

EIS 238

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Environmental impact statement : sandmining at Wright's Creek
in the Macdonald Valley.



EIS

ENVIRONMENTAL IMPACT STATEMENT:

SANDMINING

AT WRIGHT'S CREEK IN THE
MACDONALD VALLEY



EIS
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PREPARED BY

Eric Armstrong

David Cliff

Karl Berzins

Helen Hammond

Cynthia Cliff

Peter Holsgrove

Postgraduate Students of the Macquarie University Environmental Studies Programme, 1982.



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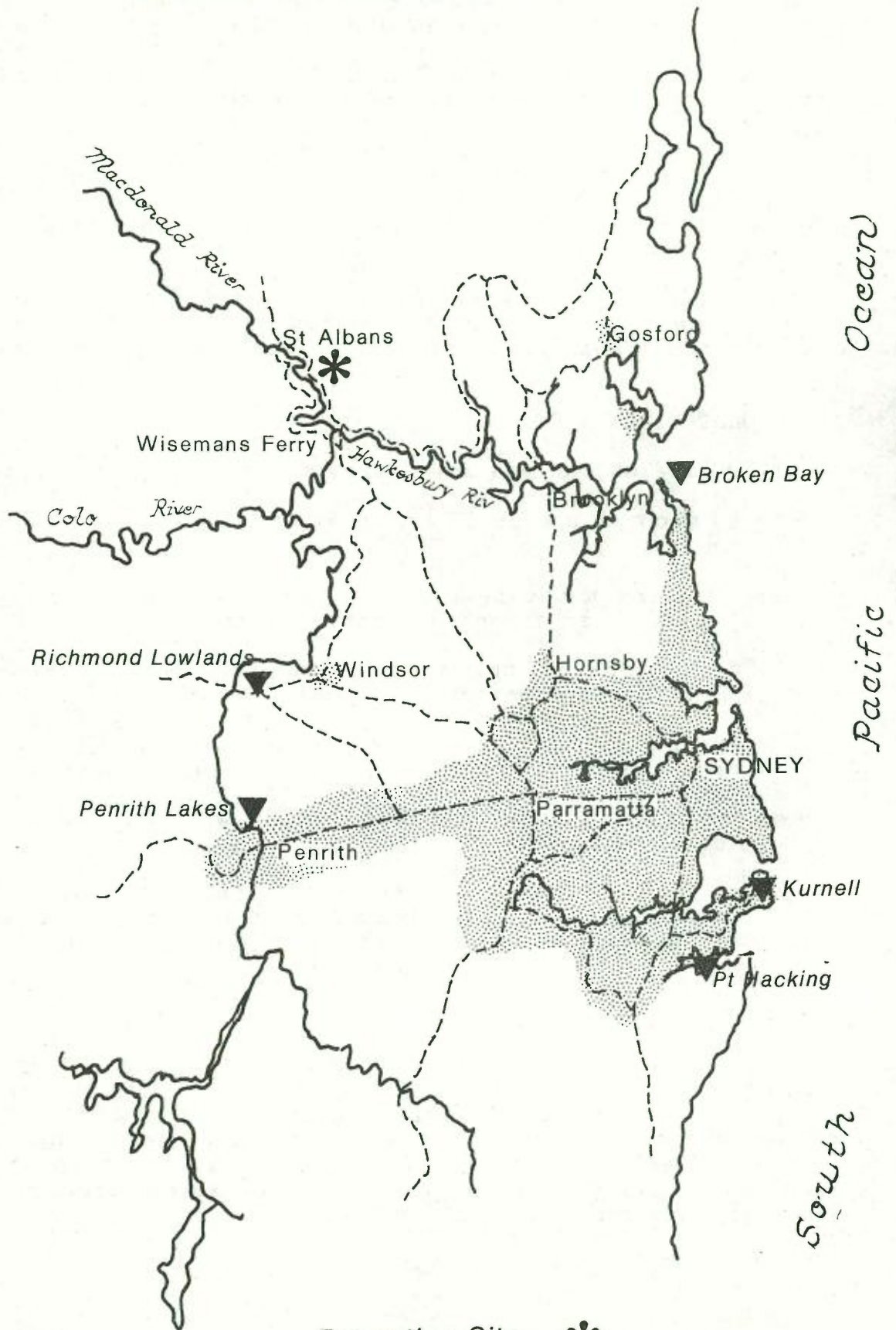
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REGIONAL LOCATION



- Extraction Site * (asterisk)
- Sand Deposits ▼ (inverted triangle)
- Urban Areas (stippled area)
- Main Roads - - - (dashed line)



investigations a detailed extraction plan will then be formulated. Since the proponent was reluctant to divulge any information regarding the proposal prior to the completion of geological testing, the study group had to devise its own proposal. The proposal was formulated in such a manner that the major environmental impacts were minimised.

It is proposed to carry out the extraction of sand, peat and clay, by both standard dry and wet mining methods. Processing and stockpiling would occur on site. Extractive and/or processed material would be trucked to Wiseman's Ferry, transferred to barges, barged to Brooklyn and then trucked to the Sydney markets. The size of the deposit (approximately 30 million tonnes) is likely to allow the extraction process to operate for some 66 years, on the basis of a five day week. The extractive operation and rehabilitation will be carried out concurrently.

2.2.3 OBJECTIVES

The objectives for carrying out this proposal are:

- to recover a valuable resource which is in short supply in the Sydney region.
- to extract the resource in a manner which will give the proponent an acceptable return on finances invested.
- to carry out the extraction in a manner which will minimise environmental impacts.
- to reinstate the extraction area to a condition equal to or better than that existing prior to the extraction.
- to provide an economic activity which is of benefit to local residents.
- to overcome some of the conditions which are presently adverse to the residents of the area (e.g. flooding, road conditions).

2.2.4. PROPONENT

The companies involved in the proposal are Breen Holdings Pty. Ltd. and Consolidated Non-Metallics Pty. Ltd. Both are subsidiaries of the Breen group of companies, of which Mr. T.E. Breen is the managing director. In addition to applying for mining leases and permissive occupancies in the area, Mr. Breen owns the majority of land in Wright's Creek. He also owns land in other parts of the Macdonald Valley.

3. DESCRIPTION OF THE PROPOSAL.

3.1 SELECTION OF THE INITIAL EXTRACTION AREA.

Mining Lease Applications (MLA's) have been lodged by the proponent with the Department of Mineral Resources to secure rights for the extraction of brick clay, clay shale, pottery clay, pipe clay, kaolin and peat. Sand is not included in the above list as it is not considered a mineral under the Mining Act (1973). Permission to extract sand from within the MLA's must be sought from both the Lands Department and the Hawkesbury Shire Council. The proponent is advantaged in making claims to these bodies in that he holds freehold title to the majority of lands within the MLA's.

The MLA's cover the alluvial deposits of Wellum's Lake and Wright's Creek, however, the proponent has indicated that initial extraction will commence in Wright's Creek.

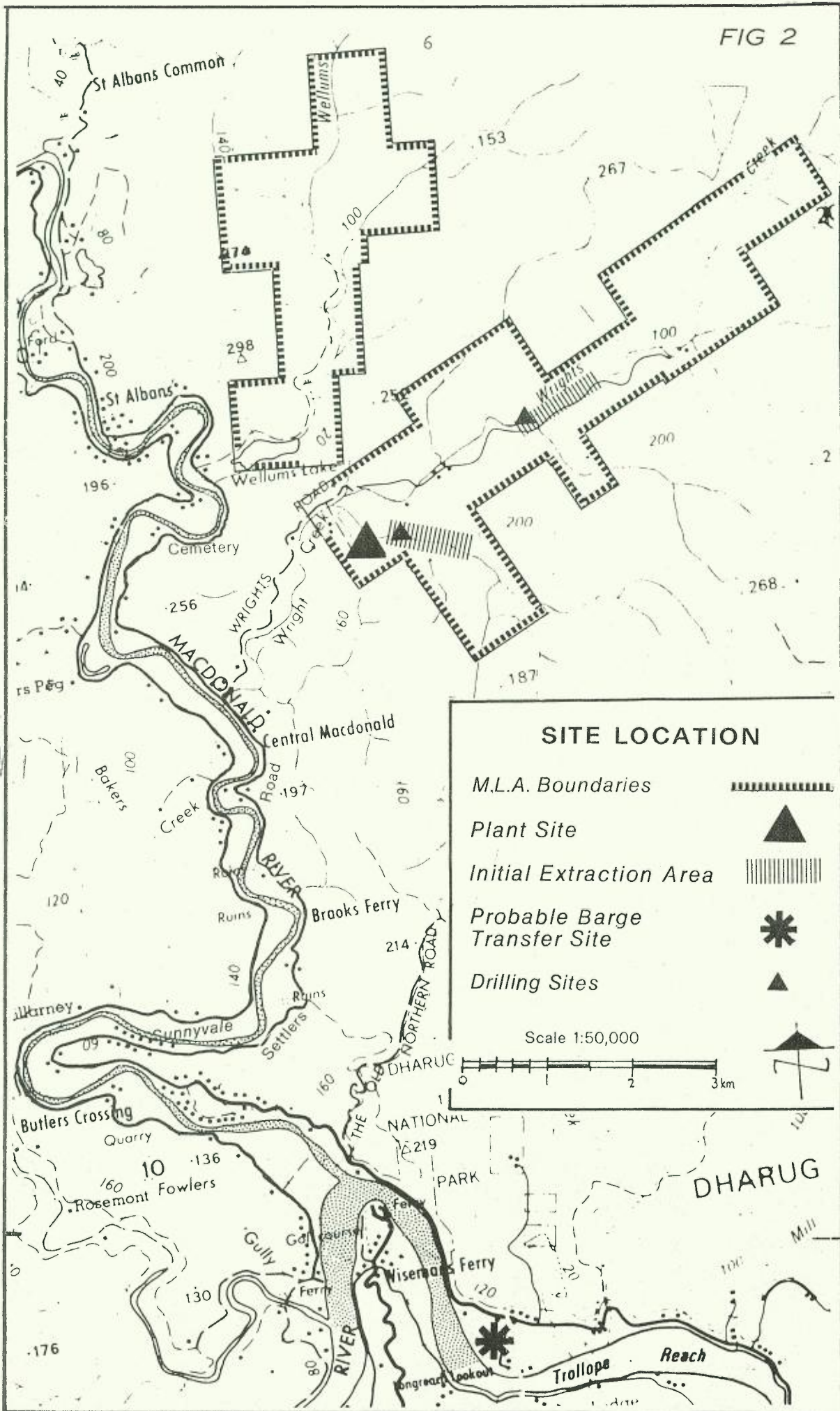
Preliminary drilling operations have been carried out in the two areas shown in figure 2. Encouraging results from this exploration indicate that these areas need to be further tested to obtain the finer detail required to plan an extraction operation. At this stage, officers of the Department of Mineral Resources have indicated that the inferred reserves within the MLA's of fine-medium grained sand, clay and peat are in the order of thirty million tonnes.

The extraction rate would increase gradually to average out at 200,000 tonnes per year for the first ten years. Thereafter, the anticipated rate would be approximately 500,000 tonnes per year (see Wallace, 1980). These figures indicate that the deposits in Wright's Creek could be mined for a period of 66 years.

3.2 BRIEF DESCRIPTION OF WHAT WILL BE EXTRACTED

The alluvial deposits of Wright's Creek contain substantial sand, clay and peat resources. The geology of these resources is presented in greater detail in chapter 4, however, a simple description of the stratigraphy of these deposits is shown below:

FIG 2



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1. SUMMARY

This Environmental Impact Statement evaluates the possible effects of proceeding with a proposal to extract sand, peat and clay from the Wright's Creek region of the Macdonald Valley, a rural area 70 km north west of Sydney. The proposal has been formulated to minimise the impacts of the extraction on the environment, where possible.

The major impacts which remain unresolved, are related to the dust, noise and increased traffic that would result from the project. Significant upgrading of roads within Wright's Creek and of Settlers Road between Wright's Creek and Wiseman's Ferry will ameliorate the dust problem.

The upgrading of roads together with the substantial earthworks necessary, will add significantly to the cost of the project. It also means better and safer access to the valley, which in turn however, will lead to increased tourist traffic on Settlers Road. This will create a demand for some improvement of the facilities currently available in St. Albans and Wiseman's Ferry, and generate extra income, but at the penalty of additional noise, fumes and traffic hazard.

The attraction of the valley to the residents, with its associated peace and tranquility, is based on its historical character and the apparent isolation of the valley from Sydney. Any major road improvements, with their associated increased traffic will greatly diminish this charm, and affect the lifestyle of the residents of the Macdonald Valley, particularly those living in the Wright's Creek area.

The EIS shows that because there are major environmental consequences of extracting sand, peat and clay from Wright's Creek which are inevitable, and because under present market conditions the operation is not economic, this proposal should not proceed.

2. INTRODUCTION

2.1 GENERAL

Supplies of peat and fine-medium grained sand are decreasing in the Sydney region. The supply of sand from the Kurnell deposits, where the proponent currently operates, has an uncertain future as a result of studies into the impact of extraction in that area (eg. Hooker Industries EIS, March, 1982). Preliminary investigations have identified possible sources of some magnitude in the Macdonald River area. These deposits may well meet future demands.

