# Final Report

This document is to be used to guide the Final Report

<table>
<thead>
<tr>
<th>Recipient Name</th>
<th>Multiple Sclerosis Society of Western Australia (Inc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Title</td>
<td>Geothermal Heating and Cooling Pilot</td>
</tr>
<tr>
<td>Project ID</td>
<td>CEEP1072</td>
</tr>
<tr>
<td>Report completed by</td>
<td>John Houdalakis</td>
</tr>
<tr>
<td>Position</td>
<td>Project Manager</td>
</tr>
</tbody>
</table>

## Indicate if an external consultant has been contracted to provide the Final Report

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Houdalakis</td>
<td>Subthermal Solutions</td>
</tr>
</tbody>
</table>

## Checklist

<table>
<thead>
<tr>
<th>Final Report complete and declaration signed</th>
<th>Invoice for payment attached</th>
<th>Final Report attached if applicable</th>
<th>Submitted before date identified in Item 1 of Schedule 2 of the Funding Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>✅</td>
<td>✅</td>
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<td></td>
</tr>
</tbody>
</table>
DECLARATION

The Authorised Officer of the organisation makes the following declarations

☑️ I declare that I am authorised to submit this Final Report (including any attachments) on behalf of Multiple Sclerosis Society of Western Australia (Inc)
☑️ I declare that the information provided in this Final Report is true and accurate.
☑️ I understand, and acknowledge that giving false or misleading information in this Milestone Report is an offence under the Criminal Code Act 1995.
☑️ I understand that final payment will only be made in accordance with the Funding Agreement including on satisfactory completion of this report.

Authorised Officer Signature: ........................................ Date: 02/04/2013

Name: Marcus Anderson Stafford

Position: Chief Executive Officer Organisation: Multiple Sclerosis Society of Western Australia (Inc)

Witness Signature: ........................................ Date: 02/04/2013

Name: Asanka Sanjeewa Dissanayake

Position: Chief Financial Officer Organisation: Multiple Sclerosis Society of Western Australia (Inc)

The use and disclosure of information provided in this application is regulated by the relevant provisions and penalties of the Public Service Act 1999, the Privacy Act 1988, the Freedom of Information Act 1982, the Crimes Act 1914 and the general laws of the Commonwealth of Australia.

The information contained in this application will be regarded as private and confidential and will be treated as such by the Department. This is subject to the operational need to provide applications to assessors, and any statutory or legal requirements to provide information to the Commonwealth Parliament and other organisations, for audit, law enforcement, investigative or other legitimate governmental purpose.

As part of the assessment process for this application, the Department may need to consult with, and provide material from this application to, other government agencies or bodies, other organisations and/or relevant individuals, in order to substantiate any claims or statements made in this application, or to otherwise assist in the assessment of this application. If this occurs, the Department will endeavour to ensure that the parties who are consulted observe appropriate confidentiality provisions.

If this application is approved, the broad details of the application may be disclosed by the Department for purposes such as promoting the program and reporting on its operation and policy development. This information may also be used in answering questions in Parliament and its committees. In addition, the selected project information will be made publicly available. Public announcements may include the name of the successful applicant and of any project partners; title and description of the project and its intended outcomes; and amount of funding awarded.
In 2011, MS WA commissioned an Energy Efficiency audit of the Wilson Administration Building and the results identified the following areas of energy consumption concerns:

“The design and positioning of the building requires oversized air-conditioning systems, therefore power use is excessive and the system is failing due to age and constant use and is replaced by individual split systems further exacerbating the incurred power costs. The area is used by Nursing / Administration Staff and for consulting the public.

Another area of high used was the therapeutic swimming pool, as it requires heating to a higher than normal temperature cost to operate it is excessive, due to high use demand by MS Members and Community Groups we are reluctant to close it or reduce operation hours in-order to save costs.

The recommendation was to pilot /implement and retrofit with an energy efficient centralised system for the admin area and is successful then cost an efficient system to replace/ support the gas fired pool heating.

After investigating the currently available energy efficient HAVC, MSSWA identified Geothermal as the least expensive to operate and maintain and that the excess energy could be used to boost the therapeutic swimming heating and a reduction of up to 50% of current expenditure could be achieved.

As the recommendations and requirements where defined in the Project Energy Assessment, The MS Society contacted the only qualified Geothermal Installer in Perth and obtained: Fixed Price quote and the Contractors assistance with the engineering and technical aspects of the application and with the milestone submissions.

The active involvement of contractor and his vendors was a key contribution as MS does not have the resources or the engineering qualifications to provide the necessary reporting this was also a condition of awarding the contract.
Sole point of responsibility and reference: instead of diluting the project to multiple contractors such as: Project Manager/Engineering Design/Civil Contractor/Mechanical Contractor/Electrical Contractor and other subcontractors. This resulted in the rapid installing and a cost reduction resulting in better value for Money for MS and ownership by contractor.

