To: The Secretary,
Environment, Resources and Development Committee
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Submission to Standing Committee on Environment, Resources and Development– Tasmanian Hemp Industry Inquiry

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Please find attached submission and Northern Rivers RDA publication *Doing Green Business Report*.

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Technical briefing paper—Hemp masonry for Aboriginal housing

Background

The Australian Hemp Masonry Company seeks to be a supplier of choice for hemp masonry building materials in Australia and to work with Aboriginal communities to develop employment opportunities in the hemp construction industry and to provide healthy housing opportunities.

Since corresponding with NSW Housing and the NSW Minister for Aboriginal Affairs, Hon Paul Lynch in 2009, a project with NSW Aboriginal Business Development to introduce hemp housing materials in communities is underway in northern NSW. A similar engagement is sought in Tasmania.

To date, Aboriginal community interest is based on the opportunities for low or carbon neutral, healthy housing using renewable resources; soil carbon improvement from growing hemp which will be eligible for voluntary and non-Kyoto carbon credits; carbon sequestration rates of hemp and the carbon sink created when hemp is locked into a durable building material.

Potential for Aboriginal Communities

Aboriginal communities could become involved in both growing the crop and building dwellings. The process could provide them with a unique combination of commercial and industrial skill development and shelter outcomes.

Several Aboriginal groups in NSW have expressed interest in growing industrial hemp for housing and trialling the technique for building in their communities. Preliminary conversations with Auntie Phyllis Pitchford from Tasmania have confirmed her interest in the opportunity for hemp housing and skills development in hemp building for Aboriginal people there.

The technology has the potential to support the development of self sustaining Aboriginal businesses especially where there is access to land. The skills gained offer employment in a important emerging sustainable low carbon industry.

A 135 sq home with 200mm thick exterior and 150mm thick interior walls contains around 2.5 tonnes of dry hemp. Yields are dependent on seed varieties, however 10 tonnes -12 tonnes green yields of hemp per ha are common. The biomass is produced in approximately 4 months with a third of the water needed for lucerne and can be grown without herbicides because the dense canopy competes successfully with weeds.

Hemp masonry technology

Industrial hemp grows very quickly (3 – 4 months). Once cropped, the dried, chopped stalk is combined with a lime based binder and water, and poured into shutters supported off a timber frame. As the hemp masonry mix strengthens it creates a masonry wall with outstanding thermal and acoustic properties. This technology has been proven extensively overseas and also in Australia.

Hemp technology

"Hemp and lime composites can be formed to look very modern and sophisticated and have commercial application. The material has the benefit of being a very low impact, environmentally responsible material but with the appearance of a modern concrete building if that is what is required."(Prof Tom Woolley, Queens University Belfast, Ireland 2006)

Hemp based technology offers a method of construction that can use substantially local materials and labour for the construction of the walls of a building.

Completed rendered houses Suffolk Housing UK

Unrendered cabin under construction Mountaintop NSW.

Some further information on hemp buildings is available on the following weblinks:

http://www.bre.co.uk/filelibrary/Innovation_Park/NNFCC_Renewable_House_Brochure.pdf

http://www.housingexcellence.co.uk/features/green-living-twist-hemp

The Triangle is a 42-home social housing development in Swindon, Wiltshire,UK

http://www.limetechnology.co.uk/pdfs/projects/Adnams_Brewery.pdf Award winning brewery and distribution centre - Lime and **hemp** helps warehouse save over 500 tonnes of CO. 2.

An overview of hemp based building can be obtained from watching a short video on Youtube at the following links http://www.youtube.com/watch?v=ZxpbX45EYDs and http://www.youtube.com/watch?v=PgNROKkVxsc. These describe the farming and construction technique and talk about the key properties of the system of construction including carbon sequestration, vapour permeability and thermal insulation properties of the material.

Wall construction involves lightly packing a mix made from a high volume of milled or chopped hemp with a lime based binder and water into shutters (formwork) which are supported off a conventional timber frame.

A masonry wall is created without using kiln baked products. The resulting wall has low embodied energy. The material has many benefits, among them the main ones are:

- Excellent thermal insulation characteristics;

- Excellent acoustic isolation characteristic;
- This is a carbon positive building material, absorbing carbon dioxide from the atmosphere both during the plant growth phase and again as the material gains strength and matures;
- The breathable nature of the walls provides excellent indoor air quality
- The materials from demolished hemp masonry walls can be readily reused in new construction; and
- Simplicity and ease of construction.

