This draft is for comment only
Please do not copy, circulate, or quote, at this stage.

SOME ENVIRONMENTAL IMPACTS OF THE MINE/RAIL DRAINAGE CRISIS AT WOMBARRA AND OCEAN OUTFALL PROPOSAL

Commentary on -
SRA, EIS for Stage I Culvert Amplification on the Northern Illawarra Line, April 1991
SRA, Supplement to EIS for Stage I Culvert Amplification on the Northern Illawarra Line, December 1991
SRA, Findings of the Technical Working Party,
Northern Illawarra Drainage Problems, December 1991
Webb, McKeown & Associates, Illawarra Railway Line Storm of 12 June
at Wombarra, December 1991
Longmac Associates, Geotechnical Assessment Culvert and Creek Amplification Study, October 1991
SMEC, South Coast Railway Diversion of Creek G at Wombarra Feasibility Study, December 1991

CONTEXT AND STATED RATIONALE OF SRA DRAINAGE WORKS

The Minister for Transport's Technical Working Party has attempted to generate engineering solutions for what are not, in the first instance, technical problems. These problems are political/legal ones:[1]

a) State Rail Authority failure to rectify rail drainage culverts blocked when the Illawarra line was electrified

b) Kembla Coal and Coke (CRA) failure to fully rehabilitate the disused South Clifton Colliery above rail line and town at Wombarra

c) problems with Wollongong Council planning and engineering policies

d) a deadlock between the SRA and Council over the question of adjusting rail culvert baffle plates.

When technical solutions are used to solve political/legal questions, environmental problems are the likely result....P x T = E

The recent history of the Northern Illawarra rail line flood crisis is as follows: [2]
Rail drainage culverts were damaged during electrification 1982-85 (No EIS?).
Major wash outs were experienced by the community in 1985 and in 1988 with two deaths at Coledale.
New large rail culverts were constructed from Clifton to Austinmer in the1989-90 Culvert Amplification program (No EIS).
Then closed off with baffle plates later in 1990 at Wollongong Council's request.
Also at Counci's request, an EIS for Culvert Amplification was finally produced, April 1991.
Meanwhile the community was washed out again 12 June 1991.
Establishment of a Technical Working Party (SRA, PWD, RTA & Council) August 1991.

Providing a rationale for the 1989-1990 SRA culvert engineering works and later closure, the EIS Supplement states:

> "Nine ... culverts have subsequently been baffled to retain the original waterway, while the impacts of the increase in storm flows in the creeks downstream of the amplified culverts could be assessed in accordance with the EPA Act." (p.5)

The notion that baffling of new culverts enabled assessment "in accordance with" the EPA Act is nonsensical, since the EIS came after the actual engineering works were on the ground. [3] Further, Illawarra communities were severely flooded before they could make any public input into the EIS.

The term "original" waterway is also unhelpful. First, because in Wombarra, five creeks were long ago diverted into one at the KCC mine; and subsequently, there has been much SRA interference with North/South drainage gradients between creek culverts immediately upstream of the rail. [4]

These complex North/South ground changes first happened during electrification; continued with culvert amplification; were amended following baffling of culverts; and further amended following the 12 June 1991 flood. SRA reports pass over North/South drainage diversions.

In addition, the Minister for Transport's terms of reference have required the TWP to consider the drainage status quo only as of 1991, so imposing a synchronic methodology on problem solving and biasing options available.

The historical, geographic and hydrological fact of culvert damage by SRA access roads during electrification is omitted from consideration by the SRA, but it is very important to the community, because major wash outs only began at completion of electrification - 1985, 1988, 1991. [5]

Unblocked culverts, which the SRA calls "existing culverts", had to carry more water after electrification. And had new and heavy impacts on people living downstream of the rail. The SRA response has been to re-define "existing culverts" as undersized by "modern design standards". These culverts were then targeted for upgrading to a very stringent technical-legal criterion - the 1 in 100 year flood. The level of upgrading is pitched so high as to remove the SRA from any conceivable future liability.

In Wombarra, this technical-legal criterion also serves to justify massive SRA culvert construction at a point on the line where a Kembla Coal and Coke mine waste dump continually collapses blocking rail drainage.

In both instances, electrification and mine land instability, a technical-legal strategy and heavily engineered works have been used to avoid dealing with what is initially a political/legal problem.