The extraction of these materials is defined as designated development under the Environmental Planning and Assessment Act (1979) regulations. This Act requires that any application to the Hawkesbury Shire Council to carry out such development be accompanied by an Environmental Impact Statement.

This Impact Statement examines the benefits and consequences arising from the extraction of peat, clay, and sand from Wright's Creek, near St. Albans.

2.2 SCOPE

2.2.1 LOCATION

Although the sand deposits in the Macdonald Valley are widespread, this proposal is restricted to the sediments found in Wright's Creek and its tributaries (an area of about 10 square kilometres). The site of the proposal is located about 60 km north-west of Sydney, and thus is well beyond the urban area (see figure 1). The St. Albans area, however, is frequented by sightseers and others for recreation. Wright's Creek is a tributary of the Macdonald River which it joins some 14 km upstream from the confluence that river with the Hawkesbury River at Wiseman's Ferry.

The shortest vehicular access to the site from Sydney is via the Old Northern Road, through the Dural area, to Wiseman's Ferry. Access is also possible via Central Mangrove and Windsor. The Old Northern Road though sealed, is steep and winding in places. Numerous small farms are located adjacent to this road. A ferry is used to cross the Hawkesbury River. North of Wiseman's Ferry, the road (Settlers Road) is partly sealed and the area is predominantly used for cattle grazing.

2.2.2 DESCRIPTION

At the time of writing this report, the proponent is involved in the preliminary geological investigation of the Wright's Creek deposit. Depending on the results of these

<u>LITHOLOGY</u>	<u>DEPTH</u>
Fine-medium grained sand with a silt component of up to 20%, clay and peat lenses occur randomly throughout.	0-5 metres
Fine-medium grained sand	5-20 metres

In some areas, such as the wetlands of Wright's Creek superficial clay deposits are extensive.

Exploratory drilling results by both the proponent and the Department of Mineral Resources are encouraging, however much more subsurface information is required to accurately determine the areal extent and thickness of the various lithologies.

3.3 ACTIVITIES PRIOR TO EXTRACTION

3.3.1 DELINEATION OF RESERVES

Based on the results of the first stage of exploratory drilling, a second stage drilling operation needs to be carried out. Sampling on a grid spacing of 20 m would provide adequate information for the planning of the extractive operation.

3.3.2 CONSTRUCTION

Introduction

Major earthworks would be required to ensure that the extractive operation is effectively isolated from the existing water courses. The design of access roads as well as the siting of the processing plant need to be considered in the light of long term planning aspects of the proposal. The construction activities will be discussed under the following headings:

- flood control
- processing plant and ancilliary buildings
- settling ponds
- process water supply
- access roads
- barge docking and materials handling facilities
- fences

Flood control

Wright's Creek is a meandering stream in an alluvium choked valley and consequently even moderate rains cause flooding. Channels would need to be constructed along Wright's Creek and its tributaries where there is a likelihood that excavation operations and access roads would be inundated or breached in times of high flow. These channels would take the form of storm water drains and would need to be designed so as to allow periodical cleansing of accumulated sediment and debris.

Flood waters from the Macdonald River are also likely to advance into Wright's Creek. Records of the past 18 years show that the Macdonald River has exceeded a depth of 3 m at St. Albans for an average of 1.2 days per year (Henry, 1977 p.9) Therefore any facet of the proposal that is below the 2 m contour within Wright's Creek, should be protected by earthen retaining walls. (N.B. The gradient of Wright's Creek was taken into account in assigning this 2 m level.)

Processing plant and ancilliary buildings

An area approximately 200 m X 100 m would be required to accommodate the processing plant, workshop, storage shed (bags, specialised sand products, etc.), amenities block and site office. A processing plant flow sheet is included as Appendix 1. A probable site for these buildings is shown in Fig.3. Screening, ease of access to all parts of the deposit, flooding and diversion of existing streams were all considered before the most advantageous site was chosen. Product stockpiles could also be accommodated in this 200 m X 100 m area.

Settling ponds

Settling ponds assist the removal of suspended solids from the process water. At least two settling ponds in series would be required. Runoff from product stockpiles would also be diverted into the primary settling pond.

The volume of water in each settling pond would be approximately 1500 m³ (i.e. 100 m X 50 m X 3 m) or 1.5 million litres. If possible, gravity feed would be used from one pond to the other. Construction of the ponds would involve excavation as well as the building of retaining walls.

Process water source

A combination of ground water utilisation and the damming surface water would be the methods employed in obtaining process water. Process water should be recycled as much as possible. A drilling programme outlining ground water reserves as well as a study evaluating the impacts of exploiting these

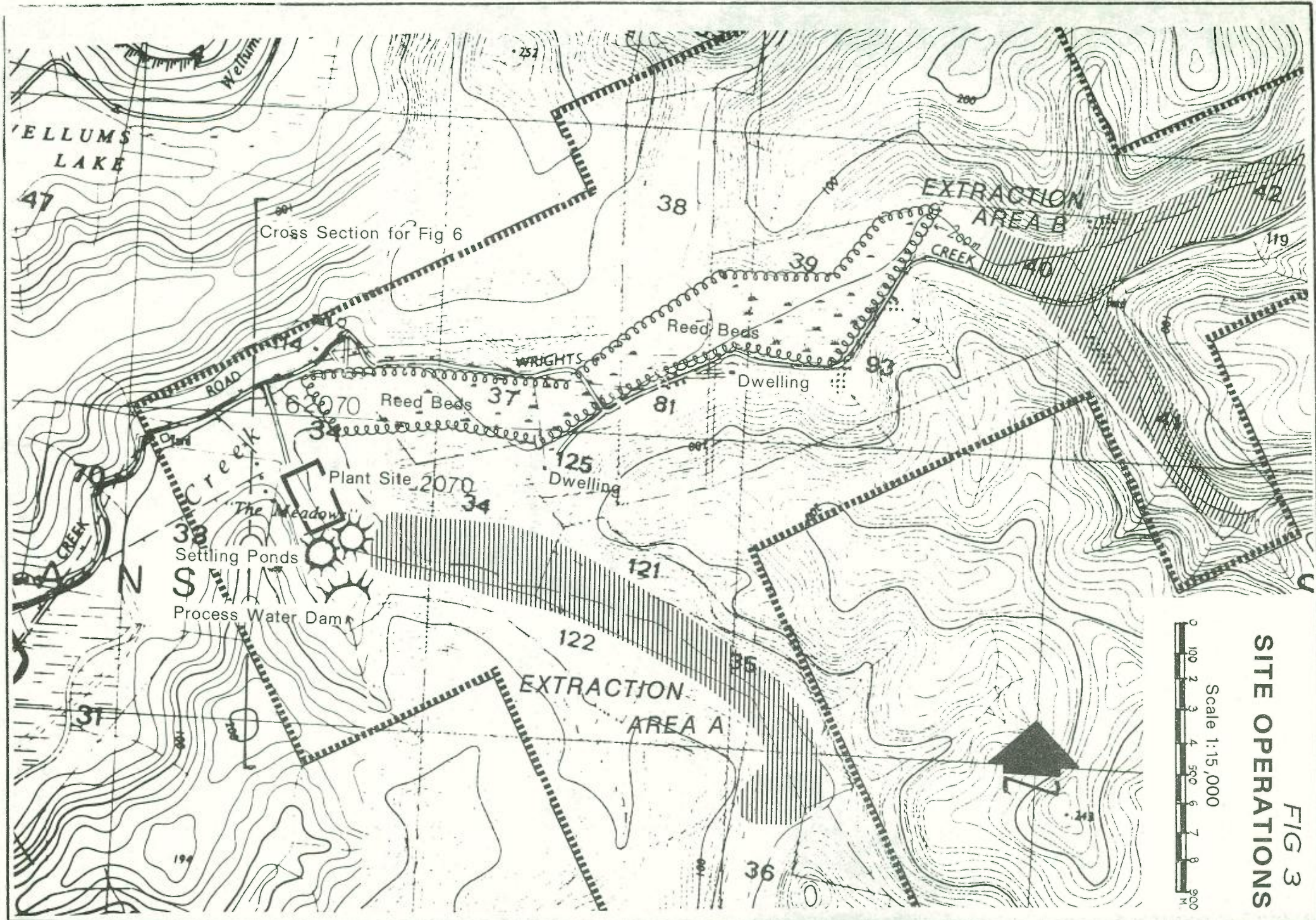


FIG 3
SITE OPERATIONS

reserves would also be necessary.

Access roads

Major roadworks would be required to upgrade the existing unsealed, narrow roads to a standard which would allow the safe two-way passage of laden trucks. These will need to be located to provide all weather access and take into account flood levels.

Barge docking and materials handling facilities

At present the proponent has indicated that the trucked sand will be loaded onto barges at Wiseman's Ferry and then barged to distribution points on the Hawkesbury River. For this transport mode to work efficiently, a docking facility, complete with cranes and an adequate truck turning area would need to be constructed on the Hawkesbury River. The most practicable site for this is shown on figure 2.

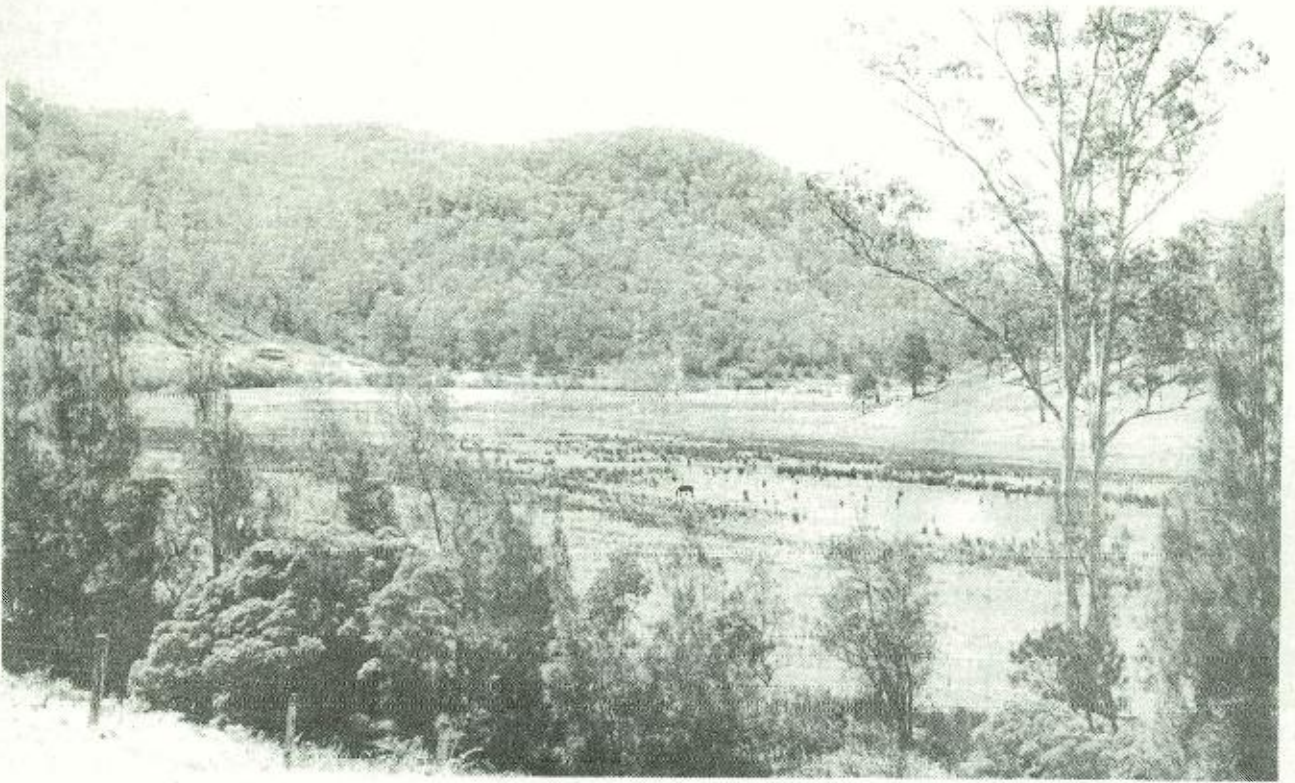
Fences

The upgrading of existing fences and the construction of new fences on the perimeters of the proposed development would be required as a deterrent to both people and livestock.

3.3.3 EXTRACTION SITE PREPARATION

Proposed extraction area A (See Figure 3), contains extensive tracts of poplar trees, and these would need to be harvested before extraction begins. Area A covers alluvial deposits of a tributary to Wright's Creek and is less swampy than Wright's Creek overall. Even so construction of access roads to cope with heavy trucks would be required. Dry extraction methods are envisaged for the initial extractive activities in this area.

Area B is situated within the Wright's Creek valley and contains secondary succession vegetation. Acacia decurrens is commonly found in this area as well as numerous trees and bushes (see Chapter 4). Some poorly maintained citrus orchards were also recorded. Levelling of these trees and bushes as well as upgrading of the existing track would be necessary before extraction commences.