Performance Advantages

The following benefits have been confirmed by independent research at the Building research Establishment (BRE) in the UK.

Health

The material has a beneficial balance between thermal mass and thermal inertia which means that the internal temperature is very effectively insulated from the external environment. As the building material breathes, unlike in most conventional masonry material, problems with mould are avoided. As the materials used are limes, hemp fibre and sand, there are no toxic emissions from the wall materials.

Durability

The material has been found to last indefinitely as long as the walls are protected from constant moisture. Construction with protective eaves and overhangs is recommended.

Insulation

The BRE study of the thermal efficiency of the Haverhill housing projects showed that the hemp masonry houses were more efficient than comparable buildings built using contemporary brick techniques.

Acoustic insulation

The BRE study measured that acoustic separation provided by hemp masonry construction compares favourably to that provided by the full masonry constructed reference building.

Carbon Sequestration

According to the UK research, hemp masonry is a better than carbon neutral product. A small detached house (100sq m with 300mm thick walls) will lock up 7.9T of CO2 in the walls. The rate of carbon sequestration is 165Kg CO2 capture/m2. The hemp masonry construction industry will be in a position to provide carbon offsets.

Low embodied energy

The BRE research states that the embodied energy for hemp masonry construction is 1.15kw/cm which is significantly less than that of masonry and most other forms of wall construction.

Recycling

If a hemp wall is demolished the hemp masonry can be crushed and remixed with a lime based binder similar to that used in the initial construction and reused in a new wall. If this is not needed then the materials can be spread on the ground and both the hemp and the lime will have the effect of improving the quality of the ground for agricultural purposes.

Affordability and ease of construction

The BRE research into labour input required for a hemp building compared to a traditional brick building found that by the second house, the labour used in the two techniques is comparable. However the skill level required for building a hemp masonry wall and a brick wall is much lower, hence it is easier for people to learn to build their own buildings, especially when a suitable reusable shuttering system is being used. The material is also much lighter to work with than conventional masonry or rammed earth or mud brick technologies, the latter two of which are also valuable sustainable housing options, along with strawbale.

Bioremediation

Hemp as a crop is suitable to remediate contaminated soils. Overseas research has indicated that heavy metals are stored in the root ball and Australian research has confirmed that in the case of nutrients, the crop has the capacity for very high levels of uptake. The crop is extremely robust, its height and hence its yield is influenced by rainfall as well as soil quality.

Accreditation for construction in Australia

Research at the University of New South Wales (UNSW) between 1999 and 2006 resulted in the development of a locally made binder and a system which has proven to create Hemp masonry walls that are equivalent to those constructed overseas. Using the UNSW blend, trial walls and three buildings have been built in northern NSW, two others are under construction in Shoalhaven and Eurobodalla regions and two in the final design phase in Sydney. The material and building method has been certified to meet the standards of the Building Code of Australia. There has been a consistent demand for hemp housing materials in Australia for at least 10 years. There is still a major shortage of supply of hemp.

Construction from hemp masonry is not new; it has been practiced over hundreds years in central Europe, for 40 years in France and for the last twelve or so years in the UK. A heritage building in Japan in Miasa Mura is dated at 300 years old.

In the UK, (http://www.suffolkhousing.org/developments/index.aspx?section=8) hemp housing was introduced at Haverhill by the Suffolk Housing Society about twelve years ago. The Building Research Establishment (BRE), the UK equivalent of the CSIRO studied the project and published three reports on aspects of thermal and construction efficiency. These can be accessed via the Suffolk Housing Society web page above. The building system has been fully accredited in the UK and our system is similar in all essential aspects.

The Australian Hemp Masonry Company supplies hemp binder in batch sized 18kg bags. These can be mixed with matching batch sized bags of hemp, sand and water to create the hemp masonry mix.

Various alternative construction methods are described in the Australian Hemp Masonry Company's construction handbook.

Material Supply

Photo 1: Harvesting 3 month crop in Ashford April 2010

Photo 2: Ashford crop at 1 month, February 2010

Batch sized quantities of binder and matching bales of dried and chopped hemp are supplied to the housing site. The basic unit of supply of binder is by the tonne (one pallet lot) and this together with the matching quantity of hemp is sufficient to construct approximately 35 square metres of 200mm thick wall.

The model which is being trialled using the Ashford hemp, is supply of value added, bagged hemp direct to housing projects, matched with binder, instructions, OH & S information and a construction manual. At this stage this is supported by small weekend workshops, with consultancy support an option. As this is an identified industry regionally, Northern Rivers Hemp Inc is investigating opportunities with TAFE to integrate information about hemp farming into existing qualifications and courses.

