Submission to Sustainability Unit

Long Distance Land Transport Concept

Introduction

The submission outlines a concept for a standard gauge rail connection from Perth to Darwin via Katherine serving coastal communities and industries en route.
West, northwest and north coastal regions of Western Australia, need to be connected together and to Australian transport networks with appropriate surface transport infrastructure.
The northern climate makes coastal regions more liveable than inland areas. Major towns are on or near the coast. The trend seems unlikely to change.

Need for permanent transport infrastructure

Developing isolated areas need physical transport connections so that they can readily interact symbiotically with each other and with distant markets.
State shipping is limited to ports served. It cannot supply services to a standard that land transport can deliver.
Road transport is well organised with powerful lobby groups aimed at ensuring that substantial sums of public money are allocated to road construction and maintenance.
Permissible vehicle sizes, lengths and axle loadings, have increased to an extent worrying to other road users, to reduce running costs. However, higher axle loadings increase road construction and maintenance costs. Drivers spend long hours at the wheel to cover great distances. Driver fatigue is a constant danger.
Present rail construction from Darwin to Alice Springs is a refreshing indication of changes in national attitudes towards rail transport as are plans under consideration to construct a railway from the eastern states to connect with the Darwin to Alice Springs rail route at Tennant Creek.
Roads are inappropriate for moving large tonnages over long distances. Rail infrastructure would assist in establishing appropriate new industries based upon not insubstantial resources of the regions.
Development should not be exploitative, with industries largely aiming to exhaust resources involved within a limited time and then to move out. The state needs to demonstrate that development, employment and facilities are here to stay.
It seems to be a chicken and egg situation. What should come first: developments or supporting infrastructure? There seems to be little doubt that, in this case, infrastructure should not wait for developments. Developments are more likely to occur if infrastructure needed is already in place. Individual new developments seem unlikely to justify the capital outlay.
Connection to a national port at Darwin with direct links established to countries to the north would increase opportunities for diversified overseas trading. New export industries such aquaculture in the Kimberley region using termites as feedstock for fish exports to world markets may be worth investigating.

A northern connection to Australia's rail network would increase trading opportunities with other Australian states. An example of mutual advantage is an idea by the late Lang Hancock for a northern railway to Queensland to establish iron smelting in each state using Queensland coal and Pilbara iron ore.
National defence capability would improve with a capacity to move large tonnages rapidly around the northern half of the country at short notice. The Commonwealth Government should have an interest in supporting a Darwin to Perth rail concept.

Proposed route

Perth – Geraldton

The route envisaged would follow the existing railway to Gingin and then head directly towards Geraldton roughly following the Brand Highway with deviations where needed to minimise rise and fall.
The present road distance is approximately 424 km.

Geraldton – Carnarvon

The route would roughly follow the North West Coastal Highway. The old railway route through Northampton to Ajana seems unlikely to be appropriate. It may be better to leave Geraldton initially following the Chapman River valley and then to climb to the east of Northampton before continuing northward.
The present road distance is approximately 474km.

Carnarvon – Port Hedland

The route envisaged would generally following the North West Coastal Highway to South Hedland. It may be worth initially heading for Cape Cuvier for protection from cyclone floods by Lake MacLeod before rejoining the highway north of Minilya Roadhouse.
The present road distance is approximately 670km.

Port Hedland – Derby

The route would generally follow the Great Northern Highway.
The present road distance is approximately 756km.

Derby – Kununurra

To minimise distance and rise and fall, the topography of the intervening countryside needs to be closely studied. A possible route could be to head for the Fitzroy River gap through the King Leapold Ranges via the watershed separating the Lennard and Fitzroy rivers, then, topography permitting, to follow the Fitzroy and Chamberlain rivers heading towards the mouth of the Pentecost River before generally following the Victoria Highway route to Kununurra.
The present road distance is approximately 861km.

Kununurra – Katherine

The route envisaged would continue to generally follow the Victoria Highway with deviations where needed to reduce rise and fall.
The present road distance is approximately 511km.