Photograph 1. Wright's Creek - downstream from the proposal



Photograph 2. Part of a typical construction sand processing plant

3.4 ACTIVITIES DURING EXTRACTION

3.4.1. INTRODUCTION

After the second stage of exploratory drilling (20 m grid), sufficient subsurface information would be available to plan a coherent mining operation. At present, only a general scenario can be outlined, however, this will enable the major problems faced in carrying out an extractive operation to be addressed. In essence, the proposed plan of extraction would involve the segregation of the mining operation from existing streams, the restriction of mining to strips or panels, and upon completion of the mining (dredging), the backfilling of the dredged pond with overburden and process plant wastes (silts and clays). Landscaping would be an essential part of the restoration. The end land use would be wetland habitat.

3.4.2. MINING EQUIPMENT

Swamp dozers, scrapers, and draglines would be used to remove overburden as well as any clay and peat deposits. If selective mining of the clay and peat deposits can be achieved, then dump trucks (10 tonne) would be used to transport the clay and peat to stockpiles near the processing plant. Depending on the depth of the water table in area A, scrapers could be used to extract fine-medium grained sand.

A suction cutter dredge (21 m x 9 m) would be used to remove the remaining fine-medium grained sand in the valley floor. The secondary drilling program or even the initial use of dredges may disclose that tree debris is common throughout the deposit. Branches and tree trunks severely restrict dredging operations, and if this is the case, draglines would have to be used over the area to recover the sand.

3.4.3. MINING METHOD

The initial stage of mining operations involves the use of draglines, scrapers, and/or swamp dozers to remove the silty sand, clay and peat which in most cases overlie the deposits of fine-medium grained sand. In area A the majority of the overburden is silty sand which may be suitable as a filling sand. At this stage it is assumed that selective mining of the clay and peat beds can be achieved (often the clay and peat are thinly bedded, lensoid, or inter-layered with fine sand beds which makes selective mining difficult).

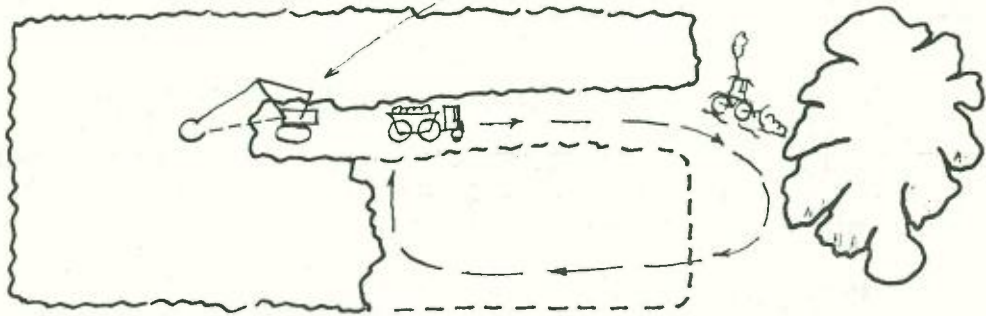
The various stages of the extraction process, as described below, are shown diagrammatically in figure 4. Draglines or scrapers where the water table depth permits will remove the overburden. This is then transported by truck to the overburden stockpile at one end of the mining panel. Upon completion of the

EXTRACTION PROCESS

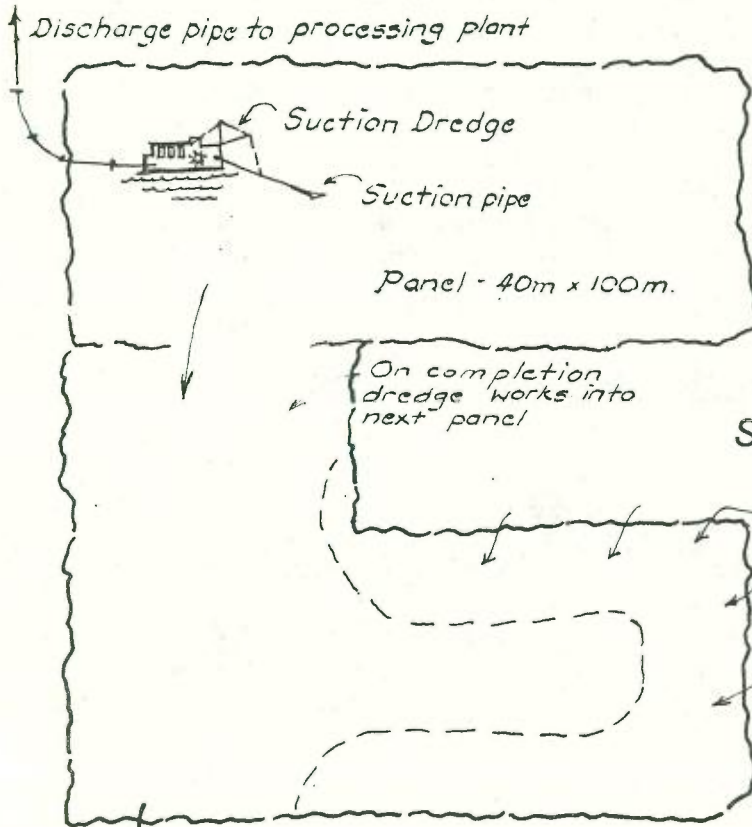
FIG 4

STAGE 1

Overburden Removal
to 6 metre depth by dragline



STAGE 2 Dredging Operation

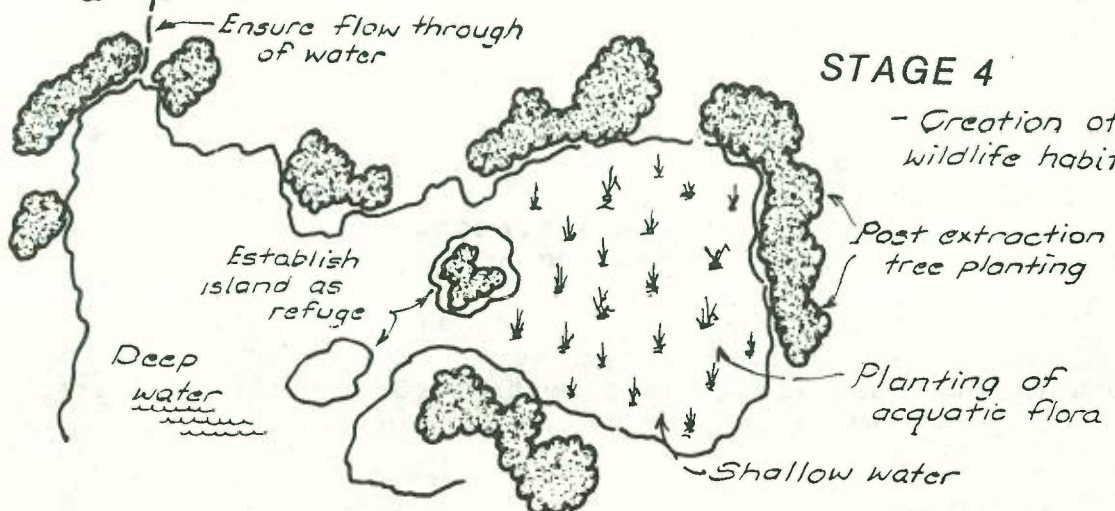


STAGE 3 - Initial Regrading of Extracted panel

Overburden returned

STAGE 4

- Creation of wildlife habitat



removal of the overburden, peat and clay, an area approximately 100 m x 40 m is left exposed for further mining by a suction cutter dredge.

Whilst dredging operations are in progress an adjacent panel would be undergoing overburden removal. The operation would be phased in such a manner that upon the completion of dredging one panel, the adjacent panel would have been stripped of overburden and would be ready for dredging.

Panels would be separated by a distance of 10 - 20 m and the dredge would cut its own channel from one panel to the next. The dredge will join some panels together to enable larger water bodies to be created when restoration is carried out. Dredging operations would not be permitted within 10 m of existing or rerouted drainage lines.

Once the suction cutter dredge has completed a panel it would move to the adjacent panel, leaving a water filled hole approximately 15 - 20 m deep. This dredged panel would progressively be infilled by overburden and processing plant wastes. Thickened processing plant wastes would be pumped out onto the floor of the dredged panel to minimise turbulence.

3.5 POST EXTRACTION ACTIVITIES

After mining has ceased in a panel, swamp/bulldozers would be used to push all the overburden into the dredged panel in such a manner that some shallow flats would remain (protrude) within the panel. These flats would then be planted with aquatic plants. Shallow flats, as opposed to deep ponds, are an ecological necessity and with time these flats if linked into the drainage system would be naturally populated by the existing life forms within the area. Rehabilitation will commence immediately after the dredge has left the mined panel.

3.6 TRANSPORTATION

It is proposed that the transport of the extracted material from the stockpiles on site, to the markets, would be a three stage process. Firstly the material would be loaded into trucks and taken to a suitable transfer point on the Hawkesbury River near Wiseman's Ferry. Here it would be transferred to barges to be taken downstream to a transfer site in the vicinity of Brooklyn. It would then be transferred back to trucks for delivery to the Sydney purchasers. To minimise the handling problems, the materials might be transported in containers, which could be moved quickly from one conveyance to another.

3.6.1. ROAD TRANSPORT FROM THE SITE TO WISEMAN'S FERRY

Wright's Creek is 14 km from Wiseman's Ferry and considerable improvements to the existing road would be required, including sealing a 6.7 km stretch of road, widening and strengthening the road at various points and possibly the easing of some of the tighter corners. Due to the narrow, twisting nature of the road, articulated vehicles (up to 28 tonne capacity), would be unsuitable unless extensive road improvements are carried out. Therefore with some road improvement 10, 12, and 15 tonne capacity trucks could be used. Sufficient vehicle turning areas and parking should be provided onsite and at the barge loading area.

3.6.2. TRANSFER AND WATER TRANSPORT

A transfer site would have to be established near Wiseman's Ferry to enable the transfer of containers or materials from trucks to barges. Provision of machinery to affect the transfer, as well as a truck parking and turning area would need to be provided. As the output of fine-medium grained sand from the proposed operation will be approximately 760 tonnes per day, a wharf large enough to accommodate 6 barges should prove sufficient. The use of steel barges of approximately 130 tonne capacity (i.e. approximately 25 x 10 m) would enable one tug of about 475 horsepower towing two barges, to convey 250 tonnes of material at an average speed of about 6 knots. Current regulations prohibit one tug from towing more than two barges at any one time. Such barges would have a draught of about 2 m when laden, so a safe minimum depth at the wharf would be about 2.5 m at low tide.

As Brooklyn is about 40 km from Wiseman's Ferry a tug with two barges could manage one round trip including loading and unloading containers, in eight hours.

Thus for each tug in operation, between 18 and 50 truck movements (from site to transfer point and return) would be required in an eight hour period.

3.6.3. ROAD TRANSPORT FROM BROOKLYN TO PURCHASER

The size of truck used for this transport will depend upon the quantity of material required by the purchaser and a variety of truck sizes might be used. These would need to accommodate one or more containers if a container system were used. Obviously the truck movements at both transfer points will create significant traffic problems.

3.7 MARKETS

At this stage it is difficult to assess the markets for clay as the quantity and quality of the material available is not accurately known.

The peat is believed to be of a superior quality, better than material currently imported from Germany. According to the proponent, the total reserves in Wright's Creek are estimated at 250,000 m³. Whilst this is a small amount, it is likely that this can be marketed without difficulty in view of the high costs involved in importing peat.

The sand available is a fine-medium grained silica sand, some being suitable for industrial purposes, that is in foundries and glass making. Further testing will determine whether the sand reserves are suitable for concrete production. It may be that the charcoal content renders it unsuitable, even after beneficiation.

3.7.1. FOUNDRY SAND

In 1979-1980, 200,000 tonnes of foundry sand were produced in NSW, of which approximately 130,000 tonnes were produced from Kurnell. Kurnell has considerable reserves of sand suitable for foundry purposes and if such reserves are used solely for foundry purposes, it would enable Kurnell to continue at present production rates for 50 years.

Demand in the Sydney region for foundry sand is at present almost totally satisfied by production from Kurnell with a small quantity being supplied from Belmont near Newcastle. Most of the foundries currently operating in Sydney are south of the Harbour and the Hume Highway. Thus Kurnell is situated close to most foundries, with the result that sand from Belmont has to travel four or five times as far and on average costs \$23.50 per tonne delivered, compared with \$16.50 per tonne delivered from Kurnell. This price difference produces a 3.2% variation in production costs. As the foundry industry is experiencing competition from interstate and overseas, it is operating on a fairly small margin.

In such a situation, the price of sand from Wright's Creek would probably fall between the price of sand from Newcastle and Kurnell, although with the multiple handling involved in barging, the end product could be similar to the Belmont price. Under these conditions, Wright's Creek sand would not have a ready market as foundry sand unless production at Kurnell was significantly reduced or stopped. Current plans are for foundry sand to continue to be extracted at Kurnell for at least the next 50 years (Cameron et. al., 1980).

3.7.2. GLASS SAND

In 1979-1980, NSW produced 210,000 tonnes of sand for glass making. This market is quite small at the moment, and in view of the multiple handling at Wright's Creek, sand from that source is unlikely to be competitive with other sources.