Using such an approach, the SRA's ill conceived 1990 culvert amplification program has already resulted in extensive environmental damage during heavy rains in June 1991. Larger scale engineering options such as a proposed tunnel outfall are likely to increase the potential for unanticipated damage - albeit damage displaced to another area, the beach.

For the fact is, that while the legal risk criterion of the 1 in 100 year flood protects the SRA, it exacts heavy social and environmental cost. Engineers quoted in New Scientist (1991) are of the opinion that in such a case, professional responsibility suggests the risk criterion should be amended to a more appropriate scale. [6]

The 1 in 100 indicator is a hypothetical figure. Judging by the degree of damage experienced during the 12 June 1991 1 in 10 flood, a 1 in 100 storm could very possibly wash whole sections of the coastal strip into the sea. In other words, the indicator seems to relate to a scenario which is beyond management and beyond reasonable liability altogether.

Another flood management strategy proposed by the TWP (p.7), involves piecemeal drainage rectification works along the line and an acknowledgment by the community that some damage may be inevitable. Here the SRA seems to be offering a sort of contract to local people, whereby engineering liability would be qualified by community acceptance of some margin of risk. The problem is, who constitutes "the community" that enters into such a trade-off. It is clear that local people attending TWP meetings were not entirely representative of the spectrum of community opinion on these problems.

Despite the fact that comparable flood impacts were not experienced by Illawarra communities before electrification, the SRA selects natural conditions to account for flood problems in the area. The first paragraph on p.4 of the EIS Supplement reads:

> "Landslip, high velocity flooding and creek erosion combine to create severe problems throughout

public and private property..."

This is misleading, as p.4 of the Longmac geotechnical assessment indicates, most of the above problems in the area are a byproduct of man-made modifications.

> "Areas of recent slope movement in the talus appear related to man-made modifications including mine waste/tailings dumps, railway excavation and road fill."

A lack of basic landcare principles in the TWP analysis is understandable given that the committee was dominated by engineering expertise (from SRA, PWD, RTA and Council). Nevertheless, the failure to respect old water course lines and now extensive use of concrete drainage structures with new TWP drainage options, introduces additional environmental contradictions and stresses to a fragile coastal environment.

A further limitation of the problem solving strategy adopted by the TWP is the division of labour between it and Wollongong Council's Northern Suburbs Drainage Working Party set up to deal with what is described as "the broader issue of flooding in the Northern Suburbs".

The NSW Government's Illawarra Total Catchment Management Plan Committee also does not appear to have been fully involved in these flood management deliberations. This is surprising since the SRA's public relations consultant is also a member of the Catchment Management Committee.

In any event, the point is that the landscape with its water courses forms an integral interactive whole and should not be arbitrarily compartmentalised for bureaucratic or technical convenience. [7]

HERE AND NOW AT WOMBARRA'S CREEK G SYSTEM

Looking at problem creeks in the Wombarra Creek G system, Longmac notes that a house has recently been built in the actual bed of Creek I at Lawrence Hargrave Drive. It should be added that a second new house straddles the bed of Creek E in Goodrich Street.

Another creek, J, is blocked by a pipe to create access to a house on Morrison Avenue. The pipe is a significant contributor to downstream flood problems since it is out of alignment with the natural fall of the creek. The actual water course has been reclaimed with building refuse in preparation for subdivision. Dumped material has repeatedly washed down from this site to block the RTA culvert on Lawrence Hargrave Drive, so flooding the road and properties in Monash Street.

Problems of this nature are localised planning issues, and could be dealt with by a competent Council authority. It is unsound to attempt to circumvent them by using massively engineered solutions causing permanent environmental change to the landscape at large.

Concerning the major drainage outlet at Wombarra, Creek G, analysis and/or documentation does not seem entirely consistent.
Longmac writes that:

> Creek G narrows from a natural channel of 15 m wide x 4 m deep at the rail line to (almost half) 9 m wide x 4 m deep near Lawrence Hargrave Drive due to reclamation of land either side of the water course (p.10).

The TWP Findings say that:
an adequate carrying "combined" capacity for G in a 1 in 100 flood, would require a channel of 7.5 m wide by 2.5 m deep (Attachment A-3).
Given the actual dimensions of G described by Longmac above:

--- Why is Creek G considered inadequate to the 1 in 100 critierion?