Motive power

Developing 5 to 10MW methanol fuel cells for motive power, augmented with battery capacity for regenerative braking and, possibly, a standby methanol/diesel generator, should be considered. It could encourage other Australian railways to change to Burrup methanol and provide a substantial traffic load for the route.

Operation

General traffic is envisaged as mainly container trains with accommodation on-board for train crews rostered in watches, like ships at sea, with substantial time off between long trips. The crews would include container transfer operators to transfer containers to and from trains at wayside stations.
Crew accommodation could possibly be extended to allow for a number of passengers on a self-service basis with accompanying vehicle carrier wagons. While journey times would be longer than for passenger trains, it may appeal to sight seeing tourists and be more relaxing than driving for motorists.

Door to door service

Containers developed over the last half-century allow door-to-door services combined with long distance rail haul. The concept envisages that continued development of container handling equipment will take place so that containers can be transferred, with minimum delay, between trains and railside trestles at wayside stations without using external equipment. Corresponding continued development of container carrying road vehicles may be needed so that they can readily transfer containers between railside trestles at wayside stations and premises served.

Design standards

Design speeds and ruling gradients should be considered after trial locations are made on paper using existing topographic contour mapping.
Safety would be of paramount importance. Heavy rail construction standards could reduce track maintenance. Cyclone flooding would need special attention.

Track maintenance

Track recording equipment, mounted upon at least one traffic train each day, to log rail track horizontal, vertical and transverse alignments is envisaged so that track faults can be identified immediately they start to develop. Mobile mechanised track maintenance units would use the information to maintain track to design speed standards and apply temporary speed restrictions where needed.

Conclusion

The distance from Perth to Katherine is approximately 3,700 km. The overall cost of a railway is unlikely to be recoverable from services in the foreseeable future. However, State and Commonwealth Governments should see it as a necessary investment needed to provide basic services for communities and industries to develop. Established industries and financiers may wish to be involved in the investment.

Peter Ravine 18 January 2002

Supplementary Submission to Sustainability Unit

Long Distance Land Transport Concept

Reference:

Submission of Long Distance Land Transport Concept by the same author dated 18 January 2002

Bulk traffic

A possible potential major bulk traffic that may be worth considering could be phosphate rock from the Mt Isa area of Queensland to a superphosphate industry located at the Burrup Peninsular. It could reduce phosphate rock imports from overseas. Empty returning ore wagons from the Pilbara to Queensland may encourage Queensland industries to smelt iron using Pilbara ore.
A potential traffic from the Burrup Peninsular to Queensland could be ammonia for fertiliser manufacture.
The Queensland Department of Mines and Energy Mineral Information Leaflet No 7 of December 1997 outlines the availability of phosphate rock in the Mt Isa region. Visit http://www.nrm.qld.gov.au/resourcenet/mines/commodities/pdf/phospha.pdf for details

Alternative fuel cell motive power option

With establishment of an ammonia plant at the Burrup Peninsular, consideration could be given to using ammonia to power locomotive ammonia fuel cells, as an option producing zero carbon dioxide emissions. As well as being produced from natural gas, ammonia could also be produced from renewable energy without requiring any hydrocarbons.

Peter Ravine 5 May 2002

DEPARTMENT OF MINES AND ENERGY

December 1997 Mineral Information Leaflet No.7

PHOSPHATE ROCK

by D.S. Wallis *ph: (07) 3237 1639*

Australia, in spite of large phosphate rock resources, currently imports all the phosphate rock used to produce fertilisers. A fertiliser project being developed in the Mount Isa region by WMC Fertilizers Ltd may reverse this situation by producing fertiliser from indigenous phosphate rock.

CHARACTERISATION & USES

"Phosphate rock" is a term for sedimentary rock containing a high percentage of calcium fluophosphate. The mineralogy of these phosphorus-rich rocks is complex, but characteristic minerals are members of the apatite group -
$Ca5(PO4, \pm CO3, \pm OH)3(OH, F, Cl)$.

The most common minerals are:

- collophane - cryptocrystalline apatite.
- francolite - carbonate apatite with 5% carbonate and 1% fluorine.
- dahllite - carbonate hydroxyapatite with 5% carbonate and 2% hydroxide.