3.7.3. CONSTRUCTION SAND

The main uses for fine-medium grained sand in construction are as a filling agent for pipe bedding in trenches, and as a component in concrete. Current demand in Sydney is approximately 1.7 million tonnes per annum, of which 1.2 million tonnes comes from Kurnell. The suppliers are Breen Holdings, Hooker Industrial Sand, and Pioneer Concrete (NSW). Indications are that extraction of sand from Kurnell will be permitted for a further 5 to 10 years. Alternative sources therefore need to be found.

4. DESCRIPTION OF THE EXISTING ENVIRONMENT

4.1 TOPOGRAPHY

The areas proposed for extractive industry are Wright's Creek and its tributaries in the Macdonald Valley north west of Sydney. The Macdonald is a tributary of the Hawkesbury River, and has its confluence with that stream at Wiseman's Ferry. The Macdonald River rises at an altitude of 650 m above sea level and drains a basin in excess of 2,000 km².

The region is a part of the Sydney geological region, and as such retains the features typical of the topography of Triassic sandstone formations. The Macdonald cuts through Hawkesbury sandstone for the most part, and thus has formed steep valley walls with rugged, exposed sandstone cliffs in the upper reaches. For most of its 180 km length, the Macdonald has a valley width rarely exceeding 400 m.

In the valley bottoms is a substantial accumulation of alluvium. In the past 40 years, the Macdonald has changed its channel morphology considerably. The changes involve a massive increase in the rate of siltation of the river bed, which has led to shallowing and widening of the bed. The accumulation has changed landuses as well as basic topography.

4.2 DRAINAGE AND SEDIMENTATION

Since the early 1940's the Macdonald Valley near Wright's Creek has aggraded its bed by 3 m and trebled its width. There has not been comparable siltation in other streams in the same area e.g. the Colo or the Hunter.

A number of possible reasons for this excessive siltation have been suggested. There has been no basic change in landuse over the time period, but it has been postulated that the aggradation is due to: erosion caused as a result of bushfires and over-frequent burning off, logging, fire trails and tracks, poor farming and grazing techniques (Scholer, 1974).

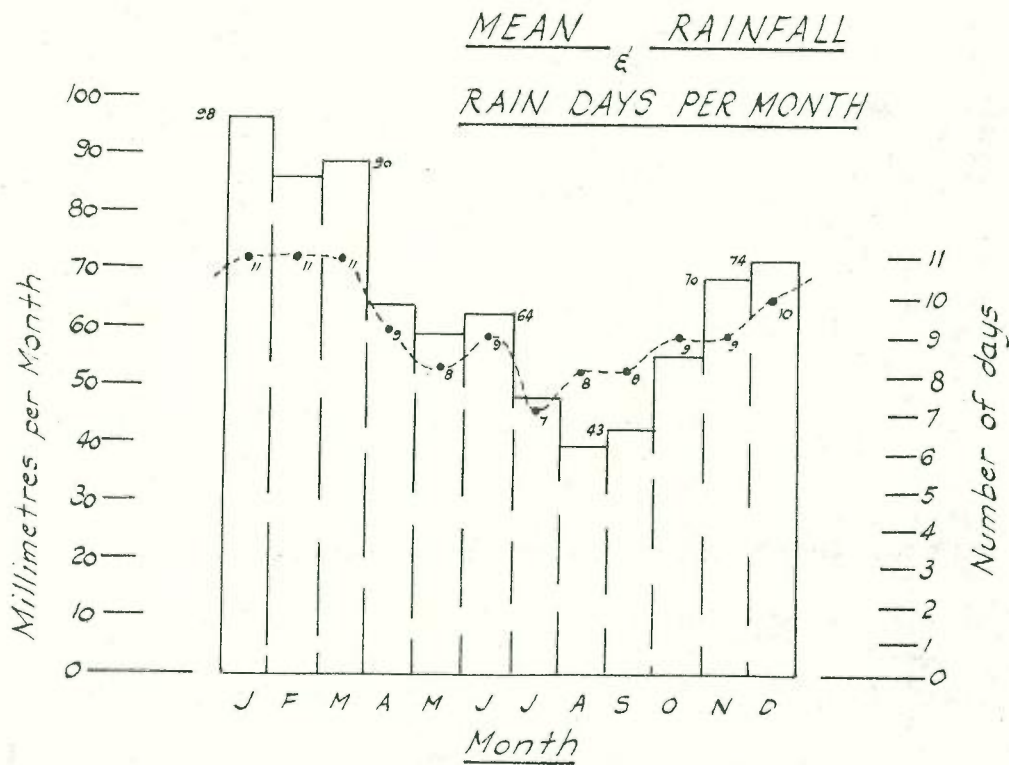
Due to the presence of the water table at the base level of the stream, there is some underground flow in dry periods. There is also a tendency for the stream to form lagoons and pools, particularly in its tributaries, as siltation occurs. Large tracts of land which were formerly suitable for grazing or cultivation have developed into wetlands or swamps. In a number of instances water is deep enough to form lakes such as Wellum's Lake. Documentation and old aerial photographs indicate the extent of the siltation in recent years.

A further complication in the drainage capacity of the Macdonald from St. Alban's downstream, is its low gradient. For the last 53 km of its journey to the Hawkesbury, the Macdonald's slope never exceeds 0.40 m per km.

4.3 RAINFALL AND RUNOFF

Rainfall averages and number of rain days per month for Richmond (Hawkesbury Agricultural College) are depicted in figure 5. It is assumed that these figures apply to Wiseman's Ferry.

FIGURE 5.



These figures show that the average annual rainfall in the area is 797 mm, which is fairly evenly distributed throughout the year. The Valley has, however, experienced numerous floods which have considerably altered its channel shape and size as previously noted. These periods of high precipitation resulting in increased flow are shown in Table 1.

TABLE 1

ESTIMATED ANNUAL STREAMFLOW OF MACDONALD RIVER AT ST. ALBANS
(10^6 m^3)

1905	31.0		1929	164.7		1953	203.0
1906	9.6	*	1930	355.7		1954	96.0
1907	32.8		1931	287.1	*	1955	618.8
1908	244.3		1932	8.0	*	1956	442.6
1909	107.7		1933	24.8		1957	4.7
1910	102.6		1934	203.1		1958	108.8
1911	83.0		1935	7.6		1959	70.5
1912	63.0		1936	17.5		1960	29.5
* 1913	583.1		1937	33.2		1961	94.5
1914	62.0		1938	14.7		1962	269.5
1915	47.7		1939	26.9	*	1963	456.1
1916	36.4		1940	9.7		1964	189.6
1917	35.0		1941	11.5		1965	13.6
1918	32.3		1942	164.4		1966	4.2
1919	2.6		1943	91.0		1967	132.8
1920	78.3		1944	7.9		1968	38.1
* 1921	362.1		1945	174.8		1969	153.3
1922	142.7		1946	204.3		1970	36.3
1923	5.5		1947	51.9		1971	171.6
1924	16.8		1948	80.0		1972	117.7
1925	19.1	*	1949	504.4		1973	88.1
1926	202.9	*	1950	1154.4		1975	42.2
1927	288.5	*	1951	314.3		1976	280.8
1928	92.3	*	1952	404.5		1977	241.1

Average annual flow 150.5

* Denotes years with flow more than twice annual average

From Table 3, Henry (1977)

4.4 HISTORICAL ASPECTS

4.4.1 ABORIGINAL SITES

There have been twentytwo groups of Aboriginal rock carvings identified by Sim (1966) in the lower Macdonald Valley. Several sites are reported in the Wright's Creek area. All are believed to be above stream and flood level, most being on the slopes and thus not affected by the proposal.

4.4.2 RECENT HISTORY

The St. Alban's area, through which the Macdonald River flows, has considerable historical significance for New South Wales. It was one of the first valleys settled for farming in the earliest days of the colony. Records show settlers as early as 1804.

The Valley has remained untouched by the urban expansion of Sydney until very recently. The Nature Conservation Council considers the area to have "...significant scenic and historical values...". The National Trust has listed the Macdonald valley as "Classified" on it's register. There are a number of historical buildings in the district, which reflect the colonial heritage of the area.

The natural aesthetic and historical qualities of the area are reflected by the lifestyles of the inhabitants, and render it a valuable recreation centre for the people of Sydney. The road from Wright's Creek to Wiseman's Ferry passes the Victoria Inn, the convict built Great North Road, the ruins of Jurd's house and Sternbeck's house.



Photograph 3. The Settlers Arms Inn, St. Albans

4.5 GEOLOGY AND RESOURCES

4.5.1 REGIONAL GEOLOGY

The area under consideration is located in the central part of the Sydney Basin (a broad structural basin). The outcropping rocks in this area are sediments of Triassic age and are described as, in descending sequence, the Hawkesbury sandstone and the Narrabeen Group.

The Hawkesbury sandstone is a relatively uniform formation consisting of massively (often cross) bedded, predominantly medium to coarse grained, quartzose sandstone.

The underlying Narrabeen Group is exposed in the basal valley slopes and valley floors. These sediments consist of quartzose and lithic sandstones, red and green claystones and some polymictic conglomerates.

4.5.2 LOCAL GEOLOGY

The Macdonald River is deeply incised into the plateau with the bedrock profile beneath the alluvium being cut to a former sea level which was approximately 100 m below the present one (Bird, 1976). Accordingly, much of the alluvium in the Macdonald River and its tributaries, is a Quaternary deposit resulting from the Flandrian Transgression (i.e. the last rise in sea level) which drowned the valleys between 17,000 and 6,000 years ago.

Recent sand deposits of the Macdonald River are mostly without gravel but have a silt component usually below 5% (Probert, 1971). The Quaternary deposits (which are approximately 20 m thick) in Wright's Creek consist of fine, medium and coarse grained sand, silty sand, clay and peat. Lack of subsurface data prohibits an accurate description of these deposits, however, in summary, the sand deposits represent a drowned estuarine succession. The sand beds are intimately mixed and contain variable amounts of silt. In general the size grading of the deposit is as follows:

fine grained	-	35%
medium grained	-	50%
coarse grained	-	15%

Silty sand, clay and peat occur randomly throughout the top of the succession. Some of the tributaries of Wright's Creek have only minor deposits of these components.

4.5.3 SOILS

Soils developed on the valley sides, where sandstones outcrop, are shallow and can be classified as coarse loamy sands.

Soils on the alluvial plain of Wright's Creek are generally clay rich and in the more swampy areas can be classed as organic rich clays. Some of the tributaries of the creek have uniform deposits of sandy loam. It was noted from some test holes that approximately 1 m below the surface there is a marked colour change and the soil becomes moderately well sorted sand with a minor silt component.

The erosive potential of the soil on the valley slopes

is high and becomes critically high if disturbed (e.g. by clearing). The clay rich soil within Wright's Creek valley is less susceptible to erosion, although most of the tributaries to the creek have less coherent soil profiles which could result in damage if careful land management practices are not followed.

4.6 BACKGROUND NOISE LEVELS

Under the NSW Noise Control Act, 1975, the L_{90} over twenty minutes is taken as the background noise level and is measured when the difference between the plant noise and background noise is likely to be greatest. Since the background noise level in the vicinity of Wright's Creek is 26 dB(A), the Act provides that a background noise level of 30 dB(A) be assumed.

4.7 AIR QUALITY

Despite being part of the Sydney air shed, the Macdonald Valley air is reasonably clean, having no major sources of pollution in its proximity. It does, however, suffer from spillover and recirculation from the metropolitan area. The unsealed roads provide a localised dust source and hamper visibility. Reasonably thick fogs can occur in the winter months, but usually clear by mid morning.

4.8 RECREATION

Increasingly because of the historic character of the region (both European and Aboriginal), the Macdonald Valley is becoming a favourite spot for picnickers and day trippers. (During a weekend in July 1982, fifty cars were parked at the Settlers Arms picnic area.) Much is made of the scenic beauty of this area in the Colo Shire Strategic Recreation Study (1974). There are two rooms available at the Settlers Arms in St. Albans, and the picnic area near the Settlers Arms is often used as a camping ground. It is also a major centre for horse trekking and endurance riding competitions. Trail bikes are also common in the area. The Colo study (Op. cit.) predicted the number of vehicles would increase from an average of 300 per day (600 on holidays) in 1974 to over 600 per day (1000 in holidays) if the road condition is improved.

4.9 VISUAL ASPECTS

The appearance of the Macdonald valley reflects its change in role over the passing of time. The valley slopes are still thickly timbered, a reminder of the time before Europeans, when the entire valley was covered with trees. The valley floors are all cleared and cut up into farms, largely neglected and no longer used for agriculture, reflecting the declining fertility of the soils and the pressure to subdivide for "Hobby farmers" from the city. Many of the wetland areas form significant waterfowl habitats with their own attractions.

It is the visual quality which attracts both locals and tourists alike and will continue to captivate visitors who discover the valley.

4.10 WATER QUALITY

The water in Wright's Creek is filtered by sand and reed beds and provides a suitable habitat for numerous species of birds and fish. It is also of suitable clarity for use as stock drinking water. Significant algal blooms (orange/brown) were observed during the winter months.

4.11 FLORA

Three distinct areas of flora exist.

4.11.1 VALLEY SIDES

The valley sides are quite steeply sloping and contain native forest/woodland. These areas show little evidence of clearing, containing trees of various ages. Species vary with slope, soil type and aspect, but include: Eucalyptus botryoides, E. fibrosa, E. paniculata, E. salinga and E. tereticornis. In addition Angophora floribunda and Casuarina littoralis are present.