The project was conducted in several stages:

1. Level 2 Energy Audit
2. Engineering Design Verification
3. Site works and loop field installation
4. Electrical Upgrade
5. Installation of Monitoring
6. Retro Fitting of Air condition system
7. System testing
8. Commissioning and Handover
9. Interactive displays installation
MONITORING

As a not for profit organisation The MS society opted for a monitoring system that had no ongoing costs and therefore the ENVI-R hardware including the LCD display was installed in conjunction with Energy tracker software.

The Energy Tracker Software system is a professional product designed to centrally collect, store and display energy and other related environmental information to deliver real-time and historical data. It is a fully scalable and highly adaptive system allowing for the monitoring of any number of energy monitoring devices. With the ability to configure and group information it can deliver a comprehensive yet simple system for obtaining, analysing and displaying data through the various software components that make it up.

Because Energy Tracker was designed for business its setup and control is tailored for simplicity without losing any of the powerful features for granular control.

The software is made up of four integrated software components:

1. Energy Tracker Data Collection and Processing engine: this component is what does all the work in collecting, storing and delivering information from energy monitoring hardware and other environmental systems it supports and understands.
2. Energy Tracker Administration Console: this is the front end graphical interface from where you configure and control the entire system.
3. Energy Tracker Client: this is a small and aesthetically pleasing graphical desktop software client that displays localised real-time information gathered by the data collection and processing engine.
4. Energy Tracker Reports: a comprehensive reporting system that allows you to view your collected data in any way we could think of. This includes right down to individual energy readings at any point in time from any electrical circuit monitored right up to aggregates data views in hours, days, weeks, months and years.

Energy Tracker allows MS with (expansion modules) to collect a wide range of energy types that include Solar, Wind, Hydro or any other form of energy source type.

The Energy Tracker Client has been carefully designed over approximately five years and has gone through several iterations based on real world use and feedback. How information is delivered is critical in Energy Trackers ability to effect change through its visual attributes. We installed the Energy Tracker to a number of computer workstations throughout the organization. Energy Tracker delivers pertinent real-time and historical energy information to all helping to empower individuals and whole organisations to change.
COMMUNICATION

Communication took several paths including an article as the feature company in Retrofit Australia magazine that highlighted the Energy Efficiency potential of geothermal systems.

An Invite in conjunction with City Of Canning, key community member’s, MS Members and business organisations to formal project opening is pending.

Open access for the local community and interested parties to Energy Tracker: online live dashboard is in progress as the security compliance that the MS Society operates under does not facilitate external access, we intended to host the access on the Subthermal Solutions Web site www.subthermalsolutions.com.au which also covers of the entire project as a case study.

Site access to Interested Parties throughout the pre and post construction Subthermal Solutions in conjunction has invited Engineering firms, Councils and interested parties to site tours demonstrating the installation process and the operation of the plant and equipment.

Subthermal Solutions will also be inviting interested parties to a site tour in May and Press release will follow.
Section B – Describe the Activities during the entire term

The project did not require a Steering Committee, a Panel or, Tender process it was standard offer and acceptance contract and was a straight forward with Project Manager reporting directly to The MS CEO therefore minimising staff involvement.

However MS staff under took the following directly:

- Monitor work site, restrict access and ensure work safe practises are adhered too.
- Ensure all millstone tables are on schedule and adhered to Fortnightly meeting with contractor and his team.
- Internal meeting with staff and Project Manager to review Milestones and Tasks and discuss any areas of concern.
- Provided Feedback to Contractor allow tuning of temperate in individual offices by the use of dampers

The project Officer had taken on using the standard model of installation for this type of unit and the activities were completed in the following manner.

- Finalise design and planning activities
- Complete installation of the loop field (see attached Pilot Geothermal presentation)
- Complete installation of the manifolds and electrical upgrade and purchase Geothermal heat pump
- Upgrade Ducting Vents and install damper mechanical and electrical ,zone low use areas.
- Complete installation of the monitoring system including sensors on electrical meters Completion of the installation of the monitoring system including sensors on and electrical meters where meters are shared with Administrative Building.
- Retrofit (install) of the Geothermal Heat pump system
- System testing complete
- Decommission existing system and commission geothermal system
- Tune airflow to suite users.
- Install LCD monitors or single interactive projector in the reception and main areas to display output from monitoring system via a dashboard
- Training on dashboard provided to staff and interested members.
Section C – Discuss in detail the conduct, benefits and outcomes of the Activity as a whole and the Activity’s results and findings

BENEFITS

The activity identified the existing building faults and areas that required and still require further improvement, such as installation and draft proofing and the ability to zone off areas by timers and manually that are not frequently used.

The area previously was Air-conditioned by an Air to Air system which consisted of 3x 10kw ducted system (plus individual split systems) and is now currently serviced by a single 18kw geothermal unit. While CAPEX cost of implement changes can be difficult for a not for profit to obtain the long term OPEX savings have immense benefit.

The loop field has been designed to operate for a minimum of 50 years with a 90 year average in present form so the savings are long term as a typical Ground sourced Heating /cooling unit has a much longer life span than a conventional Air to Air system.

The benefits towards the community are: Improved facilities, which means a better operational environment staff and members, for the MS society the savings mean more funding to support activities for members.