Construction support

The Australian Hemp Masonry Company provides builders with a Construction Manual. The company is working with NSW Aboriginal Business Development to build a network of endorsed and trained builders to support construction as required. The company is in the process of establishing:

- a network of endorsed builders
- VET standard training resources for builders

It also provides training for local builders and owner builders in hemp construction techniques as required

Hemp construction and the fit with Aboriginal housing needs

Existing and proposed collaboration with Aboriginal communities

Hemp based dwelling construction offers Aboriginal people the opportunity to develop agricultural skills as well as construction skills and also offers a significant level of self determination to Aboriginal communities, in relation to housing, alongside the development of transferable skills.

Preliminary community consultation has been undertaken over a ten year period in a number of Aboriginal communities in NSW and over a five years period in northern NSW. Working in education with Aboriginal communities in the Northern Rivers region with TAFE has allowed the opportunity to discuss the project with members of the Boards of several Aboriginal organisations in Northern NSW.

In general communities are very interested both in housing and in the employment their youth could benefit from in a simple form of sustainable construction. There is also a high level of interest in the opportunity to build healthy, affordable housing for their own communities. The lack of improvement in the Aboriginal housing crisis in the region lends weight to self help options.

Many Aboriginal organisations in the region also recognise the need to facilitate employment and training for their own communities. The consultation to date has included discussions with individual Elders and Aboriginal educators, builders, and Land Council members from the following communities: Lismore, Tweed, Tabulam, Brewarrina, Foster, Emerald and Alice Springs communities.

Aboriginal organisations could get involved in the planting, and harvesting of the hemp crop. Harvesting, baling and chopping would require specialist equipment and therefore may not always form a part of Aboriginal activity, though with the appropriate investment this could be done locally as well.

In NSW some Land Councils have farms and agricultural operations and could get involved in these stages as well. The construction phase would be ideally suited to the development of skills in Aboriginal communities. Once the timber frame is erected, locally mixed Hemp Masonry material (binder + chopped and dried hemp + local sand + water) could be cast within shutters fixed to the wall frames to create thermally insulated walls, positioned according to the design requirements of the future building occupants.

People

Klara Marosszeky

Klara was a finalist in the Northern Rivers Regional Development Board's (NRRDB) Innovation Awards in 2008 for her research into sustainable regional hemp farming models and work with UNSW, to develop hemp masonry materials and construction methods for Australian conditions, using local resources to develop a hemp housing material for affordable, social housing.

As deputy-chair of Wollombi Landcare (1991-96) and Labour Market Programs Manager for Greening Australia in the Hunter (1994 -96), Klara worked with farmers to introduce new land management practices and coordinated training for long term unemployed youth.

A qualified workplace trainer and assessor with experience in coordinating courses and delivering training to Aboriginal students, in 2008 she received the North Coast TAFE Institute Staff Award for Outstanding Achievement in Aboriginal Learning Partnerships. In 2010 she received the Institute Staff Award for Education in Sustainability.

She is currently employed part time as Project Manager Ecological Sustainability Initiatives by North Coast Institute of TAFE.

Klara is one of the most experienced people in cropping hemp in NSW and has been a licensed researcher in the NSW hemp industry since 1999. She is a commercial industrial hemp licence holder in NSW and is currently working with farmers and the Ashford Business Council in Ashford (central western NSW) and at Billinudgel in northern NSW.

Recent input about hemp industry development to the Northern Rivers Doing Green Business Report is published at http://www.rdanorthernrivers.org.au/page/Content?&select=List&rowid=1375

Klara has been instrumental in the formation of Northern Rivers Hemp Inc., a regional association of growers, researchers and industry (www.northernrivershemp.org).

She has written a Construction Manual for hemp masonry construction in Australia which is attached and has a website www.hempmasonry.com which contains information about hemp farming and building.

Marton Marosszeky

Marton has a background in construction technology and management. He is an experienced builder, academic researcher, teacher and management consultant. Some 7 years ago when he was a Professor in Construction Innovation at UNSW Marton developed the technology used by the Australian Hemp Masonry Company. He was the Founding Director of the Australian Centre for Construction Innovation at UNSW.

Currently Marton is an Executive Consultant with Evans & Peck, Australia's leading infrastructure consultancy and Chair of the Lean Construction Institute of Australia.

As an academic researcher he is well known for his work in construction process improvement as well as for his work in the durability of reinforced concrete infrastructure in marine environments.