Confidential
Multi State Water Transfer Project (Australia)
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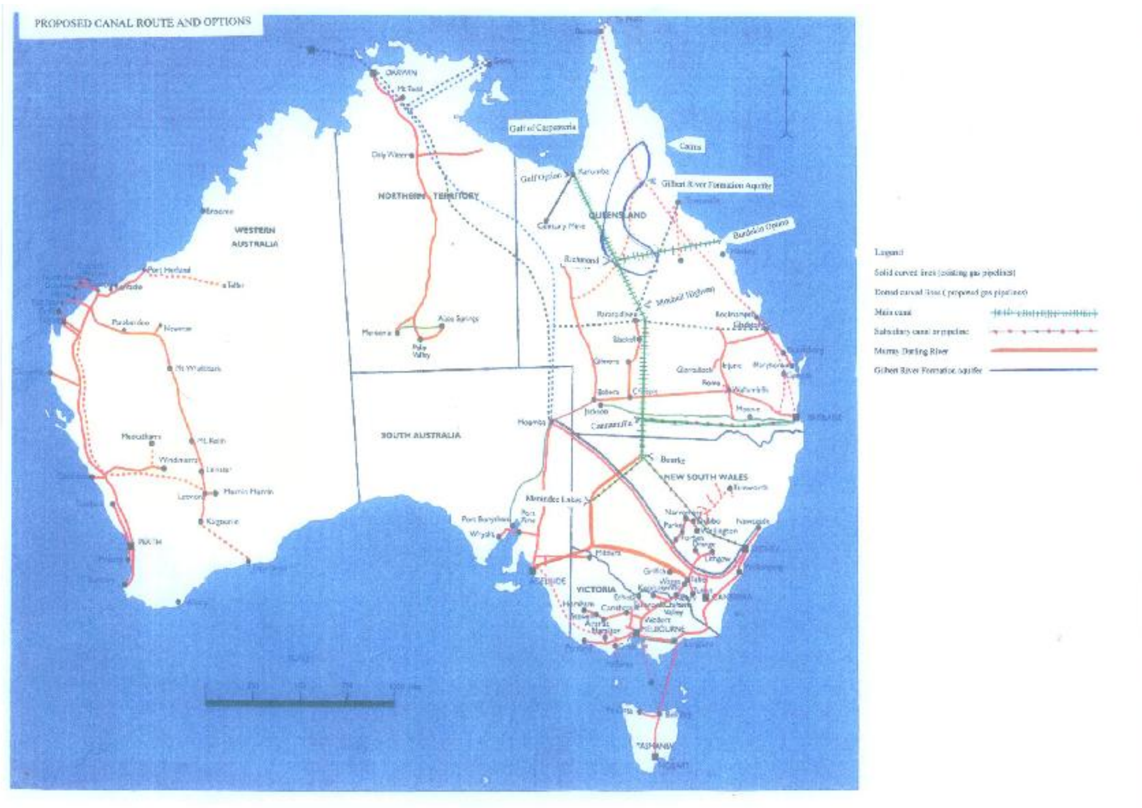

1. Overview of Proposed infrastructure

Australia's southern states are facing water shortages at a time when long term world demand for food crops is trending up. Governments are investing up to $9bn on energy intensive desalination plant for coastal city needs but so far, little on inland infrastructure. Ql'd rivers which normally deliver water to southern regions from big rainfall events are drying in transit through arid land. To maintain & expand agriculture, mining and other industries dependent on water, we need to be looking now, at how to tap into the huge volumes of northern water going to sea and move it to areas of need at minimal loss/cost. Australia has to think about, debate, and make decisions about its long term future. The way we value, allocate and manage water will have major impact on the quality of our future. We hope this proposal opens debate on the humanitarian, social and economic benefits of moving large volumes of water, currently going to sea, to regions in need.