--- And why are drainage lines at Wombarra township being turned inside out accordingly?

Webb McKeown breaks down 12 June 1991 1 in 10 flood water distribution, with Creek G closed off by baffle plates at Council's request as follows (p.9):

Culvert	Blockage	Peak Flow
G	50% blocked	3 m^3/s
H	100% blocked	
I		9 m^3/s
J		6 m^3/s
Station		1 m^3/s

A community perspective on the creeks brings more information to this table. For example: the estimate for the culvert at Creek H does not reflect the amount of water overflow that scoured out a 10 m deep gully in Creek H behind houses on Lawrence Hargrave Drive.

What is also not plain from the table is that Creek I, roughly 7 m deep x 4 m wide, took a flow of 9 m^3/s without extensive damage, while for Creek J, 1 m deep x 1 m wide, 6m^3/s was a disaster. People attempting to get out of homes near J in Morrison Avenue and below were stranded and without telephone.

The Webb McKeown report does not mention waters overtopping the rail track at culvert J on 12 June, though photographs show there was another embankment collapse there. The impact of 6m^3/s in J is highlighted by the fact that 50 m of railway embankment south of Wombarra Station collapsed under a 1 m^3/s overflow, and State Emergency crews were called out to evacuate people in Broadridge Street.

If culvert baffle plates remain on at G, flow past the Station in a 1 in 100 storm would be approximately 3m^3/s according to Webb McKeown, p.21. Presumably, the corresponding figure for Creek J becomes 18 m^3/s. This would almost certainly wipe out houses downstream on J near Lawrence Hargrave Drive.

As things stand, with baffles on G and Creeks H, I and J to the south serving as overflow valves, homes on J have lost safe access during heavy rains. An attempt to soften this flood impact has been made by SRA ground engineering staff filling and re-grading the rail line overflow channel.

Nevertheless, without consultation, the SRA has appropriated the amenity of some homes on J for purpose of drainage overflow from baffled culverts. If the SRA intends to continue directing water South by leaving G baffled, then it should purchase the properties and compensate landowners.

The baffling of Creek G culverts has simply shifted an unpredictable flood danger from one part of Wombarra to another, and the afflicted community has been put in a situation of potential social conflict.

Meanwhile the SRA has locked itself into a double-bind. By the logic of its own technical-legal risk criterion, it should remove baffle plates now a demonstrated threat to human safety. However, if it does this, it may leave other residents further north in Wombarra at risk.

Wollongong Council's role in requiring this ad hoc culvert closure at G is questionable, more especially since the community at large was not made aware of upstream flow changes potentially affecting safety and property.

Council's informal injunction overlooks the fact that until the Kembla Coal and Coke (CRA) site is fully rehabilitated, drainage in the vicinity of Creek G will remain unpredictable due to collapsing waste embankments. A low reliability thus compromises all TWP drainage options unless land West of the rail is attended to.

As Webb McKeown acknowledges: whatever engineering option is selected, drainage structures are going to need continuous monitoring. - The lesson seems to be that high tech constructions are not necessarily fail safe labour-saving/cost-cutting exercises as the 1991 EIS had supposed.

In the here and now, SRA culverts closest to Creek G still have the highest probability of blockage by pit top debris. G will block first, then H, possibly I, etc. This leaves Creek J, the smallest water course in the

system with a high probability of taking a very large unobstructed water overflow.

In view of this blockage risk, it is curious that the SRA has not made an adjustment or partial opening in baffle plates at G. After all, the TWP Findings on p.8.2 claim that in the final instance, the SRA can go ahead with necessary works outside of Council approval. **8**

THE TECHNICAL WORKING PARTY'S PROPOSED CREEK TREATMENTS

Like the EIS for Culvert Amplification before it, the TWP has not tackled the primary drainage requirement for the Wombarra area - rehabilitation of damaged mine land above rail and town.

The community has been told that the SRA's legal advice on preparation of the EIS was not to deal with land West of the rail line. However, the disused mine area with its five diverted creeks and two dams is the major source of run off through the rail line and town.

The community vision that original Escarpment water courses should be restored from rainforest corridor to sea, is not met by the TWP's proposal to put water across an unstable pit top in concrete channels. **9** Nor is it met by engineering creek flows to the sea by means of energy dissipators and drop structures.

