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TOOLS TO MANAGE YOUR STREET TREES

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INTRODUCTION

The tools used to manage and maintain street trees vary considerably from hand tools and power tools, to machinery and management processes.

This paper is intended to outline the development of City of Charles Sturt's new computerised street tree register which has been recently introduced to assist in the way we manage our street trees.

Overview of the Council

The City of Charles Sturt for those who are unaware is situated west of the Central Business District of Adelaide. The City has a population of 103,000, making it one of the South Australia's largest Councils.

The City was born on 1 January 1997 as a result of a voluntary amalgamation between the former Cities of Hindmarsh Woodville and Henley & Grange.

The City is bounded by 11.5km of coastline to the west, the River Torrens and West Beach to the south and parts of Grand Junction and Torrens Roads to the north. Centrally located, with Adelaide International Airport, the Port of Adelaide and the main railhead at Islington only 6 km away - the City has a reputation as the "10-minute" City.

The Council is responsible for the maintenance and management of some 60,000 to 90,000 street trees, plus a large number of trees within our parks and reserves. These trees are managed and maintain by the Arboricultural Unit in the Parks and Arboriculture Portfolio of Asset Management Services.

STREET TREE REGISTER

A street tree register is a means to store, retrieve, display, sort and summarise data (information) that relates to Council's street tree assets.

Because of the large number of street trees within the City of Charles Sturt, the annual expenditure of approximately $1 million on maintenance and planting and the fact that we really didn't exactly know what that number was, we decided that some form of street tree register was required.

The main aim of this register was to give accurate figures of the number of trees, the different species types, condition, age, maintenance requirements and assist in managing our responsibilities under the South Australian Local Government Act. In addition information that was previously difficult to obtain such as how different tree species performed in the Council area, their maintenance requirements, maintenance work performed, how many times a tree had to be replaced in a particular site or the reason for its removal would now be easily accessible.

Project

In August 2002 a project team was established to develop a street tree register. The Project Team comprises staff from the Arboriculture Unit and Policy Area of the Park's portfolio and the IT Department's GIS Area. The project's objectives were:

- to determine the exact number of street trees under council's care and control;
- to develop, using in-house technology and expertise, a computer based tree register with the ultimate aim of integrating the register into a corporate wide asset management software solution;
- to determine a cost effective means to keep that data up to date, once the initial data was collected;
- to support the major processes in street tree management and maintenance;
- to create opportunities to improve current work processes and practise;
- to provide flexibility to meet the changing needs of the park and arboriculture department and ultimately the City of Charles Sturt; and
- to provide a user friendly, interactive and cost effective street tree register.

With those objectives in mind a project brief was developed that addressed the following areas:

- the organisational requirements for a street tree register;
- the data required to fulfil the arboricultural unit's business needs;
- available data collection methods;
- IT requirements and available options;
- detailed implementation plan;
- ongoing maintenance of the data;
- project risks; and
- relationships with other projects.

Data

The level of detail that can be collected on each tree is extensive, however the more data one collects the greater the cost and complexity of managing that data becomes. With these thoughts in mind the project team decided the following information fulfilled the Council's needs:

- genus/species and common name;
- average height, width and trunk circumference;
- estimate of age;
- location, (i.e. nature strip, median strip, roundabout or protuberance);
- if the tree was irrigated and location and type of overhead power supply;
- maintenance requirements; and
- condition.

An overall tree condition score was calculated by assessing the tree's condition against a series of criteria. These criteria included; the percentage of dieback, deadwood, tree rot and the presences of disease or insect infestation. In addition the vigour, suitability of tree to its locality (i.e. damage to adjoining infrastructure) and the overall crown shape was assessed. Each criteria was rated with three options available that represented the severity or otherwise of the criteria in question. These ratings were then calculated to give an overall tree

condition score. Typically low scores represented trees in excellent to good condition to high scores for trees in poor to very poor condition.

It was also important for us to collect and record the maintenance requirement/s for each tree. Maintenance requirements were divided into 8 simple tasks and encompassed the following common arboricultural procedures:

- general pruning (crown lifting, road footpath and property clearance and general dead wooding);
- formative maintenance (young tree pruning and maintenance including staking, grass removal and the replacement of recently planted dead or vandalised tree);
- vegetation clearance around overhead services;
- removal;
- root barrier;
- root pruning;
- pest control; and
- white-ant control.

