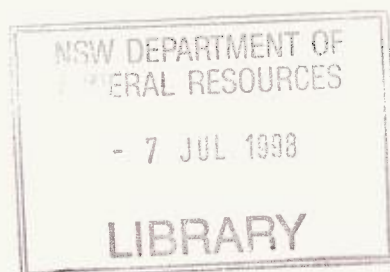




EIS 1370

AB020013

Gravel pits & derelict mines within the Upper Shoalhaven
Catchment : their impacts, management and rehabilitation



Gravel Pits & Derelict Mines within the Upper Shoalhaven Catchment

: their Impacts, Management and Rehabilitation



Peter Dougan

November, 1995

A report prepared for the Upper Shoalhaven Catchment
Management Committee

Project description and objectives

This report and associated research project was undertaken on behalf of the Upper Shoalhaven Catchment Management Committee as part of the requirements of the 'Applied Geography' Unit of the Geography Department of the Australian National University.

Funding for the project's expenses was provided by the Catchment Management Committee while the project itself was co-supervised by Steve Nichols, District Soil Conservationist, Department of Land and Water Conservation and by Richard Baker, Lecturer in Geography at the ANU.

The projects objectives, as stated in the original project application¹, were to develop a review of the environmental impact of derelict mines and quarries in the catchment. This will provide a report listing the sites of greatest environmental impact and identify those that may have existing security deposits that can be used for immediate rehabilitation. Other funding sources will be nominated for priority sites.

Early into the research process it was realised that the magnitude of the project was beyond that of the limited time available to me. As a result it was suggested that the project place particular emphasis on gravel pits and quarries within a select group of sub-catchments².

This final report attempts to achieve a balance of these objectives such that it provides some broad directions, strategies and analysis together with the necessary finer detail of the site surveys. These include an intensive survey of sites within the Manar and Durran Durra areas, as well as a broader but less detailed survey of sites within the broader catchment area that were of particular concern. A number of derelict mine sites were also located and assessed.

The same kind of in depth survey that I carried out in the Durran Durra and Manar areas needs to be repeated within the remainder of the Upper Shoalhaven Catchment so that the Catchment Management Committee, in addition to other relevant agencies and organisations, have a comprehensive basis to prioritise sites for rehabilitation. To aid such a future survey I have included in section 1.4 & 1.5 details of my research and surveying methods as well as some guidelines on how to best go about extending this process.

I would like to thank all those who assisted in the project, but particularly Steve Nichols, Richard Baker, the Tallaganda Shire Council and lastly, the Upper Shoalhaven Catchment Management Committee who initiated the project.

¹ Upper Shoalhaven Catchment Management Committee Project Application 1994/
95 Upper Shoalhaven Derelict Mine and Quarry Survey
² SJ Nichols Department of Land and Water Conservation, letter 31 August, 1995

Gravel Pits & Derelict Mines within the Upper Shoalhaven Catchment : their Impacts, Management and Rehabilitation

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Glossary

Quarry

an excavation pit, usually open to the air, from which sand, gravel, building stone etc is obtained by ripping, cutting or blasting.

Extractive Material

extractive materials are principally used as construction material in concrete, road base, road sealing, landfill and building products. They may be categorised as;

- crushed or broken stone - principally used as coarse aggregate
- gravel - used as coarse aggregate
- construction sand - used as fine aggregate
- unprocessed materials - mostly used for road making, fill, soil and landscaping materials

Sediment

Sediment is solid material both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water or gravity.

Access Agreement

An agreement between the operator of an extraction site (eg a council) and a landholder which establishes rights and responsibilities of each party in regard to access, soil and water management, site management, site rehabilitation, and safety procedure.

Leachate

A liquid that has percolated through tailings materials or other substances

Diversion Bank (or interceptor bank)

A bank specifically designed to divert water from the catchment above, normally to protect a sensitive or unstable area, or to carry runoff to or from a dam or waterway away from the natural drainage line. cultivated area

Rehabilitation

The treatment of degraded or disturbed land to achieve a level of capability and stability at least equal to that which existed prior to degradation or disturbance, or to an agreed alternative level of capability. Such rehabilitation may involve the reshaping of the land surface, spreading available topsoil, construction of soil conservation works, revegetation, and the establishment of land use practices which will ensure continued stability and productivity..

Revegetation

The re-establishment of plant cover on an area of ground that is depleted or devoid of vegetation. It is an integral part of erosion control on disturbed, eroded and/or degraded lands.

EXECUTIVE SUMMARY

The principal purpose of this project was to develop a review of the environmental impacts of derelict mines and quarries in the Upper Shoalhaven catchment.

- The project achieved this by undertaking a survey of gravel pits within a defined region so as to establish the extent of such sites. Once completed, the project went on to extend the survey to include sites of known environmental impacts within a broader area. As a result of this survey it is estimated that there are in the vicinity of 120-150 sand and gravel pits within the catchment. Of this number it is likely that 20 pits are of critical concern, of which size, greater proximity to watercourses and management are the critical determinants.
- The project additionally identified the extent of derelict mining sites within the catchment and spent some time assessing the site of greatest concern - that of the Mulloon Copper Mine. A survey of gold mining sites within the catchment was not made due to their extensive nature and the limited time available.
- A number of impacts were documented from the gravel pit survey most particularly the occurrence of erosion of gravel pits into watercourses causing sedimentation and turbidity and additionally onto productive land. Often erosional impacts extended off site into adjoining land uses or access tracks. A further significant impact of gravel pits is their aesthetic impact on the landscape.
- Other impacts documented included changes to landscape hydrology, weed invasion caused by large areas of bare ground and insufficient management, habitat loss, and impacts on heritage values. As such it was concluded that gravel pits, both those of a derelict nature as well as those currently in operation cause, or have the potential to cause, significant impacts on the environment.
- Preliminary evidence for the Mulloon Copper mine and gold mining in general would also suggest that these mining operations all have significant impacts but the degree of difficulty in rehabilitating such sites is much higher.