2. a) Australian water transfer opportunities:

It is estimated that on average, 173,000 GL pa of river water in N/E Qld and the Gulf of Carpentaria goes to sea each year. Part of this volume, which amounts to ~100 times southern city needs, could be better utilized by moving it to areas of need. Others have suggested southern irrigated agriculture should be moved to the north where all the water is. While the lower north has potential, few have made the move to the top end because of factors such as remoteness to market, poor infrastructure, depleted soils, high costs to fertilize, pattern of rainfall, dry season fires, and current climatic unsuitability for crops such as wheat. We looked at infrastructure costs to move 4000 GL pa of water 1500 km south by pipe or canal and it soon became obvious that the cost of making pipe in city and trucking it to site by road, at $32bn, was unlikely to be economic. We next looked at constructing canal to move the same volume through W/Qld into the Darling at Bourke (or past Menindee lakes to reduce evaporation losses). The Bourke option, run over flat land with minimal river crossings, came out at about $5.6bn. From this main canal a combination of rivers, subsidiary canals and pipe could move water through major irrigation areas and/or to city dams in Qld, NSW, Vic and SA. The canal route, length and outlets should be determined by market need, and canal water delivery to farm must be designed to minimize losses (see cast in place pipe). To reduce evaporative water storage losses in open dams we propose to site canal route near fractured rock recharge aquifers to part store water till needed, and average out seasonal flow variations. We also see long term potential to recover/treat some of the 65million GL of stored water in the GAB. While its quality is variable many regional towns are now currently tapping suitable bores for community and domestic use. On line water will be needed in construction and where quality and pressure can be balanced with natural aquifer inputs, suitable multi point bore outlets could be sustainably used to top up canals going south. Power to run canal pump stations will initially come from gas engines or turbines using coal seam and basin gas widely available in Queensland. Gas pipeline is already in place on part of proposed canal routes and where it isn't, new pipe will be installed. In the long term we see potential to tap into future geothermal power supplies on route and/or utilize the wastes from purpose grown crops and/or trees to produce power and transport fuels.

2. b) Water source statistics:

CSIRO estimates of rainfall trends indicate N/Qld will maintain current patterns for 90 years, while southern regions, starting in the west, dry out rapidly. Capturing water near the outlet of rivers such as the Mitchell, Burdekin and Fitzroy and/or others nearby could supply up to 40,000GL pa of base-load water for movement south. Our aim is to take no more than 33% of river flow just before it goes to sea for canal supply. A good starting point for a one off major canal would be the Burdekin Dam which has design potential to hold 10,000 GL of water storage. On average that river flows approx 11,300 GL pa to sea at Clare. It also carries with it, large volumes of silt from upstream agriculture which infiltrate tributaries of the Barrier Reef Park. We also see potential to partially reverse this adverse environmental impact by moving a third of this water into a canal system.

2. c) Preliminary cost estimates:

With a W/Qld main canal at $5.6bn and subsidiary at $3.2bn, it costs ~$8.8bn to evenly deliver 3750 GL of water to crops, environment flows & city dams in Qld, NSW Vic SA.

- We estimate if 3750 GL of water was sold only to irrigators and for environment flows at $250 /ML, returns on main & subsidiary canal capital would be ~10% pa
- If 3150 GL was sold to above groups at $250/ML and 600 GL was sold for city water at $1.80 KL (same as desalination costs) returns could go to ~25-30% pa
- If double the water or 7500 GL pa was put down the same routes, canal capex would rise by approx 55% and delivered water cost would reduce by approx 20%

These preliminary costs were based on USA canal construction data of material, labour equipment and energy usage with long term finance provided at 2.5% interest as in USA If finance rates rise to 7.5% canal costs will go up by 20% and delivered water costs will go up by 66%. We have preliminary EOI's from USA and local canal engineering groups as well as Boral (for concrete), Alinta (gas pipe line). These and other groups have contributed to our pre-estimates but we still need to further evaluate such factors as,--

: Route plans are spatially/geologically surveyed to ensure best fit with land and clientele.
: Ensuring canal routes can work around flood plains and major river crossings,
: Availability of sand and rock for on line concrete production,
: Potential of dams & aquifers to store large volumes of water and recover economically
: Suitability of land near canal for future agriculture and forestry production,
: Conversion of biomass to ethanol and power.