4.11.2 VALLEY FLOOR

The floodplain and its fringes have been extensively cleared and grazed from the time of first settlement, so little original vegetation remains. Some regeneration of Acacia decurrens was observed together with Leptospermum flavescens and Melaleuca ericifolia. However, the greater part of the vegetation was grass with bracken and brambles on some of the shallower slopes. Lantana, paspalum and other weeds were also common. In addition, domestic garden plots and a small citrus grove are present. There are a number of mature poplar plantations within the MLAs.

4.11.3 WETLANDS

A distinctive wetland area with dense beds of Juncus usitatus (rushes) exists on the floodplain. The rushes serve to filter sediment from the creek and also provide important breeding grounds for invertebrates, fish and birds. Areas not permanently underwater but subject to flooding are covered by grass and small clumps of reeds.

4.12 FAUNA

Wright's Creek is close to the northwestern edge of the Dharug National Park and as such is of some importance to the fauna in the area. On the basis of scatological evidence wombats and wallaroos appear to be fairly common in the area. Also a number of wombat burrows were observed, several with evidence of recent activity.

In the wetland numerous waterbirds, including Australian pelican, black duck, black swan, coot, swamp hen, teal and white-faced and white-necked heron were observed. Many of these birds nest in wetland areas such as those in Wright's Creek, and it is quite likely that the rushes provide nesting sites for a considerable number of species.

The presence of so many waterbirds is indicative of a rich aquatic fauna, especially small invertebrates and fish.

In addition to the waterbirds there are a large number of other birds in the valley including birds of prey, lyrebirds, swallows, wrens and the ubiquitous kookaburra.

4.13 TRANSPORT

The existing road from Wiseman's Ferry is unsealed after the first 7 km. The road is narrow and has many tight curves and a number of blind corners and crests. Passing points exist, but due to poor visibility are of limited use. The area is also subject to morning fogs in winter months.

Dust and surface erosion are a problem on the unsealed sections of road and the edges are often poorly marked, especially where steep drops occur at the sides of the road.

An alternative route from Wiseman's Ferry to Wright's Creek is available along the western bank of the Macdonald River. This route, via St. Albans village, is almost double the distance and involves using the bridge at St. Albans.

Three ferries operate at Wiseman's Ferry. The ferries on the eastern side which would be used for carrying vehicles for the proposed development have maximum capacities of 154 tonnes and 65 tonnes respectively, and take an average of 12-15 minutes for each round trip. At present the second of these ferries is only used during peak tourist season or when one of the other ferries is being serviced. The third ferry which connects the western side of the Macdonald with the great Northern Rd. has a load limit of 65 tonnes.

4.14 POWER SOURCES

Power lines are laid up the valley to St. Albans. There is a fuel agency in St. Albans which can supply both diesel and petrol in 44 gallon drums. The Settlers Arms Inn has two petrol pumps supplying super grade petrol.

4.15 EMPLOYMENT

Within the Macdonald Valley there are, at present, few employment opportunities. Many landholders commute to Sydney either weekly or daily. There is only one shop in St. Albans, and the Settlers Arms provides only a few jobs.

4.16 LAND ZONING

Colo Shire Council's concern for the historic and tourist attractions of the Macdonald Valley is reflected in the planning controls it has imposed.

Interim Development Order Number 3, Shire of Colo, came into effect in 1975 and zoned all land in the valley Non Urban A1. Under this zoning, extractive industry is permitted provided that council permission is sought and granted. Council is not able to grant approval for mining without the agreement of the Department of Environment and Planning.

Land in both the Macdonald and Wright's Creek valleys is included in an Environment protection Area and Council must therefore give special attention to any development. As most of the land is privately owned, it is likely that special protective conditions would be imposed by the Council.

4.17 LAND USE

4.17.1 AGRICULTURE

Although the level of agricultural activity in the general area is less than it was in the 1960s, some farming is still carried out. Grazing is the major rural landuse in the valleys and is confined to the flat land adjacent to the river and creeks. Although there were several dairies in the area in the past, the only cattle now raised are for beef. With increased recreational pursuits in the area, a number of farms are now grazing horses for trail riding.

4.17.2 FOOD

Apart from vegetables grown for home use, there does not appear to be any commercial vegetable production in the Macdonald Valley below St. Albans. In the vicinity of St. Albans, the growing of corn and marrows was noted. It is thought that as a result of flooding in the Macdonald River, much of the land, which was capable of vegetable production, is now covered by sand. There are a number of citrus orchards between Wiseman's Ferry and St. Albans.

4.17.3 FORESTRY

The surrounding hills are covered in open sclerophyll forest, which in the past was logged. This has now ceased. Some areas along the river flats are used for poplar growing. It appears that these were planted 15-20 years ago.

4.17.4 HOUSING

There are three villages in the area. Firstly there is the historic settlement of St. Albans which comprises some 20 homes. Although this is not a significant residential area, it is the focal point for the valley, and provides community services for the residents. On the eastern bank of the Macdonald River some 3 km from its junction with the Hawkesbury, are 20 or so cottages. These are mainly holiday houses. The third village is Sunnyvale, 6 km north of Wiseman's Ferry. This village contains over 30 cottages, some recently constructed.

4.17.5 OTHER USES

Several other land uses were noted in the area. Adjacent to the road is a cemetery which contains graves of early settlers. There are several riding schools and the Macdonald Valley Public School is on the opposite side of the river to the proposal.

Apart from the villages, properties range in size from 2 hectares upwards. Most allotments are approximately 10 hectares. The present tendency is for further subdivision.

4.17.6 WRIGHT'S CREEK

There are 10 dwellings within the Wright's Creek Valley and these are occupied by permanent residents. The cottages are either of fibro or timber construction and of moderate size. Most are only in fair condition. The majority of these dwellings are located between the turn-off from the Settlers Road and the area proposed for mining. There are also a number of vacant properties in this valley.

Because a large part of this valley, including the areas proposed for mining, is wetland, the agricultural potential is very limited. The predominant use is cattle grazing from the foothills to the fringes of the wetland, and these areas are quite small. The valley is used regularly for horse riding.

4.18 SOCIO-ECONOMIC FACTORS

To establish an impression of the socio-economic characteristics of the population, information has been extracted from the 1976 census. There are two Census Collector's Districts covering the general area from Webb's Creek to the Great Northern Road. The figures drawn from the Census are set out in Appendix "2".

At that time the population had a normal age distribution. The majority of the people lived and worked on rural properties. Hours of work were longer than normal, and incomes were substantially below the New South Wales average.

The quality of housing was not high and water was provided from tanks. Septic tanks were used for sewerage disposal.

Only 45% of the people lived in the same dwelling in 1976 as they had lived in during 1971. This illustrates the considerable turnover of properties in the intercensal period. Observations indicate that this trend is continuing.

Discussions have been held with a number of people owning properties in the St. Albans area. These people confirm that many properties have been acquired in the valley in recent years. It appears today that there are two groups within the valley - they are the original farming inhabitants and the new arrivals, mostly from Sydney. There seems to be no consensus among the residents as to the desirability of the proposed sand mining operation. The older residents seem to be more tolerant of the proposed extraction than the newcomers.

There are some limitations in utilization of the 1976 Census statistics. The most obvious problem is the age of the data. The information also excludes non-resident land owners, who may have a significant voice in supporting or opposing the proposal.

The population of the area is typical of a rural rather than an urban area, with low incomes and living standards. It is thought that those who have purchased properties in the valley in recent times are in a considerably higher socio-economic grouping than the original residents.

5. PHYSICAL AND BIOLOGICAL IMPACTS.

5.1 IMPACTS WITHIN THE WRIGHT'S CREEK VALLEY.

5.1.1. EXTRACTION AND INFRASTRUCTURE.

Topographical

The extraction of peat, clay and sand from Wright's Creek valley, would have an impact on the topography as a result of the large stockpiles of overburden and extractive material, as well as ponds and small lakes.

Drainage and Sedimentation

In chapter three, the need to separate the extraction process from the existing stream patterns was stressed. Unless this occurs there will be a contamination of through flowing water by suspended solids generated from the extractive operation. The construction of channels along selected sections of the Wright's Creek valley (ie where isolation of extractive operations is required) will improve the throughflow of water. This improved throughflow may alter the groundwater level with a consequent reduction in wetlands area. It is probable that a process water dam will be constructed on a tributary to Wright's Creek adjacent to the processing plant (see figure 3). If the flow down Wright's Creek is impeded for some reason (eg. process water dam), there would be a reduction in the provision of sediments to the Macdonald River. This in time will affect its channel geometry, with the possible enlargement of the channel and a return to the river's earlier equilibrium level as the scouring of the bed occurs. These impacts will however only be of minor significance since a "nick-point" occurs on the Macdonald River approximately 1 km upstream from the Wright's Creek confluence (Henry (1977), p.8). Damming of Wright's Creek is not envisaged as peak flows resulting from heavy rains would be destructive.

If groundwater resources are tapped to supply process water, a general lowering of the water table in Wright's Creek is expected. If the natural water level is allowed to vary by more than about 0.3 m in either direction, this could affect the wetland vegetation, and hence fauna.

Some linkage of the rehabilitated panels to the creek would be necessary to ensure that stagnation effects are minimised.

Soil Erosion

Minor soil erosion associated with earthworks will occur on or adjacent to Wright's Creek. The resulting eroded material would need to be contained in a catch-all settling pond, to be built immediately downstream from the proposal.

A major erosion hazard may exist if heavy rains or flood waters breached retaining walls and/or engineered stream diversion channels.

Flora

The impact on the flora of the valley sides of Wright's Creek would be minimal as the slopes will not be subject to any mining and in most places are too steep for the siting of plant or buildings, rendering clearing unnecessary.

Most of the vegetation on the floodplain would be removed during the extraction operations and some grazing land would be lost. In addition mining the valley floor would result in the removal of most, if not all of the wetland vegetation. In view of the significance of the rushes as a wildlife habitat extractive operations should not be permitted closer to the rushes than 200 m. This guideline may be achievable in that the cost of overburden removal (including rushes) may be prohibitive and more accessible sand deposits upstream from the rushes would be exploited first. Measures to maintain the water level in the rushes within reasonable limits (i.e. 0.60 m total variation), should also be undertaken as variations greater than this have an adverse effect on the littoral and deep water vegetation. This condition would have to be negotiated as part of the development consent.

Other significant impacts on the vegetation include the removal of at least two plantations of poplars, and also the loss of some dense stands of melaleuca in the upper valley.

Fauna

Movement of plant, trucks and people, as well as the noise they generate are all likely to affect the animal life in the valley. While some species, such as ducks, coots and small lizards, can learn to live with the disturbance, others, such as wallaroos, lyrebirds and egrets, are severely affected. Breeding in wetland areas would also be inhibited. Hence it is suggested that mining take place as far away as practicable from the rushes.

Destruction of several wombat habitats is likely to occur as a number of sets of burrows were observed in the sandy soil in and around the edges of the floodplain.

Landscaping of the ponds left after dredging should be undertaken, with edges graded to a slope of no more than one in five. Such conditions favour the growth of vegetation and are suitable for waterbirds. Irregular edges are also preferred as this increases the length of shoreline and assists in establishing the variety of conditions, necessary to ensure a variety of vegetation, invertebrate fauna and nesting sites. A number of small islands would help to create areas suitable as refuges for water birds. Deep water areas should be confined to

the centres of the ponds, not only as they are unattractive to most birds but also for safety. Once earthworks are completed each panel should be planted with appropriate vegetation to encourage fauna to colonise the area.

The effects of the extractive operation on the waterbirds and other wetland fauna should be reduced as much as possible by:

- restricting the extent of operations at any one time to the minimum practical area.
- landscaping each panel as extraction is completed.
- ensuring that at any one time sufficient wetland is left undisturbed to act as a refuge area and to stock landscaped panels with indigenous species of fish, invertebrates, and some vegetation.
- any rehabilitation of wetland be carried out under National Parks and Wildlife Service Guidelines (SPCC Policy)

Water Quality

Since it is proposed to segregate the mining operation from existing streams by the use of major earthworks and safety banks, and the diversion of runoff from the plant into two settling ponds, the water quality effects in times of normal flow would be minimal. Some danger of contamination from the proposal exists to downstream sites in times of flood. All engineering works (e.g. settling ponds) should be designed with the flood danger in mind.

Waste water from processing will be recycled in a closed system. At times some water could be discharged into Wright's Creek which must comply with the SPCC Guideline of 50 mg/litre suspended solids. This standard could be satisfactorily achieved by the use of a "Warman-Envirotec" clarifier/thickener in combination with settling ponds.

Exploitation of the groundwater resource should be such that its quality and extent are carefully monitored.

Air Quality

The extractive process would cause a negligible increase in air pollutant levels for the residents of Wright's Creek valley, with the exception of local dust problems. Dust can be controlled by regular wetting of access roads.