A further objective of this report was to provide a report listing the sites of greatest environmental impact. This was undertaken within the previously mentioned survey. Sites which the author believes warrant immediate attention include the following sites;

- i. **Back Creek TSR** : prioritised for partial rehabilitation in keeping with its current operational status
- ii. **Balmains** : so as to extend the area of current operation a distance of approximately 20 metres further distant from Reedy Creek)
- iii. **'Griggs'** : immediate rehabilitation.
- iv. **Doughboy TSR** : complete rehabilitation
- v. **Crokers** : rehabilitation particularly area south of the pit and the areas adjacent to the access track
- vi. **Ballalaba Bridge** : prioritised for partial or complete rehabilitation depending on its operation status
- vii **Mulloon/ Gordons pit**: access track requiring attention if not site rehabilitation

The last objective of the report was to **identify any existing security deposits for rehabilitation purposes and to nominate other possible funding sources for rehabilitation.**

- This was undertaken by an in depth inspection of the gravel pit royalty records of the Tallaganda Council. This process revealed a total funds of \$42,000 available for this purpose. Other sources of assistance are discussed in Section 7.

In conclusion it was deemed worthwhile to make a series of recommendations in regard to the ongoing management of extractive industry sites.

- In particular it is recommended that the Tallaganda council, the operator of the majority of gravel pits within the Catchment adopt a strategy of reducing the total number of pits it operates, rehabilitation of those pits not needed, and for sites which it intends to maintain use, to initiate a strategy of staged rehabilitation.
- Further recommendations were made for closer monitoring of the commercially managed sites and for the Tallaganda and Mulwaree Shire councils to cooperatively develop a set of principals and standards, in order to promote the more effective management and rehabilitation of extractive industries.

Section 1. Introduction

1.1 CONTENTS OF THE REPORT

This research report investigates the impacts, management and rehabilitation of gravel pits, derelict mines and other quarrying activities within the Upper Shoalhaven Catchment.

The legislative requirements relating to extractive industry operators and monitoring bodies were investigated (**Section 2**) to clarify responsibilities and requirements for management as well as rehabilitation.

Section 3 of the report contains details of a survey of gravel pits and other extractive sites within the Manar and Durran Durra map areas in addition to a less extensive survey of sites of particular concern within the larger catchment. This inventory reports on the individual status and management of sites and includes both derelict sites as well as sites currently in operation.

These findings are collated and discussed in **Section 4** in terms of their impacts on the catchment environment and their significance.

The operation, management and rehabilitation aspects of gravel pits and other extractive sites are discussed in **section 5** with particular attention given to best practice management principles, access agreements and rights of landholders and rehabilitation criteria.

Section 6 discusses the respective roles played by shire councils, government agencies and other stakeholders involved.

Section 7 identifies and discusses possible sources of funding as well as other resources that could contribute to the rehabilitation of derelict sites.

The report concludes (**section 8**) with a series of recommendations which pertain to the management, operation as well as rehabilitation of gravel pits and derelict mine sites. This is followed by a Strategic plan which outlines how these recommendations could be best put into practice.

1.2 BACKGROUND TO THE REPORT

This report arose out of concerns by the Upper Shoalhaven Catchment Management Committee and its constituent members including private landholders that derelict gravel pits and mine sites within the catchment were of an extent and impact as to cause a significant impact on the catchments environment.

Mine sites within the catchment date back to the 1860's and includes significant alluvial working of gold deposits. These impacts are evident throughout the

catchment and are often associated with more recent erosion and gullyng that has occurred as a result of the disturbed nature of the landscape. They are particularly evident at sites of sluicing and where water races have been constructed. Non alluvial workings extended to the extraction of copper, silver, iron and other minerals in addition to that of gold. These sites were typically of a small scale nature and are scattered around areas of mineral enrichment.

In more recent years as the shire and surrounding areas have grown 'mining' activities have included the extraction of sand, gravel and other building and road materials. Principal operators of the majority of these sites have been and presently are the Tallaganda and Mulwaree Shire Councils. Privately owned companies have been involved to a lesser extent, particularly on commercial sand extraction operations. These operations it should be noted are typically of a larger scale and occur in closer proximity to the Shoalhaven river and its tributaries. Some limited extraction also occurs on individual properties for private use.