The success of the pilot project has meant MS Society of WA has now applied for Round 2 Community Energy Efficiency Program funding to now incorporate the majority of the site and the therapeutic swimming pool which will result in more savings.
OUTCOMES

The success of the pilot is reducing power used and replacing the high maintenance Air to Air system 30kw ducted system & the 10x individual split system, means that MS will now progress with the implementing Geothermal for the rest of the admin wing, Therapeutic Pool and the Physical Therapy area.

The project was simplified by the MS approach of having an external (contractor) Project Manager which reduced cost and installation times and should be considered for other projects.

### Energy Efficiency Improvement

<table>
<thead>
<tr>
<th>Description</th>
<th>Value 1</th>
<th>Unit 1</th>
<th>Value 2</th>
<th>Unit 2</th>
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<tbody>
<tr>
<td>Previous Energy usage/yr</td>
<td>27000</td>
<td>kWhe/a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Predicted Energy usage of new system</td>
<td>8405</td>
<td>kWhe/a</td>
<td></td>
<td></td>
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<tr>
<td>Energy Saving</td>
<td>18596</td>
<td>kWhe/a</td>
<td></td>
<td></td>
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<tr>
<td>Energy Saving</td>
<td>66944</td>
<td>MJth/a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent Improvement of new system</td>
<td>68.9</td>
<td>%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Information provided from initial baseline energy report*

Subthermal Solutions will be demonstrating the benefits of the project to the councils, other NGO’s organisations and the broader community.
Section D – Discuss how the Activity has provided reasonable opportunities for engaging local industry
[only include for projects with a grant of more than $1m]

Not applicable
Section E: Evaluate the Activity and include a detailed discussion as to whether the Program Objectives of the Activity were achieved, and if not, an explanation of why any Program Objectives were not met.

**INCREASE ENERGY EFFICIENCY**

All of the MS objectives have been met and we will be monitoring use and energy savings at this stage. The system produces 18kw/hr of cooling and uses 4.5kw/hr and it has replaced 10x 3kw individual split systems which consumed the equivalent of 30kw/hr.

See attachment for more information.

| Annualised Heat pump COP | 4.2 |
| ^ equivalent to energy efficiency of 420% |
| Percent Improvement of new system | 68.9% |
The project identified all the major areas within the fabric of the building that require physical improvement it also identified that the major operational cost for the MS is heating and cooling, and by zoning out the areas not frequently used, such as operating the lunch room on a timer between the hours of 10.00am and 3.00pm and the board room on a mechanical on/off damper which allows air-conditioning only when in use.

This installation has been a showcase of Commercial Ground sourced Geothermal Heat Pump Systems and their capabilities in the Western Australia area the project itself is used as a demonstration for other organisations and residential homes in the area to showcase the capabilities. Subsequently two residential homes have been ordered and are currently under installation due to the success of the project with four more Commercial projects are currently under consideration.

The ground loop system that was used in the project has also been used in the Australian Square Kilometre Array Pathfinder pilot project its success will now allow the full scale implementation which is the largest project of its kind.

The capabilities of the project and will be used in forthcoming National and International conferences and demonstration to showcase geothermal energy efficiency in the WA area and climatic zones.
Section F: Include a statement as to whether the Activity was undertaken within Budget, and if it was not, an explanation of why the Budget was not met.

Project was quoted as fixed price turnkey solution by Vendor and was contacted as such Project was delivered on time and within Budget.
Section G: Include the final compiled baseline energy use, baseline energy efficiency, energy efficiency improvement and cost benefit data for each building, site or facility that is part of the Activity prepared in accordance with the Energy Efficiency Improvement Guidance provided at Annexure A

<table>
<thead>
<tr>
<th>System Parameters</th>
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<tbody>
<tr>
<td>Heat pump usage factor</td>
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<tr>
<td>Operating hours per day</td>
<td>10 hr/d</td>
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<td>Operating days per year</td>
<td>260 d/y</td>
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*Averages the peak load for year round usage

<table>
<thead>
<tr>
<th>Baseline Energy Use</th>
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<tbody>
<tr>
<td>Peak Electrical load</td>
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<tr>
<td>Energy usage/year</td>
<td>8405 kWhe/a</td>
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<tr>
<td>Energy usage/year</td>
<td>30256 MJhe/a</td>
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</table>

<table>
<thead>
<tr>
<th>Baseline Energy Efficiency</th>
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</thead>
<tbody>
<tr>
<td>Peak Refrigeration Capacity</td>
<td>18 kWth</td>
</tr>
<tr>
<td>Capacity supplied per year</td>
<td>35100 kWh/a</td>
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<tr>
<td>Capacity supplied per year</td>
<td>126360 MJ/a</td>
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<tr>
<td>Annualised Heat pump COP</td>
<td>4.2 ^</td>
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^ equivalent to energy efficiency of 420%

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^Information provided from initial baseline energy report
Section H: Include a discussion of any other matters which the Department has notified the Recipient is required to be included in the Final Report

Not applicable

Section I: Include sufficient evidence including photographic evidence to verify completion

REFER ATTACHMENTS