To assist in forward planning and to assist in scoping maintenance programs, an estimate of the total time taken to complete the maintenance task/s was also recorded.

Ongoing Maintenance

Currently 4 tree crews, made up of 3 staff per crew, carry out programmed and reactive maintenance for the trees within their designated area. The programming of works was introduced a few years ago and we found that with current staffing levels, each tree is inspected and maintenance works completed on a two yearly cycle. The teams are also involved in removals and any reactive type work. Each crew maintains a paper based diary of works completed, recording the street name, the work completed and date of completion. Being a paper based system accessing this information can be at times very difficult, particularly for non-crew members and the information is not linked to the respective tree in which the work was performed on.

It was never the intention of this project to create a works management system. However the system needed to be versatile to capture any maintenance tasks performed and the exact time taken to complete those tasks thereby creating a work history as well as keeping initial tree information up to date.

Technology

I must stress at this point that I have limited IT knowledge, and will only provide a brief outline of the technology adopted.

Considerations that needed to be examined in order to select the computer software to collect, store and access the data associated with the street tree register included:

- the ability to graphically display the results of data queries;
- the user friendly nature of the software;
- the in-house expertise that was available for development;
- the ability to create a system that was flexible and could be customised at anytime;
- the availability of the technology to all sections of the organisation.

Council's GIS system, ESRI ARC View was selected as the preferred software option, due to its ability to integrate spatial data (the location of the tree in relation to its surroundings) and textual data in the form of tables that can easily be interrogated and provide the user the option to display the data graphically and/or textually. To simplify the access of spatially located data all desk tops (PCs) throughout the Council have E-View available on them. This provides the end user with a simple tool available to view, enquire, print reports and maps on the data collected. To simplify the process even further our GIS staff have been able to customise a number of enquiry tools specifically for the street tree register as shown below.