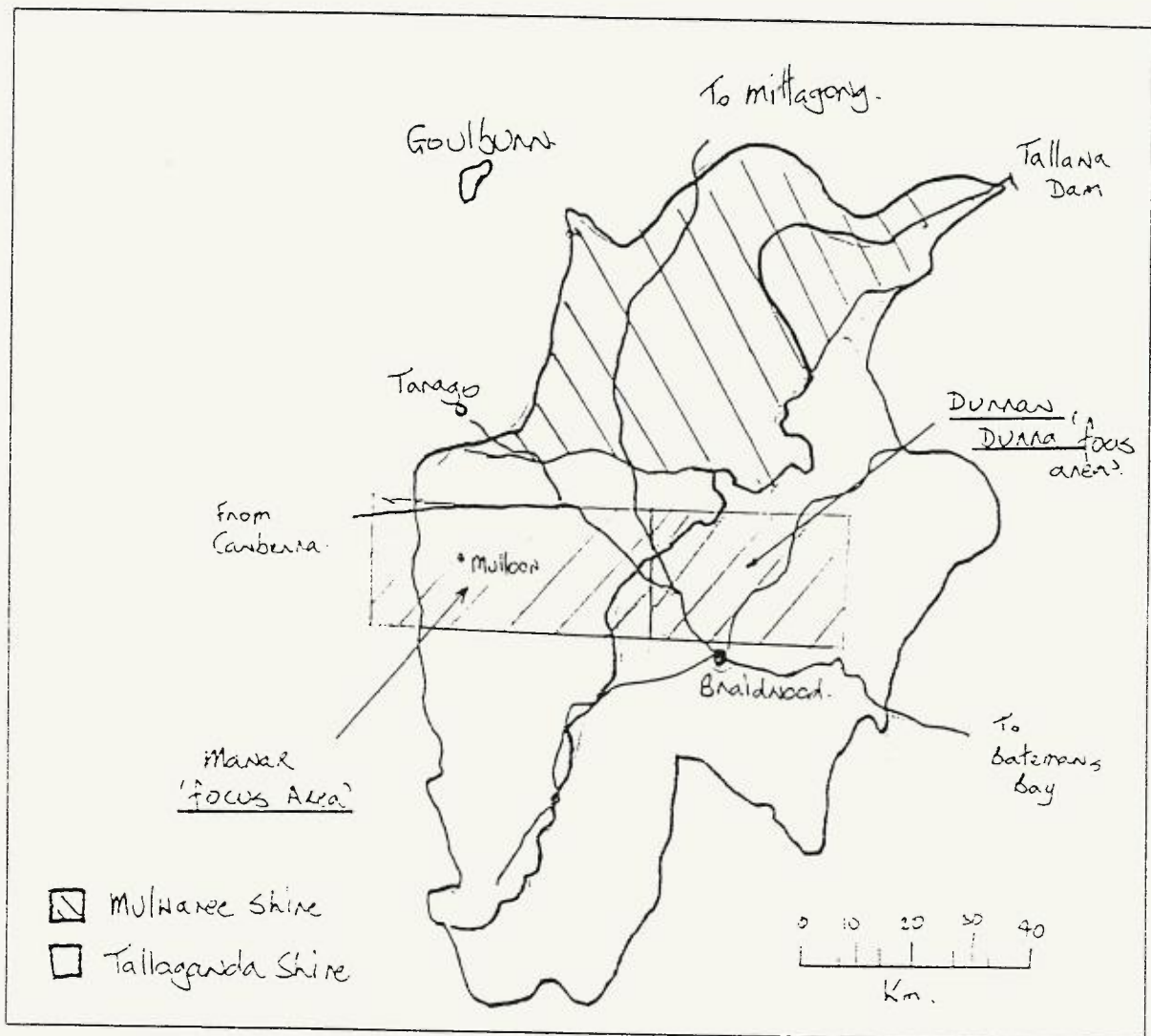
It is important to recognise that these extraction activities and industries, (particularly those of gravel pits which forms the primary focus of this report), supply materials which residents of the area directly are dependent on and benefit from. In particular the construction and maintenance of a safe and effective road infrastructure requires that these materials are extracted.

1.3 THE UPPER SHOALHAVEN CATCHMENT

The Upper Shoalhaven Catchment which centres on the town of Braidwood is located on the Southern tablelands 90 km East of Canberra. It consists predominantly of the Tallaganda Shire but also includes in its northern most portion part of the Mulwaree Shire which centres on Goulburn (Refer Map 1 : The Shoalhaven Catchment). The catchment covers a total area of approximately 4,000 square kilometres which is predominantly used for grazing, forest and nature reserves. The Catchment is experiencing an increase in population through people attracted to living on small rural blocks and the areas unique character. In addition, as Canberra has grown its influence on the region has strengthened through the impacts of commuters or people with weekenders - either within the region or travelling through it to the South Coast.

Accordingly, there has been a need for increased road infrastructure and building materials which directly influences the demand for extractive materials. The extraction of such materials, whether for road base or surfacing, construction uses, or in filling commercial demand from nearby population centres has a significant potential to impact on the catchment environment.

Map 1 The Upper Shoalhaven Catchment



Further to this there has emerged in recent years an increased knowledge, recognition and value, by both the community and various levels of government, of the importance of maintaining the health and sustainability of the catchment's natural resources in addition to the regions distinct character and heritage. It is within this context that concern on the impacts of extractive industries, particularly those of a derelict nature has grown.

Physical characteristics

- Geology and soils

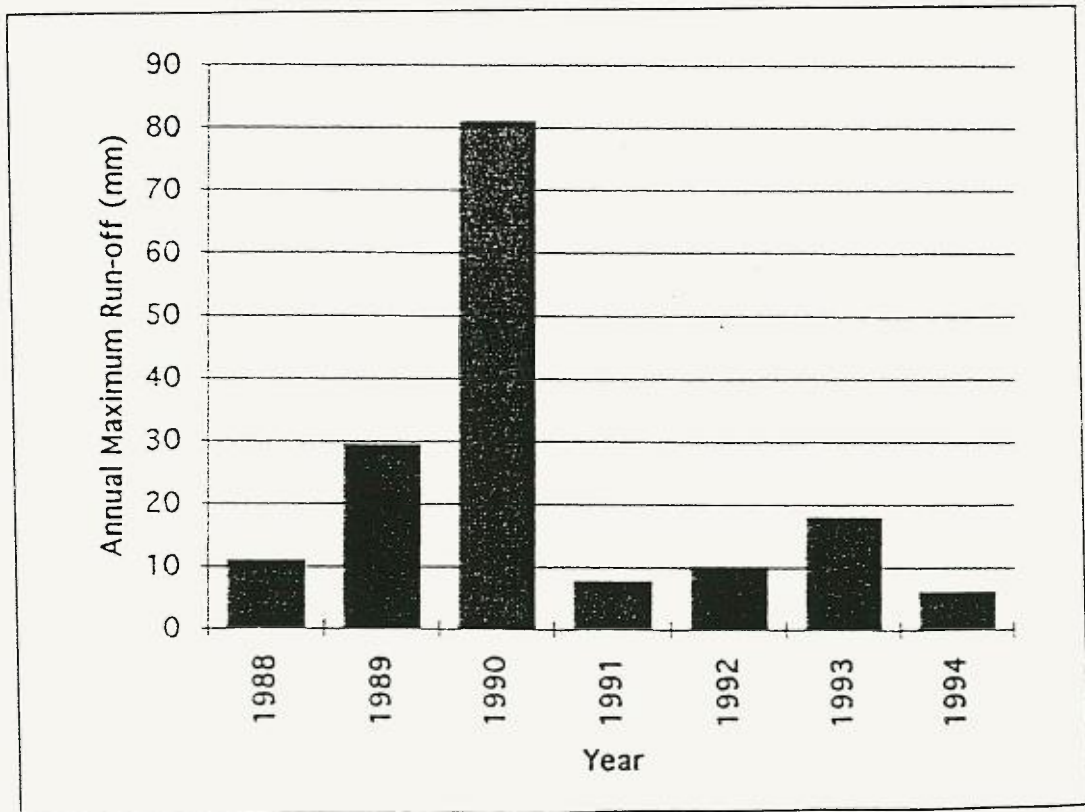
The geology of the region is predominantly granites and intermediate volcanics in the South increasing towards sedimentary deposits of an aeolian and fluvial origin in the North of the Catchment. Soils are typically of a duplex nature, in parts of a dispersable character and decreasing in stability in the northern parts of the catchment in areas of sedimentary origin.