Noise

The proponent will be required under Section 27 of the NSW Noise Control Act (1975) to submit an "Application for Approval of New Works" for scheduled premises, Class 3(b), to the SPCC. This application will include:

- a detailed description of the means proposed to contain

- or control noise from each major source.
- a list of the sound power levels for major noise sources after any specified acoustic treatment at one, two, ten and thirty metres in A-weighted decibels, including octave band levels and third octave band data.
- an estimate of the cumulative dB(A) at any nearby residential premises due to all noise sources located on the scheduled premises.
- a list of times of operation of each major noise source, including truck movements. The Act indicates that the preferred times of truck movements (having gross vehicle mass of two tonnes or more) entering or leaving the premises are 7 a.m. to 6 p.m. Monday to Saturday.

The type of machinery to be used at Wright's Creek has yet to be selected, however, major noise sources are likely to be the processing plant, dump trucks, suction-cutter dredges, scrapers, dozers and trucks used for road transport.

Excessive noise can also be expected to affect the hearing of employees and adequate safeguards must be provided by the proponent under the Health and Conservation Regulation (1979).

Visual Impacts

The peaceful landscape would be totally altered by the dredges, draglines, stockpiles of materials, trucks and the associated noise. Access roads, dust, settling ponds and any flood mitigating earthworks would add to the discomfort of the residents and/or to the detriment of the landscape. Figure 6 gives an indication of the scale of the visual impact arising from the proposal in Wright's Creek when viewed from a point 1 km downstream from the plant.

Power Sources

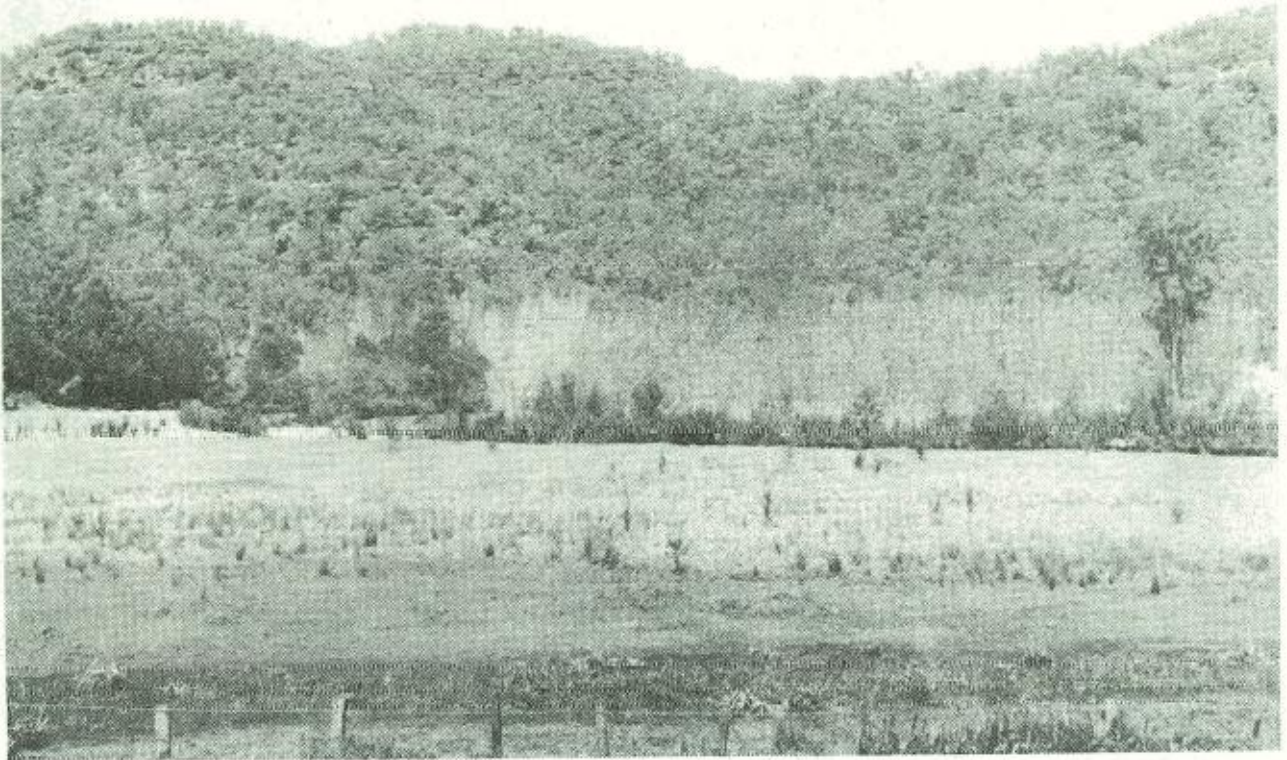
The equipment will be in the main diesel and petrol driven, requiring an on site fuel dump. Electricity is available in the Wright's Creek valley. Fuel will have to be bulk delivered to the site on a regular basis, necessitating good access, proper handling facilities and safeguards.

5.1.2. TRANSPORT

The transportation of extractive material from Wright's Creek would occur on weekdays from 7 a.m. to 6 p.m. (N.B. Truck movements to and from the site on Saturday are not recommended since they will conflict with the recreational use of the Macdonald Valley.)

The unsurfaced Wright's Creek Road would have to be upgraded to cope with the increased heavy traffic. As this road may not be sealed it would need to be continually maintained to

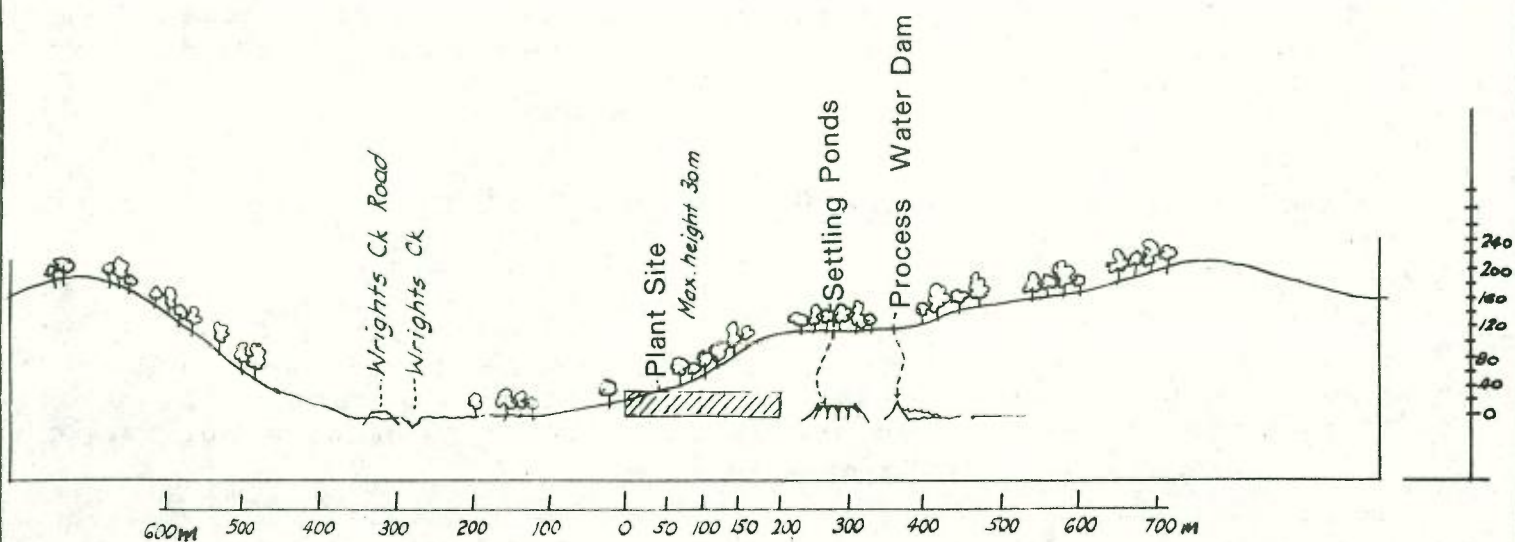
suppress dust. Alternatively a substantial upgrading of the road, including sealing and widening would remove the problem, however the cost of this may preclude this option (see chapter 7.3).



Photograph 4. Stand of poplars on proposed extraction site A

CROSS SECTION WRIGHTS CK.

FIG 6



Scale 1:10,000

Horiz. Scale = Vert. Scale

Loads would also have to be covered to minimise dust problems, and use of some form of enclosed containers could solve this problem.

Road transport will contribute significantly to noise pollution over a wide area. For example, at a distance of 10 metres from the trucking route:

$$\begin{aligned} L_{NP} &= L_{eq} + (L_{10} - L_{90}) \\ &= 32.5 + 80 - 30 \\ &= 82.5 \text{ dB(A)} \end{aligned}$$

where: L_{NP} = the noise pollution level

L_{eq} = the continuous dB(A) that would have produced the same A-weighted sound energy as the actual noise history over 24 hours.

$L_{10(90)}$ = the dB(A) level exceeded 10(90) percent of the time.

Most of the houses in Wright's Creek valley are built within 100 m of the road. Using the above figure of $L_{NP} = 82.5$ dB(A) in combination with the observation that noise levels decrease by 6 dB(A) for each doubling of distance from the noise source (SPCC Guideline), dwellings along the road may be subjected to noise peaks of approximately 60 dB(A) (dependant upon degree of screening). This peak is approximately 30 dB(A) above background levels at ground level. SPCC involvement can occur when background levels are exceeded by 5 dB(A). Consequently the proponent will have to endeavour to keep noise emissions from trucks to a minimum. The fitting of silencers will achieve some reduction however noise pollution will remain a principal environmental impact.

The intersection of Wright's Creek Road and Settlers Road would require roadworks so as to improve visibility (see photograph 5). Widening of the one lane bridge across Wright's Creek on Settlers Road is also advocated.

5.2 IMPACTS ON THE LOWER MACDONALD VALLEY AND WISEMAN'S FERRY

5.2.1. INFRASTRUCTURE

The required road improvements between Wright's Creek and Wiseman's Ferry as outlined in Section 3.6 would cause a minor loss of vegetation as well as instigating some soil erosion. These construction activities would also be of minor inconvenience to tourists as well as local residents.



Photograph 5. Intersection-Settlers Road and Wright's Creek Road



Photograph 6. Settlers Road - tight curves pose a traffic hazard

The positioning of the transfer site (truck to barge) entails many considerations and would be subject to a separate Environmental Impact Statement. Many topics requiring thorough investigation arise from transfer site considerations including:

- access
- pollution control (spillages)
- conflicts with Dharug National Park
- large capital costs
- noise from transfer machinery
- use of lighting at dusk (effects on nearby residences)
- visual impact.

The most likely direction of barge transport would be towards Brooklyn, as existing extractive operations are located upstream at Penrith. To avoid any accidents with the existing ferries it is recommended that the transfer site be located downstream of the present ferry crossing points. A possible transfer site is shown in figure 2.

5.2.2. TRANSPORT

Preliminary figures indicate that 760 tonnes of extractive material will be trucked out of Wright's Creek daily. The maximum load that can be carried by one truck is approximately 28 tonnes. These trucks are articulated and would require major road improvements for their safe operation. The cost of such improvements may prove prohibitive, but the use of large trucks would keep the number of journeys required to transport the sand to a minimum. Conversely smaller trucks would require less road upgrading, but increase the number of trips.

On the basis of individual truck capacity between 10 and 28 tonnes, the proposal would generate between 54 and 152 truck journeys in and out of Wright's Creek per day. That is, on average a truck would pass a given point on Settlers Road every 6.5 minutes.

The traffic generated by the proposal will cause a dramatic impact on the residents located on Settlers Road as well as on motorists travelling between Wiseman's Ferry and St. Albans. The road upgrading outlined above would greatly improve access to the valley and the number of vehicles using the Settlers Road would double (Planning Workshop (1974)). The increase in noise levels experienced by the residents adjacent to Settlers Road will be great and can be directly compared to the statistics pertaining to the Wright's Creek residents (see Section 5.1.2.).

The resulting diesel fumes and dust problems would lead to a minor degradation in air quality.

6. SOCIAL AND ECONOMIC IMPACTS

6.1 WRIGHT'S CREEK VALLEY

As the initial extraction area is in the upper reaches of the valley, the visual impact of the extraction on the valley residents is likely to be small. The site of the processing plant, however will be in close proximity to two residences (see figure 3) destroying the rural outlook currently enjoyed by these occupants. These residents have indicated a strong attachment to the valley and no desire to move. Consequently if the proposal proceeds these people will be faced with the prospect of living in severely degraded surroundings.

The continual flow of heavy trucks up and down the single access road with the associated dust, noise and fumes, will be a major irritation to all residents, particularly as most live very close to the road. Local residents feel that this will cause a severe dislocation to the idyllic rural environment that they desire. The necessary widening and upgrading of the access road will make this road a scar on the landscape and a continual reminder of the presence of the sand extraction industry in the valley. Some landowners downstream from the proposal feel that the interference would be such that they will have to sell and move elsewhere. It is unlikely that the newer landowners could recoup their outlay, as the increase in traffic would depress the value of the land. It is important to note that the proponent is the major landowner in the valley.

To minimise the loss of land value, the company needs to provide information to the public concerning the visual impact of the operation during its life, and guarantee rehabilitation of mined areas as soon as practicable. A substantial surety is required by the Department of Mineral Resources prior to commencement of a new development. This will be a significant step towards minimizing impacts and guaranteeing rehabilitation. Compensation to individual residents for degradation of their environment should be considered by the proponent.