Phosphorus is an essential element for plant nutrition. Most Australian soils are phosphorus deficient. Over 90% of phosphate rock mined is used to produce fertilisers. Phosphorus is also an ingredient in animal feed supplements, food preservatives, anti-corrosion agents, cosmetics, fungicides, ceramics and is used in water treatment and metallurgy. Phosphorus-based detergents are environmentally unfriendly, and are being phased out.

Commercial deposits require relatively low alumina, iron, calcium, fluorine, chlorine, pyrite, and magnesium, and should be grindable and chemically reactive.

GEOLOGY & OCCURRENCES

There are three types of primary phosphate deposits:

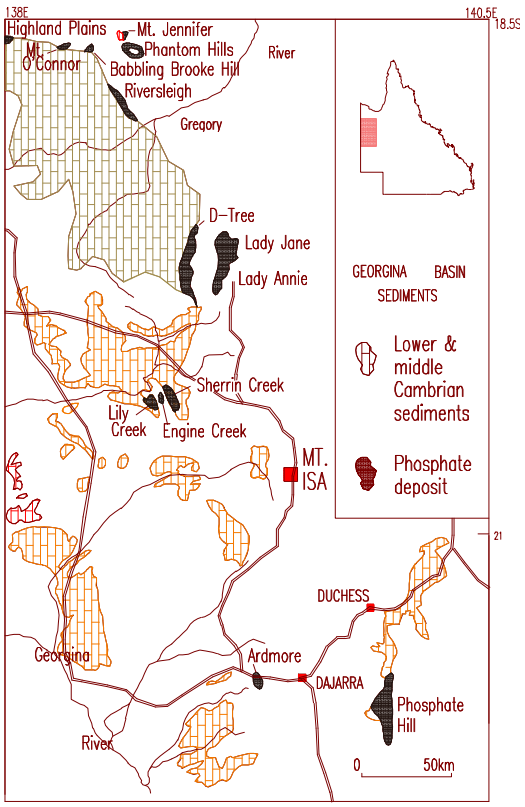
Marine sedimentary phosphorites, where the phosphorus was chemically and biologically precipitated as apatite group minerals in regions of upwelling of cold, nutrient rich, deep oceanic water eg. Lower to Middle Cambrian Georgina Basin sediments (Queensland).

Igneous apatites, where the phosphorus is a primary component of alkali carbonatite complexes eg. Mount Weld (WA).

Island phosphates, where phosphorus is concentrated up the food chain and excreted as guano on tropical islands eg. Nauru and Christmas Island.

Australia's largest phosphate deposits are the shallow marine deposits of the Georgina Basin.

The main phosphate horizon, the Beetle Creek Formation, is a series of phosphatic siltstones (phosphorites) and cherts overlying limestone and basal sandstone and conglomerate.



Queensland Phosphate Deposits.

PRODUCTION

Phosphate rock was produced at Phosphate Hill from 1975-78 and from 1981-83 (1.3 Mt sold). At present there are no Australian resources in production due to competition from imported phosphate rock.

In Australia, superphosphate is manufactured in Western Australia, Victoria, South Australia, New South Wales, and Tasmania. Production is based on phosphate rock imported from Nauru, Florida, Western Sahara, Israel, Jordan, and Togo. As the raw materials include sulphuric acid, production is aligned with sulphuric acid manufacture.

PROCESSING

Superphosphate manufacture converts insoluble apatite to soluble monocalcium phosphate by the addition of sulphuric acid.

Single superphosphate (SSP) is the basic phosphate fertiliser and is manufactured in all Australian states except Victoria and Queensland. It is produced by mixing fine, water-insoluble, phosphate rock with sulphuric acid to produce water-soluble monocalcium phosphate. The sulphuric acid is made from imported native sulphur or is produced from smelter gasses from base metal smelters.

Triple superphosphate (TSP) is made by reacting high grade phosphate rock with phosphoric acid. Monoammonium phosphate (MAP) and Diammonium phosphate (DAP) are made by reacting liquid ammonia with phosphoric acid in different proportions. All TSP, MAP and DAP sold in Australia is imported.