- Catchment Rainfall, Runoff and Erosion Characteristics

The catchment experiences a yearly mean rainfall of approximately 700 mm (Braidwood 722mm, Goulburn 539mm) which is distributed throughout the year. The Department of Land and water conservation have at Whiteheads Creek, a tributary of the Wollondilly river, a 10 Ha gauging catchment for measuring rainfall and runoff. This gauging catchment being in close proximity to the Upper Shoalhaven is useful in showing the infrequency of large runoff events.

In the 9 years of data available there is only 1 large runoff event on the 1 August, 1990 (corresponding to a flood in Goulburn) which measured 81.06 mm (catchment runoff depth) in response to 91.1 mm of rainfall in that 24 hours. The next largest runoff event was 29.43 mm 3 April 1989, nearly one third of the previous figure (Refer graph 1 Variability in maximum annual runoff event). Maximum runoff events in successive years were 7.83mm (1991), 10.14mm (1992), 18.09mm (1993), and 6.15mm (1994).

Graph 1 Variability in Magnitude of Maximum Runoff Event



This record history provides land managers in the area with the clear knowledge that large runoff events are infrequent but are likely to contribute most to soil loss and sedimentation. Various studies both in close proximity to the Upper Shoalhaven as well as the Wagga and Gunnedah districts confirm this observation³⁴.

For gravel and sand extraction sites erosion events are likely to follow a similar pattern depending on rates of water infiltration and the erodability of materials or drainage areas. As such management should be attuned to this pattern of erosion and act in a precautionary manner in carrying out litigation practices, in spite of the perhaps innocuous appearance of the site.

1.4 METHOD

The methodology adopted for this research project needed refinement as the research progressed as it was found that to maximise effective use of time only a limited number of issues could be investigated in depth. It was decided to give principal focus on gravel pits, particularly those of a derelict nature as well as those without development applications. However, some scoping studies were done of derelict mine sites, with a survey conducted of the 'Mulloon Copper Mine' - the site which appeared to have the highest potential for adverse environment impacts. Only very preliminary research as to the distribution and extent of alluvial gold mining sites was undertaken as it was felt that any effective survey of their environmental impacts would necessitate a stand alone project.

The research methods adopted consisted of the three following sections;

A/ Site surveying and assessment of rehabilitation priorities

i. Focus Area Survey

The selection and survey of gravel pits within a geographically limited focus area in order to locate sites currently unknown to relevant authorities and agencies in order to provide a detailed analysis of their extent. These findings it was envisaged could be extrapolated to indicate the probable number and distribution across the total catchment.

The Areas selected were the Manar and Durran Durra areas (as defined in Map 1 which corresponds to their delineation in the 1: 25,000 topographic

³ JL Armstrong 1990 Runoff and soil Loss from Bare Fallow plots at Inverell, NSW. Aust. J. Soil Res., 1990, 28, 659-75

⁴ K Edwards 1985 Preliminary Analysis of runoff and soil loss from selected long-term plots in Australia, in EI Swaify, WC Moldenhausser & A Lo, Soil Erosion and Conservation. Soil Conservation Society of America. pg 472- 478

map series) as they were felt to be representative in terms of distance from major towns, roads, and rivers and watercourses.

ii. Survey of Sites of Concern

A more extensive survey of gravel pits included approximately 20 sites which were of some concern to various agencies and included a selection of sites in current operation.

iii. Derelict Extraction Sites.

The location of derelict mine sites through existing metallurgical and geological maps as well as supporting materials published by the Department of Mines. The Mulloon copper mine was identified as having potential environmental impacts and a superficial assessment of the site undertaken. A number of additional mine and extraction sites were inspected as part of the general scoping required of the project.

Sites were located principally from 1 : 25,000 maps, but additionally from records of the Tallaganda Shire and from responses and comments from relevant agencies. These methods were supplemented by vehicle surveillance when travelling in the area and additionally, by the analysis of air photo records. It was found that the analysis of air photos were of negligible assistance in locating sites unknown from other records, and generally were of insufficient scale to assess impacts.

Once located, an on site survey would be generally carried out and details relating to the location, operating details, site description and environmental impacts would be recorded and generally a photograph taken - a process requiring some 2,470 Kilometres travelling.

A grading mechanism was developed to prioritise sites for rehabilitation which was based on the types and extent of present impacts and the potential for further impacts.

B/ Review of practices, legislation and stakeholder concerns

A review of stakeholder concerns were undertaken by contacting relevant agencies by phone and where necessary following up with a written request for information. A review of existing legislation and best practices in relation to both the management and rehabilitation of extractive industry sites was undertaken through conventional literature search methods in addition to some limited correspondence with relevant organisations.

C/ Identification of rehabilitation funds

Funds available for extractive site rehabilitation were investigated to a limited degree. Of key concern to the project instigators was the existence of security deposits being held by shire councils for the purpose of site rehabilitation. The Tallaganda Shire council offered great assistance in terms of time, access to files

and even providing a work area to achieve the above objective. Records stretching over a number of years relating to quantities of gravel extracted, royalties set aside and the rate which they were paid at were categorised according to site and tallied - a process requiring quite some time.