2. d) Other canal route options and future opportunities.

A main canal ex the Burdekin dam going through regions such as Clermont, Emerald, Moree, and Dubbo and even down to the Murray on the Vic border could service more populated farming areas and require less subsidiary canal and pipe to get water to coastal city dams. However a piped section to get over or around the ranges between Rolleston & Injune and multiple river crossings requiring inverted siphons or bridges on route would add considerable expense. The main advantage of this route option would be to provide additional water to rivers crossed that supply farms and eventually flow into the Darling. Capex estimates for this Central Queensland and NSW option still need more evaluation. Where possible canals should be sited near highways to enable longer term logistic gains. We recognize final route sites need to be planned with grower and industry users of water

Studies of future opportunities indicate - 1) Use of thin film photovoltaic covers could generate full canal power needs, while reducing water losses. Solar power can be stored by daily varying canal water levels to maintain 24 hr flow .- 2) Canal lining costs can be reduced by using "50 year life" membranes, to replace concrete where water table allows. Both options are under evaluation, and could be introduced as route detail becomes clear.

3. USA canal experience:

For over 100 years the United States Bureau of Reclamation have been building concrete lined trapezoidal canals to recover seasonal river water (from melting snow) and moving it to suitable land to make it profitable for agriculture and industry. Many USA canals have been financed by the Feds at 2.5% interest rates on the condition that "user-pay" water charges are to recoup capex & operating costs over 50 yrs. By opening this land canals have led to the development of W/USA cities such as Los Angeles, Tuscon, and Phoenix, plus associated industries, to which they still supply water. Canal construction costs are less than pipe for equivalent volumes and transmission loss from evaporation & seepage when run through the Arizona desert at 100Km/day, are approx 4% per 1000 km of travel. Canals are easier to maintain than pipe which can have air supply problems during inspections, also, unlike pipe, they can be significantly upgraded in volume flow as demand develops. In recent years demand for water in California has begun to exceed supply and canal authorities have started a program to save seasonal water, excess to needs, by storing same in aquifers along canal routes. Water charges to growers along canals are around $60/ML but can be as low as $30/ML when subsidized by hydro-power or higher city water charges where the water is also servicing major cities. Use of centre pivots etc, to minimize water usage, can add ~$50/ML from Capital/ Power/ R&M costs. Imports of frozen vegetables from US canal regions, are often at less cost than from here

4. Market Opportunities:

With large demands coming out of N/Asia for agri commodities, bio- fuels and resources both agriculture & mining should continue to be industries of major focus. Below are economic and environmental benefits possible from making water available.

4. a) The Murray Darling River's needs for 1500 GL of environmental flows: appears to be at a critical stage. A buyout of this level of water could cost between $3.0-6.0bn. If government financed canals, the operating costs associated with delivering 1500 GL pa of its water for the environment @ $128 /ML would be $190 million pa. This is a cost effective option to buying out water rights whose volume may reduce as climatic drying takes hold. Water right buyouts, can lead to loss of towns, no longer supported by farms.

4. b) Supply coastal city dams at prices well below costs of desalination. i.e, $1.80/kl: Cost estimates indicate water delivered by canal & pipe to city dams, could be ~$0.55/KL

4. c) $100bn pa grain and fuel sales from new water, to supply Asian markets:

The GRDC are projecting by 2020, grain output of 100 million TPA could come from value added areas of demand such as ethanol, starch, feed concentrate, meat substitutes etc. The main requirement to grow a quarter of this volume, is a temperate climate and a reliable annual supply of irrigation water. If a North to South 7500 GL pa canal system as described above, was set up to irrigate 3.2 million ha of land with new irrigated wheat varieties yielding 9T/ha (6T in north -12T in south) it could produce 26 mill T of wheat. (ref- S Kearns GRDC). With variable growing costs of $2000/ha (inc'l $750 for water) and a grain price of $350/T, the crop could generate $9.1bn pa revenue and $3.0bn pa of grower margins. It is also possible to recover 12T/ha of straw from above crop while returning stubble to soil. This could be converted to 12bn litre of ethanol & generate 7.5 million Mwh of power to run a canal. Ethanol sold at 70c/L would generate $8.4bn sales, (60% of Australian fuel demand) to give a $3.4bn margin. To meet larger demand, more canals sourcing water across the top end from Qld toWA would be required. While these plans are ambitious, as Asia urbanizes grains and food will become future high demand export items. Taxes from exports at 30c/Dollar will soon pay back needed infrastructure. By growing sorghum and maize in rotation with wheat we may see future potential for carbon offsets on operations run entirely on renewable energy and fuels from biomass.