Very little agriculture is carried on in the valley so there will not be a discernible loss of livelihood. However what remains (i.e. minor citrus orchards and grazing) contributes greatly to the landscape quality of the valley. There is, on the other hand, a flourishing horse-riding stable located near Settlers Road which makes considerable use of the tracks and fields within the valley for its operation. The trucks would disrupt this activity and probably require it to be relocated elsewhere. Within the mining area are several stands of mature poplars that would need to be harvested prior to excavation.

The residents in Wright's Creek will suffer some detrimental effects. However, as there are less than 30 people in the valley, the inconvenience caused may be marginal when viewed in a wider social and economic context.

6.2 THE MACDONALD VALLEY IN GENERAL

The effects on the residents of the Macdonald Valley will be similar to the impacts on the residents of Wright's Creek. The main social effects are related to transport rather than to the extractive operation.

Residents of the Macdonald Valley appear to view the impact of the development more as a threat to their lifestyle than as a loss in property value, although both points are important.

Those residents living between Wiseman's Ferry and Wright's Creek, particularly those living close to the road, will suffer significant disruption due to the noise and fumes, although there is already considerable traffic on Settlers Road in the tourist season and at weekends. This volume of traffic can be expected to double if the road is upgraded and sealed. Traffic generated on Settlers Road by both recreation and the proposed mining operation will be of major concern to residents. The residents of Sunnyvale (ribbon development) will be most affected and the safety of children may become a major issue.

The road improvement will turn the narrow gravel road into a sealed major secondary road which will be clearly visible on the landscape. The present unspoilt nature and lack of major development in the valley makes it appealing and a strong tourist drawcard. It should be noted however, that the tourists come to enjoy the recreational facilities as well and increased patronage may well lead to improved facilities. Increased use of the valley may benefit the residents of the valley by generating extra income and providing a number of jobs.

The number of jobs, which the proposal might provide for local residents is not expected to be high. If the operation is transferred from Kurnell to Wright's Creek, the company is likely to bring its trained operators into the works. Because of the long distance from Kurnell to St. Albans, it is likely the workers will move their homes closer to St. Albans. Where transfer of homes is not a possibility, then suitably skilled workers from the northern urban fringe or closer will be hired.

The impact on the historical atmosphere of the valley is less easy to gauge. The increased traffic flow will in some ways detract from the general impression created in the valley. However increased interest in the area may help in the preservation of some of the currently decaying, but important historical sites, such as the graveyard on Settlers Road, just north of Wright's Creek. However some facilities are already over used, such as the camping/picnic area opposite the Settlers Arms and the ferry service across to Settlers Road. Duplication of the ferry service by the proponent, as discussed in section 7.1,

would lessen this problem, at least on weekends when the trucks are not operating. Although, the projected increase in tourist traffic may negate this advantage.

6.3 WISEMAN'S FERRY

The people of Wiseman's Ferry will also be affected significantly by the proposal. The increased tourist traffic will disrupt the peace, although there is already a large traffic volume in the tourist season. If the sand is trucked to the Sydney market via Wiseman's Ferry, road improvements will have to be made to the Old Northern Road immediately adjacent to Wiseman's Ferry. This will involve widening, severe mitigation of the degree of slope and easing the tightness of the bends.

There also will be secondary effects due to the demand for increased facilities in the Wiseman's Ferry area, particularly as it is likely that some truck drivers will want to live in close proximity to the extraction site to minimise unproductive time and cost. The number of families involved is small however, probably less than twelve. Services such as food outlets and petrol stations are most likely to benefit. The increased tourist activity will no doubt generate additional jobs and revenue.

It must be borne in mind however, that the percentage increase in tourist traffic will be small. Presently for every vehicle that journeys north to St. Albans, five travel east. Thus a doubling of the traffic volume to St. Albans only represents an increase of 17 % in the total traffic using the ferry.

7. ALTERNATIVES

7.1 ALTERNATE MODES OF EXTRACTION AND TRANSPORT

The improved subsurface information obtained from the second stage of exploratory drilling will define water table levels, occurrence of clay and peat reserves and overburden dimensions. Depending upon the results obtained, excavating equipment such as scrapers, front-end loaders, power shovels, dredges and draglines would be used in various combinations. These are the standard machines employed in this type of extraction and no radical departure from the standard mining techniques is envisaged.

The transportation of extracted material to Wiseman's Ferry could also be achieved by conveyor belt and/or slurry line. Conveyor belts require high energy input and are much more costly than road transport. They are also not without their own environmental impacts and consequently would not be economical or practical. A slurry line is not favoured because it requires a large volume of water for its use as well as causing a disposal problem of contaminated water at the discharge point (Wiseman's Ferry). The distance and winding nature of Settlers Road would make the construction of either a slurry line or a conveyor difficult.

Originally the proponent indicated that he intended to dredge the Macdonald River to Wright's Creek (see Minutes of Public Meeting, 1981) so as to provide access for barges. This would be a major undertaking in itself and should be the subject of an Environmental Impact Statement. Dredging to provide a channel from Wiseman's Ferry to Wright's Creek would take several years and would almost certainly be uneconomical. The dredged material would be heterogenous in nature (i.e. a mixture of silt, sand, mud, and charcoal) and therefore not marketable without costly processing. A further major problem facing any channel dredging operation in the Macdonald River would arise when the river was in flood as the entrained sediment would be deposited in the dredged channel. The interaction of dredging and the river bank stability has not been satisfactorily resolved. Consequently the barging of extractive material from Wright's Creek to Wiseman's Ferry is not feasible economically or environmentally.

The proposal as gleaned from the proponent involves barge transport, however the capital cost as well as the running costs of a barge service substantially increases the cost per tonne of the extractive material. For example the cost of 3 tugs and 6 barges (secondhand) and the infrastructure costs of the transfer terminals could exceed \$2 million. To operate this transport system some 30 workers would need to be employed at a cost of approximately \$0.4million/year. Therefore the labour costs alone place an additional \$2.00 per tonne on the retail cost of fine-medium grained sand. (N.B. Kurnell sand currently retails at an average of \$4.50/tonne delivered). These figures

indicate that barging is uneconomical under existing market conditions.

An alternative and more economical means of crossing the Hawkesbury River would be to duplicate the existing ferry service at Wiseman's Ferry. Because of the number of trucks involved, at least one extra ferry comparable to the largest Wiseman's ferry (154 tonnes) would be required to operate continuously from 7 a.m. to 6 p.m. Monday to Friday. However substantial roadworks (four lane sealed road) would be necessary to allow the trucks to negotiate the Wiseman's Ferry hill on the southern side of the river. Other major impacts associated with this alternative transportation mode would be the effects of the heavy traffic on Wiseman's Ferry township as well as the area between there and Sydney.

The construction of a bridge across the Hawkesbury River at Wiseman's Ferry is also a possibility, however no definite proposals have been made by the Department of Main Roads. Notwithstanding the construction of a bridge the same traffic and access road impacts as discussed above in regard to the extra ferry crossing would occur.

In summary, the introduction of a new ferry service by the proponent would be more feasible than barging the extractive material. However both proposals have a significant detrimental impact on the landscape as well as on the residents (e.g. from noise) living adjacent to the transport route.

7.2 ALTERNATE SOURCES OF FINE-MEDIUM GRAINED SAND

Construction sand resources in the Sydney Region have been described in detail by Wallace (1980). Table 2 outlines the sources of fine-medium grained sand in the Region.

The extractive operation on the Kurnell Peninsula is under increasing pressure because of its environmental impacts. The extraction of fine-medium grained sand, but not foundry sand, from this area is likely to be phased out within the next 5-10 years (Cameron et. al., 1980).

A sand deposit also occurs at Maroota but its extraction would be restricted due to the fragmented land ownership of the area. The Pagewood-Eastlakes area, Narrabeen Lakes and Middle Harbour all contain small sources of sand, but mining in these areas is subject to considerable environmental constraints. On the other hand the Richmond Lowlands contains a large quantity of sand, but further investigation is needed before it can be developed. Development of this source will mean loss of the existing agricultural landuse as well as suffer from occasional major flooding.

TABLE 2
SOURCES OF FINE-MEDIUM GRAINED SAND

SOURCE	ESTIMATED QUANTITY	AVAILABILITY
Kurnell Peninsula	15 million tonnes	mostly available
Pagewood-Eastlakes	5 million tonnes	mostly unavailable
Narrabeen Lake/ Middle Harbour	~5 million tonnes	mostly unavailable
Richmond Lowlands	112 million tonnes	unavailable
Macdonald River	20 million tonnes	unavailable
St. Albans area	30 million tonnes	unavailable
Marine aggregate	12 million tonnes	unavailable
Maroota	15 million tonnes	unavailable
Pittwater and Port Hacking	(max) 100 million tonnes	unavailable
Penrith Lakes	unknown	available
Stockton/Anna Bay	~100 million tonnes	unavailable

For explanation of availability see text. This table is taken from Table 2 of Wallace (1980).

The Macdonald River itself contains a significant reserve, but it is not of the same quality, being in the main medium- coarse grained sand (Probert (1971)). These sands occur in shallow beds and are contaminated with mud and organic matter, and would be more difficult to extract and process than sand from Wright's Creek. In any extractive operation, flooding and siltation would cause difficulties. However, dredging the Macdonald River would help appreciably in flood mitigation and increase the recreational use of the area.

Pittwater, Broken Bay and Port Hacking have the potential to supply vast quantities of sand but little is known at present about the quality and quantity. The impacts of underwater mining have been the subject of controversy. Extraction costs are likely to be considerable. Dredging in Port Hacking is needed to improve navigation , (pers. comm. K. Lund), but the sand obtained would be heavily contaminated with shells and salt, limiting its usefulness. Consolidated Goldfields have prepared an EIS for Broken Bay which describes some of the problems of mining marine aggregate.

Wallace (1980) warns that unless Richmond Lowlands, St. Albans or Port Hacking becomes available, Sydney faces a shortage of fine-medium grained sand in five years time. This can be alleviated in the short term by mining some of the smaller reserves. His report favours the Richmond Lowlands and suggests that it be phased in by 1995. Until then, Kurnell should be permitted to continue with the possible contribution from Port Hacking and other minor sources. Indeed " the only possible alternative to Richmond Lowlands is the large scale extraction of marine aggregate."

Possible sources of unknown quality and quantity are also located at Penrith Lakes (primarily coarse sand , but some fine grained sand) and amongst the unstable hind dunes along the Newcastle Bight between Stockton and Anna Bay. This latter source would incur very high transport costs (\$16.00 per tonne to Sydney). Breen Holdings is known to have several small leases in the Hawkesbury River and the Georges River.

Should the extraction of sand from Wright's Creek not proceed, then one or more of the above schemes would need to undergo accelerated development, most probably the Richmond Lowlands. The development of the 112 million tonne deposit at the Richmond Lowlands would make the extraction of the Wright's Creek deposit (30 million tonnes), which has greater environmental impacts, unnecessary at this stage.

Increased effort into quantifying and assessing the quality of the resources outlined above is necessary to safeguard the long term future of fine-medium grained sand supplies for the Sydney Region.

7.3 COMPARATIVE ECONOMIC VIABILITY OF THE PROPOSAL AND ALTERNATIVES

The demand for fine-medium grained sand in the Sydney Region is static and is expected to remain so for at least the next 13 years (Cameron *et. al.*). This demand is about 1.7 million tonnes per annum, of which Metropolitan Sand (T.E. Breen) supply approximately 0.2 million tonnes.

The most important consideration in determining where a purchaser acquires his sand is the price at which it can be delivered by the supplier. This in turn is regulated by agreement between the Transport Worker's Union and the extraction companies. Prices can vary a little depending on the cost of extraction and ease of access to the delivery point. For example, the high number of traffic lights along Parramatta Road precludes Hooker Industrial Sand from delivering sand competitively any further west than Burwood despite the fact that Kurnell is closer than other deposits.

The Metropolitan Sand Company charges \$1.93 per tonne flagfall and 7c per tonne per km ex Kurnell. The extra earthworks, access roads and barging facilities required in the Wright's Creek proposal would increase the flagfall to about \$4.00 per tonne (see chapter 7.1). The cost of upgrading Settlers Road could add to this a further 30c per tonne. While the proponent may not be required to contribute to the upgrading of this road, a figure of \$4.30 per tonne ex Wisemans Ferry has been adopted to cover this and other contingencies. Because of the inferior access and road network in this region, with many steep hills and winding roads, the travel cost can also be expected to rise, probably to 10c per km per tonne (B.Nunn pers. comm.).

Figure 1 indicates the location of all the major proven and possible fine-medium grained sand deposits in the Sydney Region as described in chapter 7.2. The Wright's Creek deposit lies further from the centre of Sydney, than any other deposit in the Sydney Region.

Obviously sand from deposits south of the harbour (i.e. Pagewood-Eastlakes or Port Hacking if developed) would be the cheapest replacement for sand from the Kurnell deposit for that region, assuming no substantial special extraction costs. The sources west of the centre of Sydney, Penrith and Richmond Lowlands, similarly are best placed to cater for the expanding western suburbs and the hills district. Ease of access to the northern suburbs places the Penrith and Richmond Lowlands deposits in a more favourable position. The northern beaches and North Shore can be supplied cheaply from Narrabeen Lakes and Middle Harbour. The growth regions are thus well catered for by deposits closer than Wright's Creek, assuming that they are developed and do not incur any major extra costs.