1.5 GUIDELINES TO EXTENDING THE SURVEY

The intention of this survey was to serve as a scoping project which could assess, to a preliminary degree, the extent and location of gravel pits and derelict mine sites within the catchment. It is hoped that further researchers, either community or academically based, may continue this process. As such the methods by which this survey has been undertaken have been detailed in section 1.4 and particularly in part A. However to lend further assistance gained from the experience of this project the following guidelines are offered;

1. Council records and 1:25,000 maps are the most useful sources in locating extraction sites. Furthermore, particular emphasis should be placed on areas in proximity to roads as well as the Shoalhaven River and its tributaries. Generally the smaller sites marked on 1:25,000 maps are a waste of time as they have experienced little use and are often revegetated or of insignificant impact.
2. Sub-catchments would form a useful unit for the surveying of these sites as they allow a unit of focus which correlates well with other land management units.
3. The usefulness of aerial photographs to locate extractive sites is of marginal benefit as the details they offer is generally not fine enough. They are better used as an indicator of sedimentation particularly for the larger quarries located in close proximity to water courses.
4. A further survey method are flyover's using slow flying 4 seater aircraft. Sandra Bell of South Coast Office of the Department of Land and Water Conservation who routinely uses this method has found it particularly useful in monitoring the condition of larger sites (of approximately 100 metres width) as well as spotting operations that were unlicensed or breaching management guidelines⁵. This surveying method offers the advantages of observing impacts on river stability such as sedimentation, channelling and undercutting of stream banks and suitable aircraft may be hired at a cost of approximately \$ 100 - 150 / hour. It should be noted that this method is again used only for surveying sites along waterways and not as a more general search method.
5. The Mulwaree Shire section of the Catchment is suggested as a profitable focus for any further survey.

⁵ Sandra Redell, South Coast Office, Department of Land and Water conservation, personal communication 13 October, 1995.

Section 2. Legislation

2.1 REVIEW of LEGISLATION REQUIREMENTS & CONTROLS

Legislative controls and requirements are an important facet of the development, operation and rehabilitation of extractive sites as they identify requirements and frequently standards to which such sites must conform. As such this section briefly summarises the range of legislation and other controls relating to extractive industries.

2.1.1 Tallaganda Local Environmental Plan (1991) & Development Control Plan

The Tallaganda Local Environment Plan 1991 (TLEP) requires that extractive industries obtain development consent to operate. Before approving any such development council must, amongst other things, consider the impact of the proposed extraction activity on⁶;

- (b) vegetation, land capability (including soil stability) and water resources (including the quality and stability of watercourses, aquatic wildlife habitat
- (d) the protection of localities of significance for nature conservation or of high scenic or recreational value, and places and buildings of archaeological or heritage significance's, including Aboriginal relics and places
- (g) the quality and availability of water resources within the water catchment area

Further requirements exist in respect to draining (the mechanical disturbance or removal of soil modifying surface or sub surface water flow) on environmentally sensitive land (**part 3 clause 28**), and the carrying out of developments as listed in schedule 7 on land within the Welcome Reef Dam inundation area and buffer zone (**Part 3, clause 43 (i, ii)**).

Development Control Plan No. 4, Part 3 deals specifically with extractive industry and mining and states as its aims;

- 4.1 To provide a co-ordinated, orderly and consistent framework for the management of rural industry, mining and extractive land use within the shire.
- 4.2 The objective of this section of the Plan is to make adequate provision for the use and protection of natural and rural resources, while protecting other land use options and the natural environment.

⁶ Tallaganda local Environment Plan 1991 Part 3 ; (9831)

It includes as matters for consideration at the development application stage;

- emissions and EPA requirements
- effects on water quality and the hydrodynamics of watercourses
- rehabilitation measures (citing the Soil Conservation Services guidelines (see section 5)
- archaeology of the locality
- consultation with the NP&WS
- effects in surrounding land
- alternative sources of material
- management plans
- visual amenity of site & landscaping measures aimed at mitigating effects

These are potentially the most comprehensive of controls on extractive industries and as such are included at Appendices (Matters for Consideration at the Development Application stage).

2.1.2 State Environmental Planning Policy No. 37 - Continued Mines And Extractive Industries (SEPP 37)

SEPP 37 requires all operators of current quarries to ;

- have registered and applied for development consent with their council by September 1995.
- to prepare, where specified, a statement of environmental effects or an environmental impact statement to accompany the development consent application.
- until development consent has been received, to submit three monthly reports on quarry production and land use to the regulating authority.

Councils are further required to keep a register of extractive sites whether they are subject to SEPP 37 or not.