4. d) Ethanol and Bio-diesel

$12bn of Australia's 06/07 $17bn trade deficit was due to oil imports. We plan to introduce a proven ethanol from cellulosics technology via www.brienergy.com .This technology can produce ethanol & power from carbonaceous feed-stocks such as plastics, straws, MSW and gases. General Motors in USA have invested in similar technology via www.coskata.com and see ethanol as a major car fuel for the future. NSW has already mandated introduction of ethanol into fuels and by 2012, it will reduce costs to motorists by allowing purchase of a lower cost E10 fuel with lower carbon charges. Cars can be fitted in NSW with a $350 fuel conversion kit to use regular fuel or purchase E85 fuel at approx 2/3rds the current cost of regular fuel. (yesterday's cost, who knows tomorrow?)

Considerable selective breeding work is underway to adapt a local tree species Pongamia Pinnata for production of bio-diesel from annual harvest of its oil bearing seeds. Oil yields of 3-10 T/ha/yr are possible when plantation trees are grown at rate of 250 trees/ha under varying conditions of northern water and soils. Oil is extracted from mechanically harvested seeds and converted through a relatively simple process plant into bio-diesel. Residual dry shell & husks from above processes can be converted into meal for cattle feed or further processed using technologies similar to above to produce ethanol and power. This is a promising bio-fuel development project that also has potential for carbon off-sets to benefit the wider economy. The 2.5 million Ha of black soil S/E from the Gulf may have potential for plantations. For info go to www.pacificrenewableenergy.com.au

4. e) Meat: $revenue traditionally triples the value of grain used to lot feed animals. As populations in Asia urbanize the world bank projection are for a 80% increase in world meat demand by 2030. Methane ex cattle/sheep now responsible for 18% of our GHG emissions can be reduced by feed-lotting, cereal based meat substitutes, and more usage of poultry, pork and we should consider, growing of kangaroos as a future meat source.

4.f) Dairy Farmers in recent droughts have found it less expensive to feed cows grain than on pasture grown using expensive irrigation water. Dairy farms could triple feed /Ha while substantially reducing water usage using new cultivation technologies **(7.0)** to grow grain for feed. Also US grain fed cattle tend to yield 2-3 times more milk/cow than ours. Demand for dairy products and stock is already high and expanding in China particularly.

4. g) Wine& Fruit: Low water allocations in NSW, Vic & SA grape districts put $7bn PA of wine exports at risk. Many in this industry are now looking at how to tap into huge markets in Asia. Many growers desperate from prolonged drought are selling water rights at low prices.

4. h) Mallee Eucalypts to control salinity, sequester carbon & produce industry products: Mallees are a fast growing native tree that survives in dry conditions of 125mm rainfall &