Based as it is on environmentally inappropriate creek treatments, the TWP Option 2 - Creek Restoration diagram misinforms the community about the viability of a restoration solution. Passing water through concrete channels speeds up flows, so increasing dangerous velocities downstream.

Furthermore, the TWP's technical control measures contradict its own earlier recommendation and that of the EIS Supplement p.9, to the effect that inflexible concrete channels and structures are not advisable where land is prone to slip and/or subsidence. Geotechnical data from KCC bore hole measures on the mine waste mounds show mine land to be moving slowly downhill in a south east direction. **10**

Since the old colliery will only be stabilised by re-establishing native forest species which drink up surface flows and retain water in their soil binding roots, it is illogical to drain the area of water in artificial concrete channels.

The TWP approach also collides with Wollongong Council Escarpment Working Party plans to protect rainforest lands at the base of the Escarpment for eventual creation of a State Recreation Area or National Park corridor.

Plant species will not rehabilitate as long as roots remain compacted with toxic coal residues, so waste should be removed from the pit top as soon as possible. This is done traditionally in Wales by scooping up the material and dropping it down the original mine shafts.

The advantage of that is it suffocates spontaneous combustion pockets underground. This in turn should help take care of emissions of methane and carbon monoxide gases periodically expelled from eroded fissures on the disused mine site.

A normal mining lease binds a company by law to restore land to its original condition on completion of works. Given KCC/CRA's large team of environmental experts and stated commitment to sound earth management, full rehabilitation is in principle achievable. Its cost would be negligable against mining company profits. Benefits to the SRA and community would be enormous.

Downstream of the rail corridor, the TWP's water management recommendations again overlook the effect of concrete channels in increasing velocities. "Get rid of" water quickly and efficiently this way, then you need an energy dissipator to control the faster flows.

If creek beds are left natural water movement slows down. Rainforest species have a powerful hydrological function. They impede velocity, absorb and retain water, and bind surface soils. With more trees, ground water levels also drop, so helping to stabilise the landscape and creating further capacity for surface absorption.

Going at in the other way round: You put heavy machinery across a slope and bingo, you have a wash out. This is acknowledged in the SRA Draft Environmental Code of Practice (1990). **11** Lack of recognition of basic landcare principles in the TWP deliberations will exacerbate the very environment it intends to manage.

The engineering approach to stream management has made it look as if houses must go to make way for big concrete channels, drop structures, and such. The hydrological profile on p.5.2 of the TWP Findings would look very different if environmental techniques were applied to the retardation of water flows on sub-Escarpment slopes.

Putting back natural streams will also disperse water run-off more softly and fairly through the town.

Plainly, Option 2 for restoration of natural water courses has not been adequately investigated by the TWP, because the environmental expertise for dealing with it was not represented there. The community has thus inadvertently been shortchanged on this option.

THE TWP'S PREFERRED ALTERNATIVE - AN OCEAN OUTFALL

The TWP's preferred drainage option for the Creek G system is described on p.8 of the EIS Supplement as "managing and formalising multiple creek diversions" by means of a tunnel and ocean outfall. This will introduce a third set of drainage diversions at Wombarra, in addition to creek diversions on KCC land and more recent SRA channels.

The feasibility study put forward by the Snowy Mountains Engineering Authority diverts creeks into two 15 m wide open concrete channels across pit top, with drop shaft to a 16 m^2 underground tunnel situated above the rail line some 50 m north of Fifth Street. - As someone remarked at a community workshop, the tunnel will be big enough to let dumped car bodies wash through.

In the light of past experience of conditions near the mine, it is reasonable to infer that movement of the unstable pit top could lead to cracking of the concrete channels and/or collapse of waste mounds into the shaft. A blocked shaft in turn, could overflow and intensify flooding downstream.

On the other hand, substantial expulsion of suspended mine waste residues at the beach end of the tunnel would damage the marine ecology by turbidity and toxicity.

A major landslide of mine dump mounds liquified by heavy rains (as happened in Aberfan 1966), cannot be ruled out. This would presumably upturn and spill the new concrete drainage channels on to the rail corridor and town below.