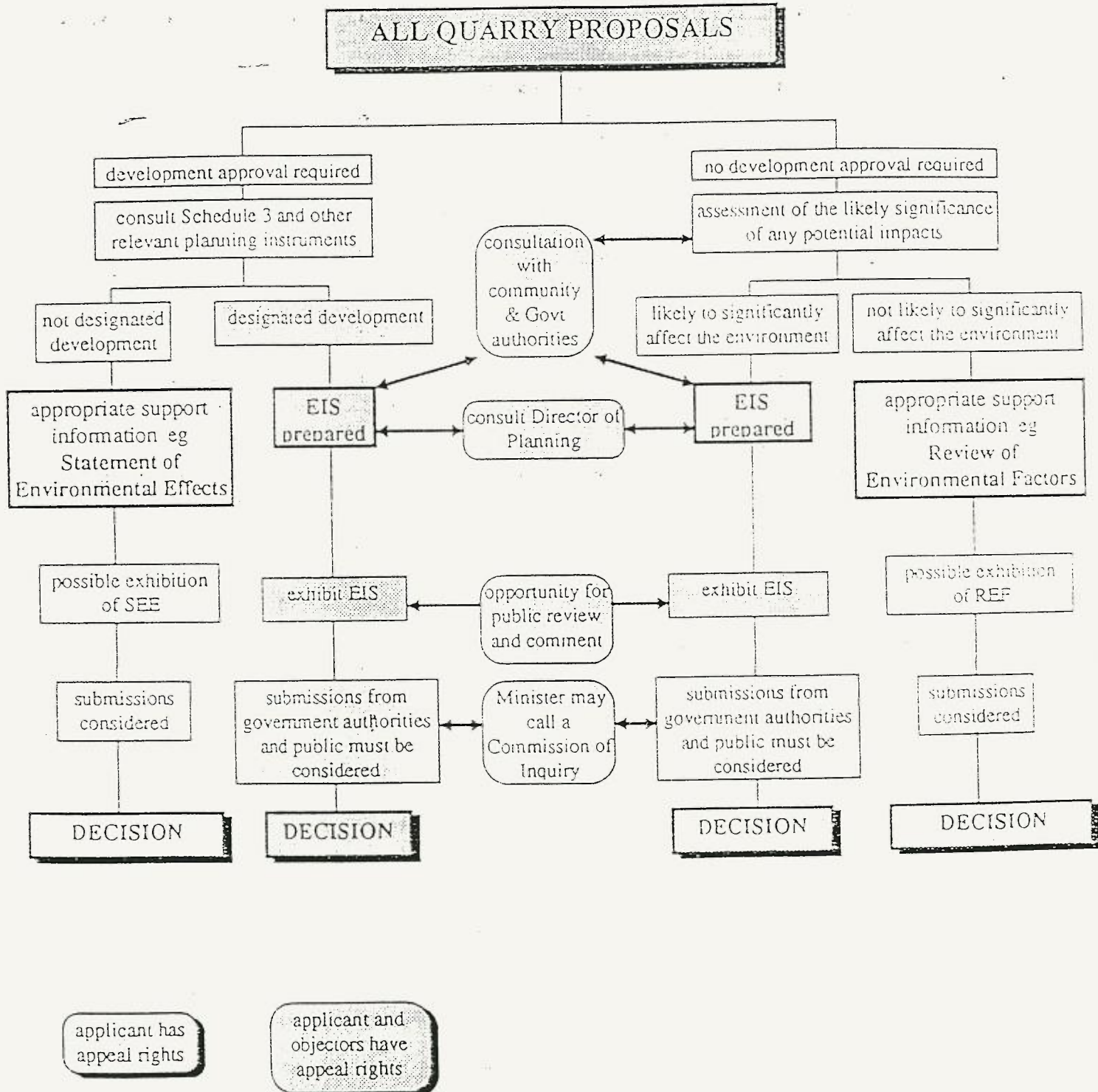
2.1.3 Environment Planning & Assessment Act 1979 (Part 4, Part 5 (Review) and "Regulations" (EP&A Act); Schedule 3 of the "Environmental Planning & Assessment Regulation (1980)

Under part 4 of the EP&A Act (1979) an extractive industry may require development consent under a local environmental plan or other planning instrument - here the Tallaganda Local Environment Plan and Development Control Plan 1991). In such a case Schedule 3 of the "Environmental Planning and Assessment Regulation (1980) applies. This schedule identifies those operations where an EIS is necessary.

Figure 1 Quarry Approval Process
(as required under Parts 4 and 5 of the EP & A Act)

Approvals required under Part 4 of the EP&A Act

Approvals required under Part 5 of the EP&A Act



Where a local environmental plan is not in place Part 5 of the EP&A Act requires relevant government authorities to determine whether or not an Environmental Impact statement is needed or whether a Statement of Environmental Effects will suffice. This decision is based on whether the proposed extractive industry has the potential to cause significant environmental impacts using specific criteria.

The criteria as to whether an Environmental Impact Statement is necessary or not in either of these two cases includes⁷;

- sites production (generally more than 30,000 Cm per annum); or
- disturbs or will disturb a total area of more than 2 Ha; or
- site is located within 40 metres of a natural waterbody, wetlands, or environmentally sensitive area; or
- site is located on land that is sloping more than 18 degrees to the horizontal.

2.1.4 Local Government Act 1919, 1993

Local councils have under the Local Government Act the power compulsory acquire land, or the power to enter land to extract materials used for public purposes. However, the sub section 196 of the Act provides for compensation and conditions of use as follows;

- (4) If in the exercise of a function under this part, any pit, trench, hole or bore is made, then council must, if the owner or occupier so requires :
 - (a) fence it and keep it securely fenced so long as it remains open or not sufficiently sloped down; and
 - (b) without unnecessary delay, fill it up or level it or sufficiently slope it down
- (5) In respect of any damage under this section, other than damage arising from work done for the purpose of an inspection, the council shall make compensation to all parties concerned.

2.1.5 Crown Lands Act (1989) & Commonwealth Native Title Act (1993)

The amendments to the local government Act mean that quarrying operations, including those operated by local councils on Crown lands are now subject to the Crown Lands Act, 1989. That being, all such gravel pits will now require a license which will be given subject to land assessments, appropriate conditions in respect of their management and rehabilitation. In addition to these changes the Commonwealth Native Title Act has placed some uncertainty over whether or not native title may still exist in Crown lands currently used by councils as gravel pits. This has been well documented in a recent letter sent by the

⁷ Schedule 3, EP&A regulation 1980

Goulburn Regional manager, Crown Lands Service to the Tallaganda Council and all other councils within the Goulburn Lands Board District⁵.

2.1.6 Other Legislation and Authorising Bodies

In addition to the above legislation there also exists the Soil Conservation Act (1938) , the Mining Act (1992) as well as the Heritage Council of NSW and the National Parks and Wildlife Service. Generally however, any concerns that come under these sections, apart from perhaps the Soil Conservation Act, are covered in other legislation or requirements.