can yield up to10 dry T/ha/yr in 550mm regions Growth rates taper off, when not harvested at maturity. They are grown widely to sequester carbon & have been used to lower water tables in WA wheat cropping areas. By harvesting coppiced tree tops 1 in 4 yrs on plantations irrigated with 7500 GL water we could produce biomass for 20% of Australian power needs or 55% of our liquid fuel needs (via ethanol) By growing without harvesting they can sequester 10% of Australian C emissions. Other uses of harvested wood are for panel board products, or to extract lignin via a solvent paper pulping process to be used as a binder for MDF board or in the production of carbon fiber suitable for light weight car panels competitive with steel. Pyrolysis processes can convert mallee biomass into bio-char and bio-fuel that can be used to generate turbine power. The bio-char can also be added to soils to improve long term fertility. Char can be used now as a 33% substitute to coke from coal in the production of iron ore into steel, (Brazilians are already doing this). 100% substitution is possible from stronger chars adapted to suit blast furnaces. In the long term char could be used to convert high temperature CO2 emissions from industries such as cement and shale oil into carbon monoxide and then to ethanol. Similar to the current importation of wood chips for power in some European cities, wood char may be a substitute for CO2 geo-sequestration if that technology fails to gain acceptance in Japan or Sth Korea. Fast growing poplars from China can also be used for the above outputs or for production of Engineered Strand Board (ESB), with the strength of steel in some building applications.

5:)New mining sites:

W/Qld,-uranium, shale oil, zinc, copper, rare earths **S/A** – uranium, gold, copper N/**T**-uranium, gold, phosphates, rare earths. **NSW**: coal. All require water to be viable

NEW DEVELOPMENTS

6:) Bush-fires need to be put out while they are still small. Multiple small UAV's fitted with cameras can transmit fire images to base & direct water bombers to fly to lined dams ,strategically located near roads in fire prone regions. Canal water could provide top up for dams. Fires markedly reduce water in catchments, while increasing carbon emissions.

7.) Soil fertility and soil carbon offsets (Government projects now underway to validate) A big part of developing water infrastructure for agriculture is related to retaining continuous soil productivity thru improved land fertility. Some propose, future farms, with land divided in a 1: 2 ratio of trees to cropping area. Up to 2000 growers are using pasture cropping to grow grain and livestock on a rotational basis, others are using gypsum / rye grass soil structure improvements on heavy soils that improve water mobility, soil fertility and increase carbon at the rate of 20-40 T of CO2/ha/pa. A combination of bi-annual irrigation and crop/land rotation is required to maintain such increases in carbon On land irrigated with 7500 GL of water (see item 4.c) there is potential to sequester 600 million T of "soil carbon" equivalent CO2 offsets over 4 yrs, while generating a similar 120 million TPA from crop biomass. This level of sequestration will be useful as an offset to cover 18% of carbon emissions from our livestock industry or part cover emissions from coal exports. Increased international demand for grain (30%) and meat (80%) by 2030 should provide Ag markets for these carbon offsets. **NB:** Soil carbon still needs recognition as an offset in a ETS.

8.) National Broadband Network and Other Services Large Telco's have problem with the costs and returns of introducing fibre optic cable communications to scattered inland clientele. Canal infrastructure controlled by fiber could provide a trans-sectoral fiber backbone for inland communications, while aiding distribution of future renewable power from solar, wind & geothermal In the future FttH broadband will improve inland educational, medical and other services, normal, to those living on coast. Better facilities will encourage companies to staff inland enterprises that will drive our future economy.

9.) SUMMARY

Data to build canal in 2 stages to enable early delivery in 3 yrs, is available on request. ie. canal costs, route map options, environment plans, and availability of skilled workforce. Large farm ops may best be handled by corporate sector using local and imported labor. A quick visit to the USA, allows one to see most of the infrastructure needed in operation It must be appreciated the above overview is only a preliminary indicator of costs and benefits that could accrue, from setting up canal infrastructure to supply inland & coastal city needs. Detailed plans/costs, considering client markets, and projected area rainfall patterns, can only be assembled when water volumes for various needs are firmly stated.

If it wasn't for our resources sector, the Australian economy could be seen as largely a service driven economy. We need to recognize the resource sector will always be cyclical and we should be working on improving productivity & output in the less cyclical "agri-business" sector to provide another source of export revenue. We also need to recognize the potential of "water generated biomass" as a future source of low carbon fuels, energy & carbon offsets that can protect our high GHG industries in a carbon constrained world.

The groups we work with on this project consider now could be an optimum time to build needed infrastructure. Based on the project humanitarian basis, and government support, there should be a opportunity for low interest, debenture finance, to meet project goals.

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