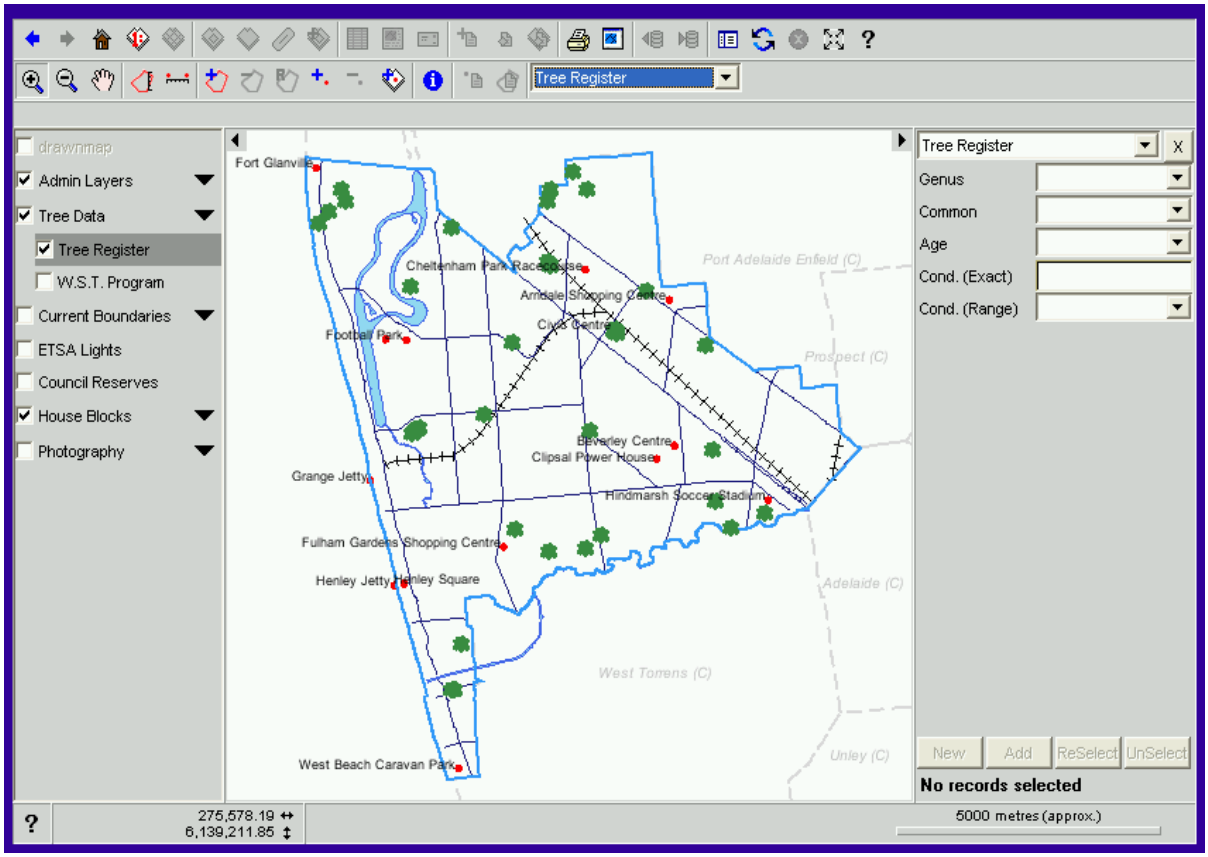

Figure 1: Customised E-View Interface

The Project Team also investigated the most efficient procedure to collect data in a quick and consistent manner by staff with limited IT knowledge. It was found that hand held data capture devices and a combination of global positioning systems (GPS) and manually adding points through objective positioning would be the most efficient data collection method available.

We selected Compaq pocket palm pilot 36 series for the hand held units. The units have 64 Mb of Ram, 48Mb of ROM and 206 MHz processor. The software used to develop the required data collection functionality is ESRI's Arcpad version 6.0. It comes as an out of box solution that has been customised and enhanced to develop the interface used by the collectors. This allowed all of the necessary information to be collected in the field, which minimised post processing and maximised efficiency of field collectors. The biggest issue in collecting data for analysis is consistency. This software allowed almost all data to be hard coded into the interface so that the user can only choose from preselected criteria.

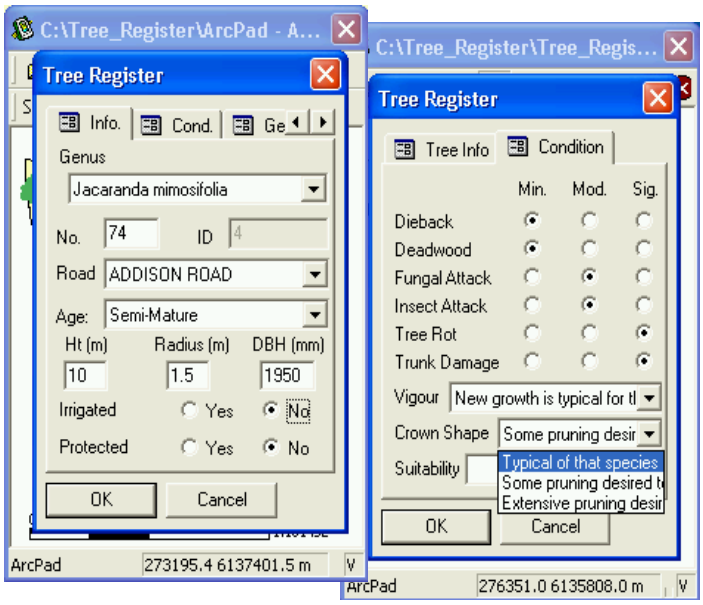

Figure 2: Hard coded interface of hand held data collection devices

Each unit has a series of tabs that cover the three categories of data: tree information (attributes), condition and maintenance tasks. In addition a map layer or the cadastral boundary of the City, which locates individual property boundaries, is provided. The data collection process involves locating the tree either via GPS or manually, using the features of the map as a guide and then completing each tab, by choosing from the preselected criteria or completing the required fields. To up load the data into the network all the data collector needs to do is to dock the hand held unit into a docking station. The data is automatically sucked into the network and populates the database thereby eliminating any need for data entry. The docking stations also recharge the battery of the hand held unit.