The geological analysis of the tunnel site provided by Longmac seems to contraindicate excavation on six counts:

a) geological complexity of the area
b) shear zone associated with the Scarborough Fault is unknown
c) the latter is possibly water charged
d) a second fault intersects with the Scarborough Fault in the vicinity of the proposed tunnel
e) competent bedrock may be as low as 100 m under ground
f) stabilisation would require more subsurface drainage

Presumably, if competent bedrock turns out to be lower than sea level, a tunnel outfall is not likely to be functional at all.

The possibility of additional sub-surface drainage works being called for to stabilise the tunnel, might in turn, de-stabilise parts of the town.

The tunnel proposal amounts to a sandstone quarry under Wombarra. The use of explosives as in the case of the Sydney Harbour Tunnel may have devastating effects on both surface and subsurface structures,

including homes.

It is not indicated by the SMEC Study where rock "spoil" will be taken to. The haulage of spoil by trucks through Wombarra township will also damage the social and environmental amenity of the town for the several years of tunnel construction. Dust and noise pollution are likely.

The tunnel option and associated creek diversions in the Wombarra area will lead to the drying out of some creek beds. This disturbance in turn could produce a rise in ground water levels with possible increase in soil salinity and destabilisation of the surface mantle. As Longmac already points out in another context:

> "Local pockets of talus mantle can be expected to be subject to instability almost invariably related to periodic rises of ground water level."(p.16)

Cracking of house foundations is a possible unanticipated consequence of these ground water changes. This has been observed to occur recently when a Water Board sewer tunnel was put under homes in the Sutherland locality.

The concrete lined tunnel is planned to discharge from high on the cliff face of the headland by the rock pool at the north end of Scarborough Beach. A large ugly concrete energy dissipator will be constructed where water hits the ground so as to slow down the flow.

The north head of the beach consists in an intricate tessellated pavement and rock pool structure that supports a variety of marine life.

Marine species including bream, leatherjackets, jew fish, abalone and lobsters would decline as a result of ingesting toxic residues in mine waste.

A periodic current carries sand from the north end of the beach to the south. This means that storm water and any suspended mine debris would circulate distributing ocean turbidity and pollution along the entire beach, making it unpleasant for swimmers.

Given the complex habit of currents at Scarborough, it cannot readily be predicted what effect an outfall will have on beach erosion. However, by combining single creek flows together, the tunnel option contradicts SPCC drainage guidelines devised to protect against erosion.

Obstruction of the beach by outfall and dissipator at the rock pool will block community of safe access to small bays north of the headland.

The gentle saltwater pool at the north headland would also become unusable. It is presently one of the few safe areas for children and non-swimmers to bathe at Scarborough Beach without being caught in rips.

Construction of the outfall will involve closure of the beach for some two years while an access road for bulldozers, other heavy machinery and trucks is constructed along the beach.

The entry point of the road on to the beach from Wombarra (Monash St?, Haig St? Reef St?) has not been identified in the SMEC Study and it is not known whether the road will be asphalt or other foreign material.

SMEC does not describe how the road will be removed or whether it will be left to wash into the sea once tunnel construction is finished.

Clearly, the TWP conclusion that the environmental impact of the tunnel option will be minimal (p.B-8), is unconvincing. An ocean outfall will be a major threat to environmental, social and aesthetic amenities at Scarborough beach and Wombarra township.

The effect that all this activity with possible loss of the beach, will have on real estate values in the area is a further unknown

CONCLUSION

The real sources of drainage difficulties in the Northern Illawarra continue to be bypassed by State and

Local Government authorities, and tax payer's money is wasted on inappropriate P x T = E solutions. Affected coastal communities have undergone a series of SRA sponsored "public relations" workshops, and under threat of losing their homes (TWP Options 2, 3 & 4), Wombarra people have been made to believe that flood control can only be achieved by further major groundworks. **12**

The tunnel outfall proposal at Wombarra is contraindicated for roughly 18 reasons:
- geotechnical
- environmental
- social.

The proposal and Snowy Mountains Engineering Corporation feasibility study comes at a time when ocean outfalls are proving to be costly, inefficient effluent removers.

A national coastal protection policy outlawing discharge of waste into the sea is imminent.

