Big Thinking: How to Lead in Times of Expanding Challenges and Declining Resources
- Pavement Management Using Sustainable Materials
- Sustainability in Road Construction
- Modelling and Managing Stormwater; A Decade of Development
- Street Life – Getting More Life Out of Your Roads
- Using Low Impact Development (LID) to Combat Impacts of Urbanisation
- Leadership in Changing Times – Featured Speaker; Ian Hill – Foremost Advocate of Those in Public Service

In addition, the congress included an impressive list of exhibitors that occupied and area of almost one hectare. The opportunity was taken to browse the exhibit floor between sessions that comprised everything from design consultants to software developers and machinery displays as well as everything in between.

KEY TOUR FINDINGS

The five identified areas associated with the study topic of Procurement and Delivery of Public Works are listed below along with the key findings relevant to the respective theme.

Planning and budgeting for public Works

The objective of this theme was to obtain an overview of how asset data is collected, stored and maintained and how this translates to the production of capital works programs and budgets. The key findings relating to this topic were as follows:

1. Asset management as we know it is a relatively new concept to the organisations visited in the United States. Although they all seem to have a reasonably accurate inventory of the assets they own, they are generally not aware of the condition of the assets or the funding required to maintain them at acceptable standards. They all acknowledged that they have a funding gap but don't know the extent of it. It seems that these organisations use age rather than condition as one of the basic decision tools. Projects that are funded through the budget process are put forward with limited technical criteria or basis for prioritisation.
2. For the reasons listed above and along with anecdotal observations during the tour, it is my view that the United States faces some major infrastructure challenges in future unless substantial investment is made. They could benefit significantly by an increased focus in asset management principles.
3. Canada and United Kingdom are far more advanced than United States in the asset management area and would be on par with or even ahead of Victorian municipalities.
4. Assets are mostly mapped and stored using GIS software and programs however specialised asset software is only fully used in Canada and England. Similar to Australia, there are a number of different commercial software packages being used.
5. The majority of organisations visited have reasonably robust budgeting systems and processes and some even adopt multiple year budgets. The multiple year budget process was an interesting concept that would be worth exploring in Australia especially in smaller municipalities where resources are limited.
6. In the US, property owners are responsible for maintenance of naturestrips, footpaths and trees to back of kerb. Defect notices are issued to land owners to repair hazards. Many of the footpaths I walked on contained many hazards and were in fair condition at best therefore I question if this approach works well.

Given the belief we have that the US is a litigious society, I query how exposed the property owners are to the risk.

Design of public works infrastructure

The objective of this theme was to gain an understanding of the quantity of engineering design that is undertaken by in-house teams, the timing and how works are designed and documented. It would also be an opportunity to gain an understanding of any movements in design standards and construction methods due to sustainability and climate change issues along with the tight time constraints facing local government in relation to delivery of public works. The key findings relating to this topic were as follows:

1. Design of the majority of infrastructure projects is largely completed by in-house teams rather than by consultants. It seems consulting firms are only used for specialised projects or where the in-house teams are fully allocated. This is slightly different to Australia where there has been a shift away from in-house design teams.
2. Sustainability and climate change are major components of the decision making process when it comes to budgeting and subsequent design. As expected, the coastal towns are modelling and preparing for sea level rises but more surprising was that every organisation we visited was taking action to mitigate climate change. This was something I didn't expect to encounter and I would say is being taken more seriously than local government in Victoria.
3. Sewer and stormwater share the same infrastructure in the US and Canada. This creates major problems for treatment and causes major spills in storm events. All organisations acknowledge this is a problem but the funding required to construct separate systems is enormous and can't be funded.
4. Stormwater treatment has been introduced to all areas visited. The main focus at this point in time seems to be on stormwater quantity rather than quality but some of the systems being introduced have inherent stormwater quality values. The sharing of infrastructure with sewer and the use of salt for snow treatment has no doubt hindered a focus on stormwater quality and it is apparent that this will become an increasing interest in the near future.
5. The road authorities in the US and Canada have greater powers over utilities than we do. For instance, if a project discovers a service that requires alterations

due to works being carried out, the utility company is required to relocate at its cost. This concept is very appealing.

6. Disability access is acknowledged but is not being seriously funded with most footpaths not having any kerb ramps and no proactive programs to eliminate them. This was surprising given the large cities we visited and the volume of pedestrian traffic on their footpath networks.
7. Overall, the only evident change to design methods across the board was through addressing stormwater quantity.