Nitrogen-phosphorus-potassium (NPK) fertilisers are made by blending dry superphosphate, potash, urea, ammonium phosphates, and ammonium sulphate.

RESOURCES

World reserves of phosphate rock are calculated at about 34 000 Mt, the bulk of which occur in Morocco and the western Sahara.

Australia's measured and indicated resources of phosphate rock total about 4000 Mt and average 7.4% phosphate (17% P_2O_5). Over 2800 Mt of these resources occur in northwest Queensland. The largest deposit is located at Phosphate Hill, 135 km south southeast of Mount Isa and contains a proven/probable resource of 103 Mt grading 23% phosphate, with a further 2000 Mt of 23% phosphate resources available. Other significant deposits are Ardmore, located 70 km west of Phosphate Hill and Lady Annie-Lady Jane located 120 km west northwest of Mount Isa. These resources are mainly phosphorites of the Georgina Basin, and are distributed evenly between Queensland and the Northern Territory.

Australian Phosphate Resources

Deposit	Measured/Indicated Resources Mt	Inferred Resources Mt
Duchess/ Ardmore	1115	304
Lady Annie/ Lady Jane	486	
Highland Plains	84	
Phantom Hills	46	
Babbling Brooke Hill	38	
Quita Creek	30	
Mt. Jennifer	20	
Mt. O'Connor	15	27
Riversleigh	11	
D Tree		339
Lily Creek		191
Sherrin Creek		175

MARKETS & OVERSEAS TRADE

Australia has always imported most of its phosphate rock needs. Australia currently imports about 1.1 Mt of fertiliser a year at a cost of over A$500 million. The fertiliser is imported mainly from Florida and Morocco. Phosphate rock is also imported mainly from Florida, Jordan, Morocco, Senegal, Togo, and Israel.

Christmas Island Phosphates, a community-owned company, currently operates a phosphate mine on Christmas Island. Most of the production is exported to SE Asia.

The Australian market for phosphate fertiliser has decreased from 2.7 to 1.1 Mt/y in the past three years due to the current recession and drought.

PRICES

The overall trend in prices for phosphatic fertilisers has been downward since 1980. The low prices for phosphate rock stem from producers maintaining tonnages in a shrinking market. This trend appears to have stabilised, particularly for the higher value phosphate derivatives. The consumer prices for SSP, TSP, DAP and MAP in November 1995 were approximately $185, $360, $430 and $435 per tonne respectively.

POTENTIAL & OUTLOOK

There are no alternatives to phosphate rock for traditional fertiliser-based agriculture. The need for increased food production to feed an increasing world population assures the long term growth in world demand for phosphate rock..

A high analysis fertiliser project based on the manufacture of these products from northwest Queensland resources is being developed by WMC Fertilizers Ltd (a subsidiary of WMC Ltd), in association with Mount Isa Mines Ltd. The A$700 million project involves reopening the Phosphate Hill mine, a sulphuric acid plant based on smelter gases at Mount Isa, and a phosphoric acid plant, ammonia plant and fertiliser plants at Phosphate Hill. Additional acid may be sourced from the Sun Metals zinc smelter near Townsville and other smelters proposed for the Mount Isa - Cloncurry area.

A major factor in the viability of the project is natural gas which will be supplied by Santos Ltd via pipeline from southwest Queensland. In addition to being the most economical fuel in process drying and power generation, natural gas is required for the production of ammonia used to produce DAP and MAP.

The Phosphate Hill deposit is one of the cleanest phosphate resources in the world. This means that relatively low grade phosphate rock (23% P_20_5) can be used directly in the phosphoric acid plant without the need of prior upgrading. The rock also has low levels of cadmium, and fertiliser produced from the rock would have a cadmium content below current legislative levels. The project would require approximately 2.24 Mt of phosphate rock per year to produce one million tonnes of high analysis fertilizer. At this rate the resource is capable of sustaining a fertiliser project for decades. Fertiliser production is possible by early 1999. Fertiliser would be railed to Townsville and stored prior to shipping.