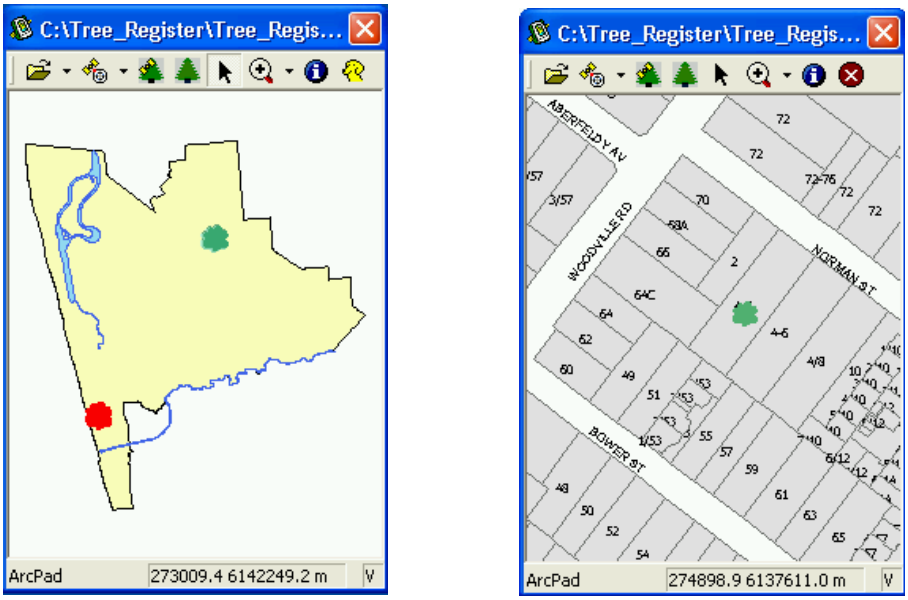

Figure 3: Map layer or the cadastral boundary of the city

To collect the maintenance tasks as they were completed it was decided that the functionality and technology developed for the initial data collection exercise would fulfil this requirement, (with exception of emergency call outs, which are applied retrospectively) and replace the paper based system currently in use.

To simplify the method of updating for whole streets of trees of a similar nature where the same task/s were performed, a bulk up-dating functionality was required. We recognised there would be nothing more tedious for these crews than to have to update the details for each individual tree. The system through a grouping function allows the operator to select a group of trees, tick the task/s performed and then update any changes to the attributes and then click a button, which automatically updates the selected trees.

Pilot

In February 2003 a pilot was conducted for a month to evaluate the functionality, technology, and determine the number of trees that could be assessed per day and the best method for staff to collect the data required.

We selected three suburbs which provided a range of trees of different ages and conditions to test the versatility of the software and different street widths to test the GPS technology. Two staff from are arboricultural operating unit were selected to conduct the pilot.

The pilot showed that the functionality initially developed required some modification, especially the maintenance component which was simplified and additional functions added. In addition the use of GPS to spatially locate the tree's position was not as accurate as we would have liked, particularly when trees were located in narrow streets, growing under large overhead canopies or in tight clusters. It indicated that a combination of GPS and manually adding the tree's location would be the most effective method. We also had some minor technical difficulties with the uploading of data via the docking station.

On average data was being collected at a rate of 23 trees per hour, with a total of 1700 trees recorded over the 15 working days of the project. The data collectors collected for an average of 5 hours per day.

Even though there were a few technical and function hurdles initially, the pilot showed that overall functionality, the use of hand held data collection devices and the use of E-View as the means to access, query and produce maps did fulfil the requirements of the project.

POTENTIAL BENEFITS/BENEFITS REALISED

Due to the timing of this paper, many of the identified benefits have yet to be realised due to the small number of street trees within the register. But as the number of trees and associated data grows so will the benefits this information offers.

Management of Trees

Those of us responsible for the management and maintenance of street trees are increasingly working within an environment of doing more with less, with an increased expectation from the communities we serve to minimise the costs of those services we provide.