Procurement & Delivery

The objective of this theme was to explore various methods being used elsewhere for procurement of public works along with project delivery and supervision with the view of comparing to Victorian methods and identifying possible improvements. The key findings relating to this topic were as follows:

1. The predominant procurement technique is what is termed design-bid-build and this is almost identical to our own tender and contract process following design and documentation.
2. Toronto has adopted an interesting process where projects are tendered at the preliminary design stage and agreed rates are established with contractors. This is similar to what we call schedule of rates and they are paying a premium of 6% to 8% increase in cost however they are prepared to accept this as the program is being delivered in a timely manner.
3. Alliance contracting is being used in the US and UK for major projects in some cases. The principles of the respective contracts seemed pleased with the process for both the San Francisco Hospital and the UK A46 Highway construction projects where this type of contract arrangement had been adopted.
4. Cambridgeshire has used a design, construct and operate contract for their waste treatment facility over a 28 year term. This has enabled the successful contractor to finance the project up front.
5. Overall the techniques being employed in this area are very similar to our own systems and methods.

Construction materials & techniques

The objective of this theme was to conduct investigations into the various construction techniques that are being employed and what materials are being used including any innovations in terms of recycled material and re-use. The key findings relating to this topic were as follows:

1. Milling and re-asphalting of pavements was the common rehabilitation technique used in the US and Canada. There did not seem to be any analysis of the cause of pavement failure and if the causes were being addressed with the treatment.
2. The use of low temperature asphalt is very common in all areas that we visited. The primary reason for its use was the reduction in carbon emissions, not for any other reason.
3. The UK focuses much of its efforts in reclaiming and reusing excavated material from road projects and maintenance activities. The reclaimed material is used as base for footpath construction or crushed, screened and mixed to produce an asphalt product.
4. The UK use pre cast kerb in many applications that is deep and hollow and doubles as a stormwater system. This negates the need for stormwater pipes behind kerb, however I envisage that there would be problems with blockages of the inlets to the system that are a series of openings side by side of relatively small dimensions.
5. Worksite safety and in particular worksite traffic management and signage is substandard in comparison to our own methods and standards. Signage and advanced warning was virtually nonexistent in some road projects we observed.
6. The construction period in the northern hemisphere is shortened due to extreme weather, snow and ice. Basically minimal external works are undertaken during the winter months other than snow ploughing and salt application. Therefore works need to be adequately planned and programmed to allow for this shortened construction window.

Land Development

The objective of this theme was to obtain an overview of how the development process is undertaken elsewhere in terms of provision of infrastructure and compare to Victorian methods. The key findings relating to this topic were as follows:

1. Many of the organisations we visited were large, fully developed cities with only infill or high rise development and minimal residential development.
2. The development process in Canada and the UK has many similarities to Victoria's systems and legislation.
3. Developers in Canada are imposed with a maintenance period of two years for infrastructure that is constructed by them and will be inherited by the local authority. This helps protect the authority from taking control of infrastructure not constructed appropriately and allows time for defects to surface particularly with

the seasons experienced. This is a logical approach and is something Victoria should explore to help protect municipalities as the three month period we have is clearly not long enough.

4. Stormwater quantity measures are being implemented for new developments to mitigate flooding in most areas visited however water quality is not a current focus.

Recommendations

Based on the sessions, discussions and findings during the tour, there are four recommendations that I believe would be worth local government in Victoria exploring or implementing that could assist in the Procurement and Delivery Public Works.

1. The development and adoption of multi-year budgets would reduce the administrative effort put into the preparation of annual budgets and also provide some certainty in the projects that are being funded and thus assist in the pre-planning and design of future projects. Smaller municipalities would especially benefit from this system given their low level of resources.

2. The introduction of a standard requirement for mandatory allocation of operating and maintenance budgets for new capital projects and gifted infrastructure thus taking into account whole of life cost would address problems currently being experienced in some municipalities that struggle to obtain increases in recurrent budget allocations.

3. The implementation of a two year maintenance period for developers prior to Council's taking control of inherited infrastructure would be a sensible pursuit. The current three month period is not long enough to determine defects and doesn't account for seasonal conditions or introduction of traffic in many cases.

4. The US in particular has far more power and control of other service authorities in the road reserve and don't fund relocation or alteration of services when a conflict occurs. This is worthy of consideration in Australia and would significantly reduce the cost and timing of many projects that are undertaken by local government in Victoria.

Conclusion

The tour, although a gruelling schedule and jam packed, was a completely enjoyable and rewarding experience. The contacts made, the overall experience and findings can be put to immediate use and will be invaluable in personal and professional growth. The assistance from MEF Victoria and Moorabool Shire need to be recognised to make such a tour a possibility and I would strongly recommend other local government engineers taking part in this wonderful opportunity.