If the Richmond Lowlands deposit is fully developed, it would be hard to imagine how sand from the Macdonald could

compete economically anywhere in Sydney (see Table 3 below). Access from the Richmond Lowlands to most parts of Sydney is superior to that from Wright's Creek, especially when the barging is taken into account. The Penrith Lakes scheme, should it prove to contain substantial reserves of fine-medium grained sand , would be similarly advantaged.

The difference in costs can be illustrated by comparing the cost of a tonne of sand ex Brooklyn (i.e. from Wright's Creek) with a tonne from the Richmond Lowlands. As barging of the sand to Brooklyn adds in excess of \$2 a tonne to the cost, direct trucking may be cheaper. However the nature of the road out of Wiseman's Ferry to Dural even with major upgrading, increasing the cost per km appreciably.

Table 3

COMPARATIVE COSTS OF A TONNE OF SAND

	Brooklyn	Richmond Lowlands
Flagfall	\$2.00	\$2.00
Transport to barge	\$2.00	-
Barge related costs	\$2.70	-
Total (per tonne to Brooklyn)	<u>\$6.70</u>	<u>\$2.00</u>

Brooklyn is further from most markets than Richmond, and the access, via the old Pacific Highway is more difficult.

If the sand were trucked to markets then, the cost of the sand transported as far as Wiseman's Ferry is:

Flagfall	\$2.00
Transport	\$2.00
Total	<u>\$4.00</u>

Wiseman's Ferry is still at least 20 km from the nearest market in the hills. The cost of the sand to this point is \$4.00, but it is still further from the markets than the Richmond Lowlands.

As the Richmond Lowlands is closer to the other growth areas the cost advantage will always be in its favour.

It is concluded that it would be more economical to develop the Richmond Lowlands which also has the advantages of being a larger deposit and including other types of sand. The majority of the other sources of fine-medium grained sand are smaller and could not individually replace Kurnell. However production from these deposits in conjunction with the larger deposits in the Richmond Lowlands would obviate the economic need to extract in Wright's Creek.

8. CONCLUSIONS

At present the proponent is engaged in the preliminary geological testing of the Wright's Creek deposit and has not produced a plan of the extraction operation. Therefore, the assumption of this environmental impact statement has been that the final proposal adopted by the proponent will seek to minimise environmental impacts. Even so there will be significant and unavoidable effects on Wright's Creek and the lower Macdonald Valley.

A number of salient points emerge from the present study.

Siting the extractive activity in the upper reaches of Wright's Creek will minimise its visual impact.

The engineered structures (e.g. process water dams and settling ponds) specified in the proposal would be in some danger from flooding.

Noise pollution from the extractive operation and processing plant will be localised to the Wright's Creek area.

The major impacts to the flora will be confined to the valley floor where most of the existing vegetation will be removed. Measures for minimising the impact on flora and fauna include careful regulation of water levels, restriction of mining activity to the minimum practicable area at any one time, landscaping each mined area as extraction ceases, and retention of refuge area as seeding sources for flora and fauna.

There will be loss of fauna on both a temporary basis, due to disturbance caused by the mining operations, and on a permanent basis due to changes in the nature of the wetlands. The proposed landscaping will, however, provide a habitat suitable for a large number of species.

In addition to the above, major impacts arising from the proposal will be associated with transport of the extracted material.

Firstly, the upgrading of roads both in Wright's Creek and the lower Macdonald Valley will cause a visual change to the countryside. Some land will be resumed to accommodate the wider roads. The sharp corners and many curves will need to be eased or straightened with a resulting loss of rural charm. Dust on Wright's Creek Road will need to be controlled by regular watering or other means.

The road improvements, instigated to improve truck access, will result in improved access to the Macdonald Valley for all vehicles. Consequently a large increase in recreational traffic, as well as truck movements is predicted. This will carry

with it the penalties of additional noise, air pollution and danger to local residents (especially at Sunnyvale and Wiseman's Ferry). Also the remote character of the valley and much of its historical atmosphere and charm will be greatly diminished, thereby significantly changing its attraction as a recreational area. Once the Settlers Road is upgraded, the increased recreational traffic will mean an improved turnover for the small service businesses at St. Albans.

The proponent has indicated that he intends to transport the extracted material by barge. As it is not feasible to operate barges up the Macdonald River a transfer station will need to be located in the Wiseman's Ferry area. This transfer point will be downstream from the ferries to eliminate the possibility of accidents. The inclusion of barging transport in the proposal does not seem feasible on economic grounds as barge related expenses add an extra \$2.70 per tonne of sand.

An alternative to barging is for the proponent to operate a ferry service for his own trucks. The major impacts of such a proposal would be associated with upgrading the road from Wiseman's Ferry to Maroota and the increased traffic on that road. The steep hill out of Wiseman's Ferry would need a sealed four lane road in place of the present two lanes. The cost of such upgrading is approximately \$1000 per metre. The increased truck traffic through Wiseman's Ferry would be likely to evoke a strong protest from residents. These impacts are therefore significant enough to warrant a reappraisal of this option.

By far the largest inferred reserve of fine-medium grained sand in proximity to the Sydney markets is in the Richmond Lowlands deposit. It will be more economical than Wright's Creek to extract. The environmental impacts associated with extraction from the Richmond Lowlands deposit are probably similar to, or less than those described for Wright's Creek deposit. To exploit the Richmond Lowlands and Wright's Creek deposits simultaneously would mean an unnessecary duplication of environmentally degrading activities. That such duplication is even under consideration clearly shows the need for a coherent plan for extraction of construction sand for the Sydney market.

Wright's Creek is an important reserve of fine-medium grained sand, however, until the impacts ascribed to transportation can be justified, and the economic viability of the proposal proven, sandmining at Wright's Creek should not occur.

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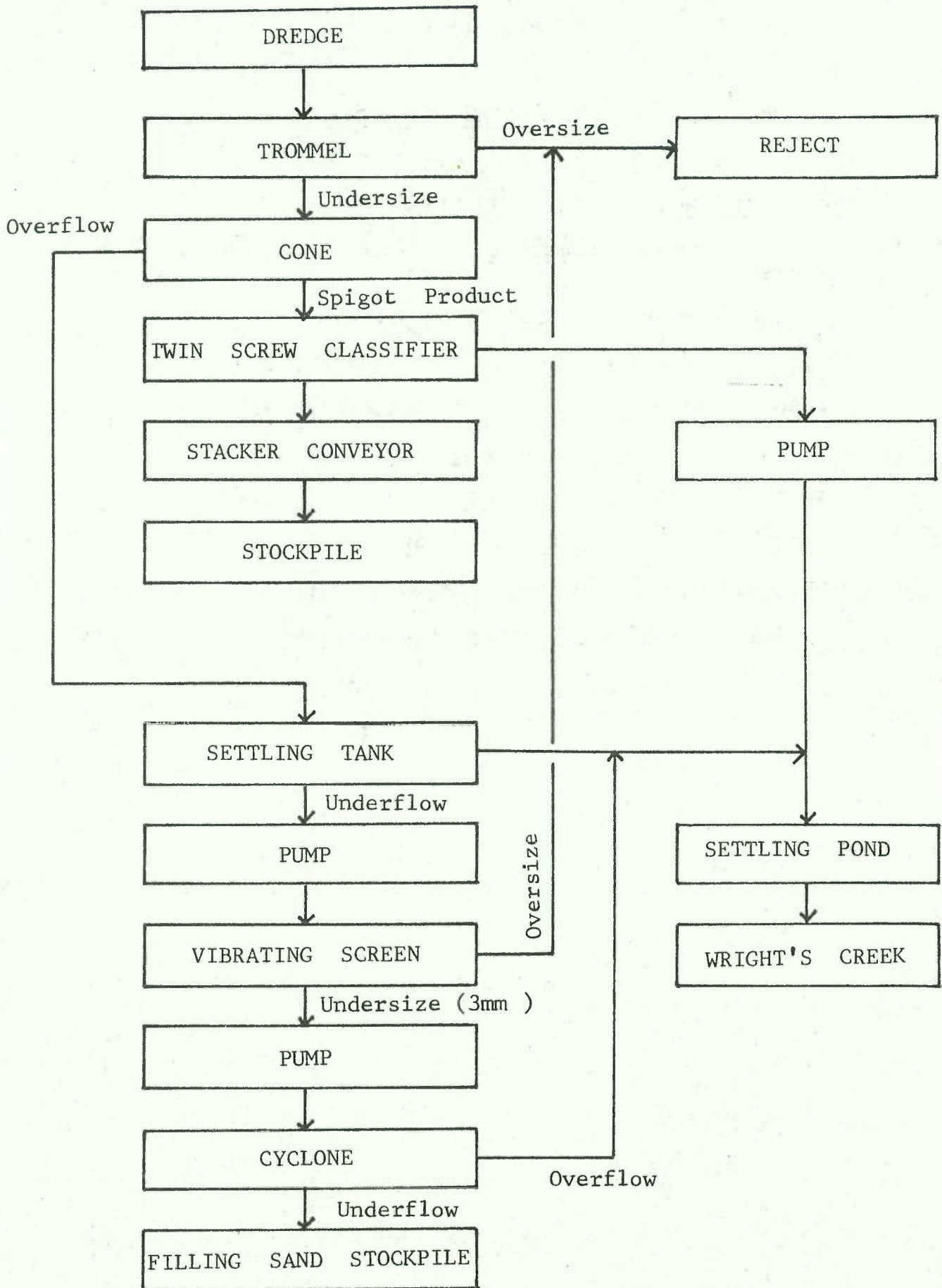
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CONSULTATIONS

1. Breen Holdings and Metropolitan Sand Compapny, T.E. Breen
2. Dept of Environment and Planning, I. Reynolds
3. Dept of Main Roads, NSW, M.A. Lloyd, Secretary
4. Dept of Mineral Resources, S. Lischmund and J. Watkins, Geologists
5. Dept of Public Works, B.D. Lloyd, Secretary
6. Ferrymasters at Webbs Creek and Wiseman's Ferry
7. Hawkesbury Shire Council, G. McCully, Shire Planner
8. Macdonald Valley Defence Association, Bill Gregory, President
9. Minister for Planning and Environment, E.M. Bedford
10. Minister for Public Works, J. Ferguson
11. Nature Conservation Council of NSW, C.H. Prattern, Chairman
12. Soil Conservation Service, NSW, L.D. Longworth, Commissioner
13. Sutherland Shire Council, K.Lund and P.Herborne, Town Planners
14. The National Trust of Australia (NSW), P.C. James, Acting Director



GENERALISED FLOW DIAGRAM
SAND BENEFICIATION PROCESS

APPENDIX 2

PROFILE OF SOCIAL FACTORS - 1976 CENSUS

The following data has been drawn from information in the 1976 Census for the two Collectors Districts surrounding St. Albans.

Population:

- Total Persons - 319 of which 28 or 9% were born overseas (Colo - 17% born O/S).

<u>Age Structure</u>	<u>Pop.</u>	<u>%</u>	<u>Colo %</u>
0 - 4	20	7	11
5 - 16	68	21	23
17 - 65	206	64	59
Over 65	25	8	7

	319		

Housing:

- Total dwellings in CD's = 259
- Unoccupied = 154
- Occupied = 105

- Of the dwellings unoccupied 134 were claimed to be holiday cottages.
- Of the 1976 population of 319 only 126 or 45% lived in the same dwelling in this area in 1971 i.e. 55% have moved into the area since that date.
- People living on rural properties = 148 or 47%.
- Only 87% of houses were classified as private which is lower than the figure for all of Colo i.e. 96%.
- 50% of the people claimed to own their house outright compared to the Colo figure of 32% while the % for those purchasing the property was correspondingly less.
- Housing standards (occupied cottages only i.e. 105)
 - . 50 constructed in timber and 36 in asbestos.
 - . 80% use tank water.
 - . 53% have septic tanks (Colo 85%) - balance have pan systems or like.

Employment:

- Of the population (319) 127 or 37% are in labour force and unemployment was about 2%.
- Of these 36 are self employed and 72 are wage earners with the balance being unemployed or unpaid help.
- 8 persons are Government employed, 119 non Government.
- 36% are farmers compared to the Colo average of 17%, next major group are labourers and process workers - 25%.
- Hours worked

	CD's	Colo
40 hrs.	40%	43%
49 hrs. plus	34%	30%

Incomes (Households)

- Varies greatly between CD's but both well below average for Colo.
Income bracket with greatest number of persons -
Colo 45% earned more than \$9,000
CD1 45% earned from \$5-8,000
CD2 9% less than \$4,000
- for CD's 72% earned less than \$5,000, but for Colo only 52% were below this figure.
(Average male earnings p.a. = \$9,500 as at June '76).

Other Data:

- Transport to work:

	CD's %	Colo %
- Car Passenger	36	67
Walk	18	5
Work at home	32	15
- Vehicle Ownership		
1 Vehicle	57	44
2 Vehicles	15	35
- Property Ownership		
Outright	50	32
Purchaser	17	37

MACQUARIE UNIVERSITY

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Sandmining at Wright's Creek in the
Macdonald Valley