The existence of three pending SMEC tunnel proposals for:
a) Scarborough Beach;
b) Helensburgh to coast;
c) Helensburgh to Thirroul through the Escarpment;
calls for a State or Council initiated moratorium on further development until a comprehensive assessment of longer term environmental impacts in the Northern Illawarra region is made.

In the meantime, the political/legal question of tax payers money being spent by State Government authorities to repair problems originating on private company lands needs to be resolved. So does the issue of private land holders picking up the tab for environmental damage stemming from State Government activities.

Expert opinion from A.N.U.'s Centre for Resource and Environmental Studies to the New Delhi based Foundation for Science, Technology and Natural Resource Policy, maintains that natural water courses should be protected as basic to ground conservation and coastal management. NSW SPCC guidelines on urban drainage planning, similarly warn against combining streams into larger, faster, erosive flows, particularly on slopes. Eventually, failure to conserve natural water courses leads to dust-bowl conditions, wherever it occurs. **13**

As an alternative to engineered water management and associated difficulties at Wombarra, the KCC mine and Creek G drainage system with its unique Escarpment rainforest could be rehabilitated under a youth employment landcare program. **14**

Use of environmental techniques to control water run off, on lands above the rail, would permit the original stream-based rail culverts blocked during electrification to be re-opened. It has also been estimated that emplacement of pipes a little larger than the existing 3 ft brick arch culverts, could even accomodate the required technical-legal 1 in 100 flow.

This kind of approach would not only scale back drainage programs for the SRA and downstream community, but preserve the environmental integrity of the area for future generations.

NOTES

1. Richard Jones, Legislative Council Questions and Answers, 3 & 4 Dec. 1991.

2. Ongoing Flood Crisis in Northern Illawarra Communities, Summary for Illawarra Escarpment Coalition Meeting, Nov. 1991.

3. Ariel Salleh, Response to SRA EIS for Culvert Amplification, July 1991.

4. Recollection by J.W. Saywell, retired Wombarra miner, 1991; Editorial, Illawarra Mercury,15 June 1991.

5. Muston & Associates, Proposed Culvert Amplifications: Community Consultation Stage I,

Jan. 1991; June 1991.

6. Sharon Beder, “The fallible engineer”, New Scientist, 2 Nov. 1991.

7. David Brown, "Planning blunders outrage", The Advertiser, 23 Oct. 1991.

8. Richard Macey, "Rail repairs begin as flood sparks quarrel", Sydney Morning Herald, 15 June 1991.

9. Wombarra - plan for saving our town, Discussion paper as amended by the Town Meeting, 17 July 1991.

10. Longmac Survey Results South Clifton Colliery, June 1989 - July 1991.

11. Environmental Defender's Office, "SRA Draft Environmental Code of Practice 1990" in Environmental Law and the State Rail Authority Seminar Proceedings, 30 Nov. 1990.

12. Lynne Whiley, "Pipe dream has NSW Govt suffering 'tunnel vision'", Illawarra Mercury, 5 Dec. 1991.

13. Anon., “Dam Builders Descend on Cambodia”, The Nation 6 Sept. 1991; Vandana Shiva, Staying Alive, (London: Zed, 1989);

14. Department of Conservation and Land Management, Decade of Landcare: Report on Interim Plan for NSW, Dec. 1991.

MAPS AND PHOTOGRAPHS

1. View south along Illawarra Coast from Stanwell Park
   Wombarra township and Scarborough Beach (Thanks to Jenny Templin)

2. Map of Wombarra - scarp, rainforest, mine, rail, town, beach

3. View of Escarpment from KCC’s pit top
   Adjacent rainforest containing Aboriginal midden

4. Residents' maps of drainage diversions at Wombarra (Thanks to Harold Thomas & Bert Coleman)

5. Collapsing mine waste mounds at Creek G
   Amplified/baffled SRA culverts at Creek G

6. Photographic record of flood damage Wombarra 12 June 1991

7. TWP Options for Wombarra (1 - 5)
   - Extensive treatment for creeks B and G (1)
   - Return of creeks to “original” channels (2)
   - Partial treatment (3)
   - Alternative partial treatment (4)
   - Tunnel and ocean outfall (5)

8. View south along Scarborough Beach from north headland
   Rock pool at site of proposed ocean outfall

Ariel Salleh, Wombarra Preservation
Program in Environmental Conservation Education, NYU, 1992