The fundamental requirement of good management is knowing the extent of the assets under your care and control and identifying those that require work or are at risk of failure.

A street tree inventory is a powerful tool for dealing with present maintenance and future planning and provides the information needed to make better decisions in regards to tree management. Rather than being reactive or programming works based on a cyclic approach a street tree inventory identifies those trees in need of work thereby providing a logical system to effectively rank and therefore prioritise the resources at your disposal. This gives the organisation an opportunity to be proactive in its approach, make better decisions and therefore provide a better service.

Tree Information

As well as the Parks and Arboriculture Departments of Councils, Planning, Engineering and Customer Services also require at times information about street trees to support their internal processes.

Due to the available IT functionality, Council's street tree inventory has the capacity to sort and retrieve data with certain characteristics, produce customised reports and represent this data graphically. For instance when someone applies for a vehicle crossover, Council will be able to use the stored data to check whether a tree exists, and if it is worthy of retention. Instead of using costly employee time to make an inspection. The inventory will also be able to quantify tree species, numbers, age and condition for particular, streets, suburbs, wards and the entire Council area, just to name a few of the numerous possibilities.

In addition as works histories and attribute information accumulates for each tree a cumulative history for each planting site, street, suburb, and species will become apparent. This information will help identify species that grow well under local conditions, how many times a tree had to be replaced in a particular site or the reason for its removal would now be available. In addition whole of life costing including establishment and on going maintenance for street trees can be established.

Budget & Forward Planning

Future budget planning will be simplified once the condition, maintenance requirements and estimated times to complete those tasks for each trees are known. This data can become the basis for forecasting future workloads and allow forward planning of staff and equipment. Once costs are allocated and maintenance prioritised this information can greatly assist in identifying future budgetary requirements.

This information can also be used to assist in identifying the priorities in light of budgetary figures set for a particular year and those that fall outside of those available funds.

By understanding ones long term budgetary commitments, the tree's condition and age, streets can be prioritised over a number of years and long term tree replacement programs established. This will not only help identify and spread capital resources, but spread removals across a number of years thereby softening any loss of amenity, ensure trees are being removed at the optimum time in their life cycle, assist in the coordination of replacement programs with engineering programs such as kerb, footpath and road surface replacement and reduce the number of reactive removals as a result of customer requests.

Customer Complaints & Enquires

Those involved in the maintenance and care of trees are well aware of the number of customer enquires and complaints received in relation to street trees.

Once attribute information is collected, maintenance history has accumulated, and forward programs developed you will be able to reassure a customer at the end of a phone line, by being able to provide the history of the tree, work carried out, its general condition, species, age, or if the tree has been scheduled for removal when this will occur.

Risks

Approximately 20% of all requests received by Council, for compensation, relate to street trees.

The South Australian Local Government Association and Mutual Liability Scheme Risk Management Department have produced a guide entitled *Trees: Legislation and Risk Management Guidelines for Local Government (July 2003*). The guidelines recommend that accurate and comprehensive records need to be kept to defend Council's actions where a claim arises.

If ever a claim is made the street tree register will be able to provide evidence of when the tree was inspected, its condition and works history which is the type of information needed to defend Council's position.

By taking a proactive approach by assessing the tree's condition and identifying the maintenance works required we hope that tree related insurance claims will be reduced over time.

Staff Productivity

Another output of the register is a means to assist with programming for maintenance by recording the actual time taken to complete a maintenance task when compared to the initial estimates made as part of the initial collection of data.

The data within the inventory can also be used to demonstrate achievements, show progress in a particular works program and the effect of a policy or process change.

The data can also be used to improve program efficiency by aiding in dispatching crews, determine crew size and develop improved work scheduling and aid in the purchase of equipment needed to perform the identified works.

SUMMARY

At the time of writing this paper the main part of the project had just commenced and I would suggest there were still a number of hurdles that need to be jumped.

However by knowing the extent of the street trees under Council's care and control and having up to date data on those trees, the street tree register will become a powerful tool that will increase the effectiveness and efficiency of management, assist in coping with ever present budget constraints, provide the necessary data to make better decisions and improve our approach to performing maintenance activates and therefore provide a better service to our customers.