2.7 SUMMARY OF LEGISLATIVE REQUIREMENTS

The TLEP and SEPP 37 are the major controls governing extraction operations within the catchment. However, they place councils, where they are sole operators of a gravel pit, in the difficult position of having to serve as regulating authority as well as the development proponent - ie having to prepare a development application to themselves. As a result councils have a need to be careful in applying a consistent standard to their own activities and maintaining the communities expectation that they will act responsibly and without bias.

Within the controls are many references as to the matters and details to which project proponents, as well as regulating bodies, should give consideration to before they can receive development approval. As such legislation covering these developments is generally clear and readily understandable.

The Local Government Act is less clear , however it is particularly significant for the owners of private land who have council operated gravel pits located on their land. The recent changes in the Crown lands Act and the Commonwealth Native Title Act add further complexity to the legislative requirements relating to councils as operators of extractive industry. Such changes in themselves may necessitate some adjustment by councils of their current strategies for the extraction of road building materials.

⁵ File GO30100 Gravel Pits : Procurement File, Letter AJ Ferrier, Regional Manager, Crown Lands Service 15.6.1995

Section 3. Survey

This section reports on the assessments conducted within the field research component of the project and is organised into three parts; those of gravel pits, commercial extraction sites and lastly derelict mines. The results of this survey are then summarised and discussed in section 4 : 'Environmental Impacts'.

3.1 Gravel pits

The vast bulk of the survey work consisted of the assessments of the gravel pits within the two 'focus areas' and then that of the 'Sites of Concern'. These assessments contained a strategic approach aimed at assessing the type and distribution of gravel pits requiring rehabilitation work or attention. The outcomes of this approach are discussed in the 'environmental impacts' section.

The survey additionally had the purpose of identifying and prioritising those gravel pits with the greatest need of rehabilitation attention. To further this aim, sites which had been commented upon by agencies or individuals were individually surveyed in addition to an extension of the basic survey framework.

Originally it was intended to develop a scoring mechanism by which sites attributes could be assessed and totalled providing an objective and numerical basis of comparison. However, such an approach proved unwieldy for the diversity and subjectivity of the assessment process. Hence a more simplistic grading mechanism was developed based on the criteria stated in table 1 (Priority Grading Criteria) which served to guide this process.

Table 1 Priority Grading Criteria

High :	sites characterised by severe erosion and actual or potential deposition into watercourses, are lacking in basic or adequate water containment structures in addition to negative visual impacts.
Med/High :	Those sites with a substantial erosion impact but which are not severe as measured in extent, depth and sediment loss. Have a significant visual impact, and require some rehabilitation and additional management structures but not critically.
Medium :	Have some degree of erosion and sediment loss as well as aesthetic impacts. However, of low potential & actual impact.
Low/Med. :	those sites having an observable and potential impact but only requiring <i>minor and non urgent attention to amend the impact.</i>
Low :	Have a negligible impact on their surrounding environment with no additional management required.

3.1.1 Focus Area Survey : 'Manar' and 'Durran Durra'

Manar

The gravel pits within the Manar focus area (corresponding to that part of the Manar 8827-iii-n 1: 25,000 map sheet located within the Upper Shoalhaven Catchment ; see Map 2) were identified and surveyed over a number of days in September. The following information documents their status;

1. **Balmains (Grid Reference 472 904) priority : high**
location : Bordering Reedy Creek and located off Kings H'way 1 km
 North of junction with Mayfield Road.
size : approx. 130 x 140 metres
present impacts : Within 20-30 metres of Reedy Creek with some
 sedimentation evident, currently stable
potential impacts : highly vulnerable to further erosion and sedimentation.
Priority : high

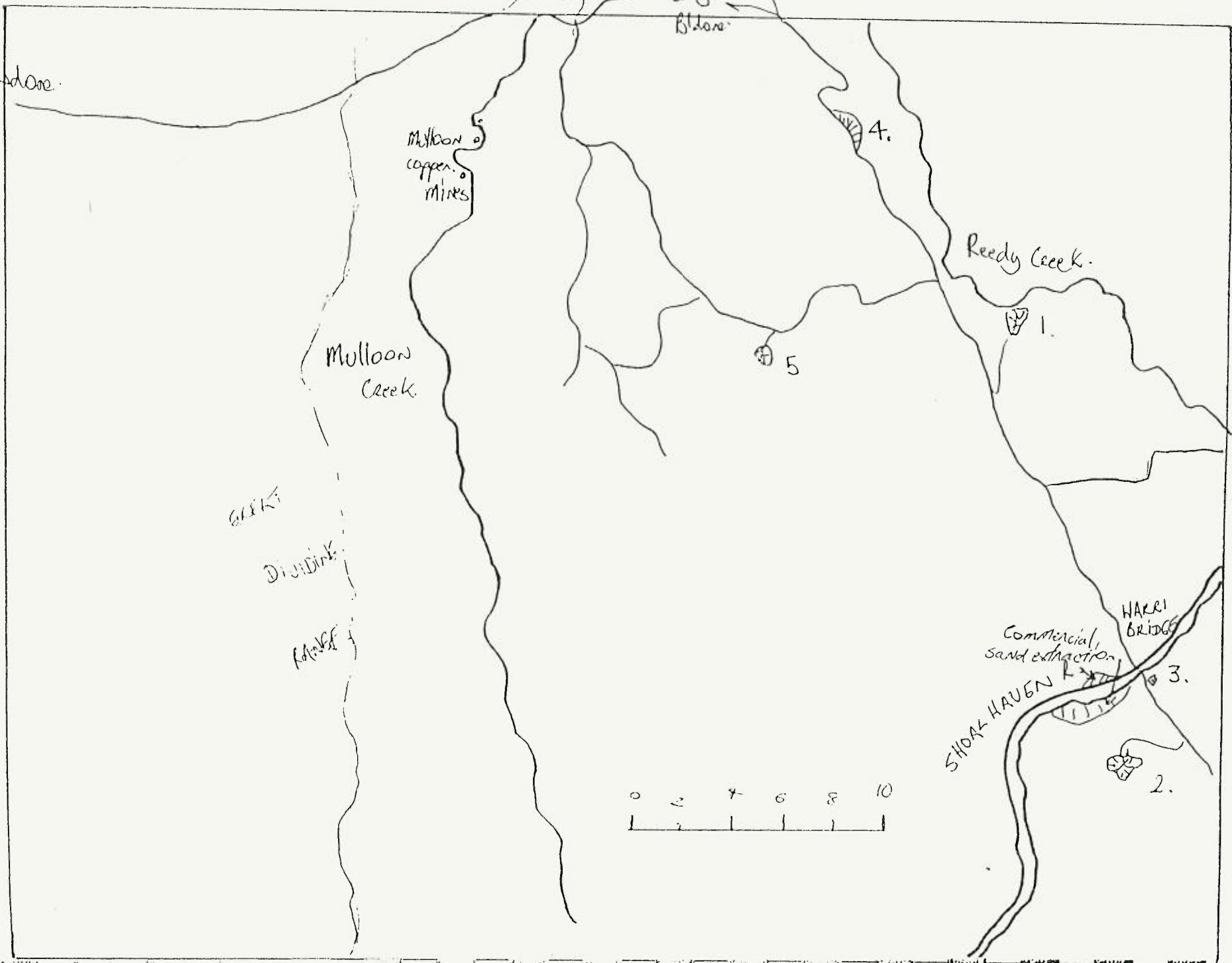
Site Description:

- diversion banks are constructed around quarry perimeter to divert water away from site or contain it within the site. However, banks are in disrepair in two sections on lower portion bordering Creek. Area between quarry and Reedy Creek although relatively narrow (20-30 metres) is generally well vegetated.
- Creek itself appears to have experienced some sedimentation of sand and fine gravel at some time in the past, however site appears currently of marginal impact. However, in a heavy rain event, erosion and sedimentation could occur to a significant degree.
- This possibility would be exacerbated by the unnecessary large area of workings making its staged rehabilitation , particularly of lower portion of the quarry.

2. **Grieggs (GR 488 842) priority : high**
location : near Warri Bridge bordering Sydney Water and G. Whites
 property.
size : approximately 150 x 150
present impacts : Gullying and rilling evident at Northern and southern
 ends of pit. weed presence
potential impacts : landform is highly unstable and vulnerable to further
 erosion

Map 2 The Manar 'Focus Area'

Sunge Road



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Site Description:

Site has been derelict for some considerable period of time and is subject to substantial erosion. Pit is excavated to a depth of 2-3 metres and effectively divided in two by a thin ridge. Weed infestation of scotch broom and serrated tussock occurring in areas of sedimentation. Site is approximately 1 km from the Shoalhaven River and is also at the high water mark of the proposed Welcome Reef dam.

3. **Unnamed (GR 48853)** **priority : low-/medium**
location : North-East side of Warri Bridge
size : approximately 40x 30m
present impacts : aesthetic (located near picnicking area, some erosion)
potential impacts : is contributing to erosion alongside bridge

Site Description:

The site is relatively small and has caused some problems in the past as rehabilitation work evident in one area. Area alongside Bridge needs interceptor bank to prevent further erosion.

4. **Doughboy TSR (GR 438945)** **priority: med/ high**
location : North-East side of Kings Highway 22 km from
Bungendore near Doughboy creek
size : 300 x 70 metres
present impacts : aesthetic, low level erosion, may contribute to dry land
salinity evident down slope
potential impacts : low level

Site Description:

Quarry is to immediate North of road and part located on TSR. It is excavated to a maximum depth of 2 metres with water ponding in lower sections. Northern part of pit is revegetating with some sparse Eucalypt cover. Appears relatively benign but recharge capacity may be a concern for dry land salinity evident further down slope. Priority rating is mostly on account of its adverse visual impacts.

5. **Gordon's/ Manar (GR 428897)** **priority : low/ med.**
location : At Manar township off Kings H'wy.
size : approx. 40x 50m
present impacts : access road is visibly eroding (rill)
potential impacts : above will deteriorate

Site Description:

Pit is located on steep land and access track is at lowest portion of pit and is therefore exposed to runoff from the site with subsequent erosion. Other areas are in reasonable condition with management works in place. Minor work on access track would prevent further problems.

6. **Mulloon Roadside (GR 370970)** **priority : low**
location : South side of Kings Highway
size : approx 80x 60m
present impacts : aesthetic
potential impacts : probably minor

Site Description:

Pit located on South side of road near intersection of Manar-Mulloon Rd and Kings H'way. Site appears to be in current operation.

7. Other sites

There are some minor pits commonly located near roadsides in the focus area. These are commonly excavated to a minimal degree, are of limited extent and are revegetating naturally.

Durran Durra

The Durran Durra area (defined according to map sheet 8827-II-N contains a greater number of gravel pits than the Manar area including approximately 10 commercial sand extraction sites. A total of 13 gravel extraction sites were identified using the 1:25,00 map again as the primary source. Some of these sites could not be located once in the area, possibly at time as a consequence of revegetation. Unfortunately four sites could not be travelled to in the time available. These were 'Stewarts Crossing' (GR635946), 'Grants' (Nerriga Road at 885-895N), a large 'unknown' site (GR 673868) and "Hockey's" (633826).

1. **Unknown (GR 519871)** **priority : low/medium**
location : West side of Larbert Road North East of Cleft Hill
size : approx 3/4 Ha total area affected
present impacts : some sheet and rill erosion
potential impacts : is at high water mark of proposed dam

Site Description

Site is somewhat scattered with open Eucalypt scrub and grass cover. Significant quantities of junk including ~8 cars and ~20 car batteries. Site is generally not excavated. Some sheet and rill erosion is evident, particularly on tracks but is not extensive. The fact that it is at Welcome reef high water mark is probably the only issue.

2. **Unknown (GR 607852)** **priority : low**
location : Nerriga roadside near intersection with Cookanulla Rd
size : 80 x 250m
present impacts : none
potential impacts : none

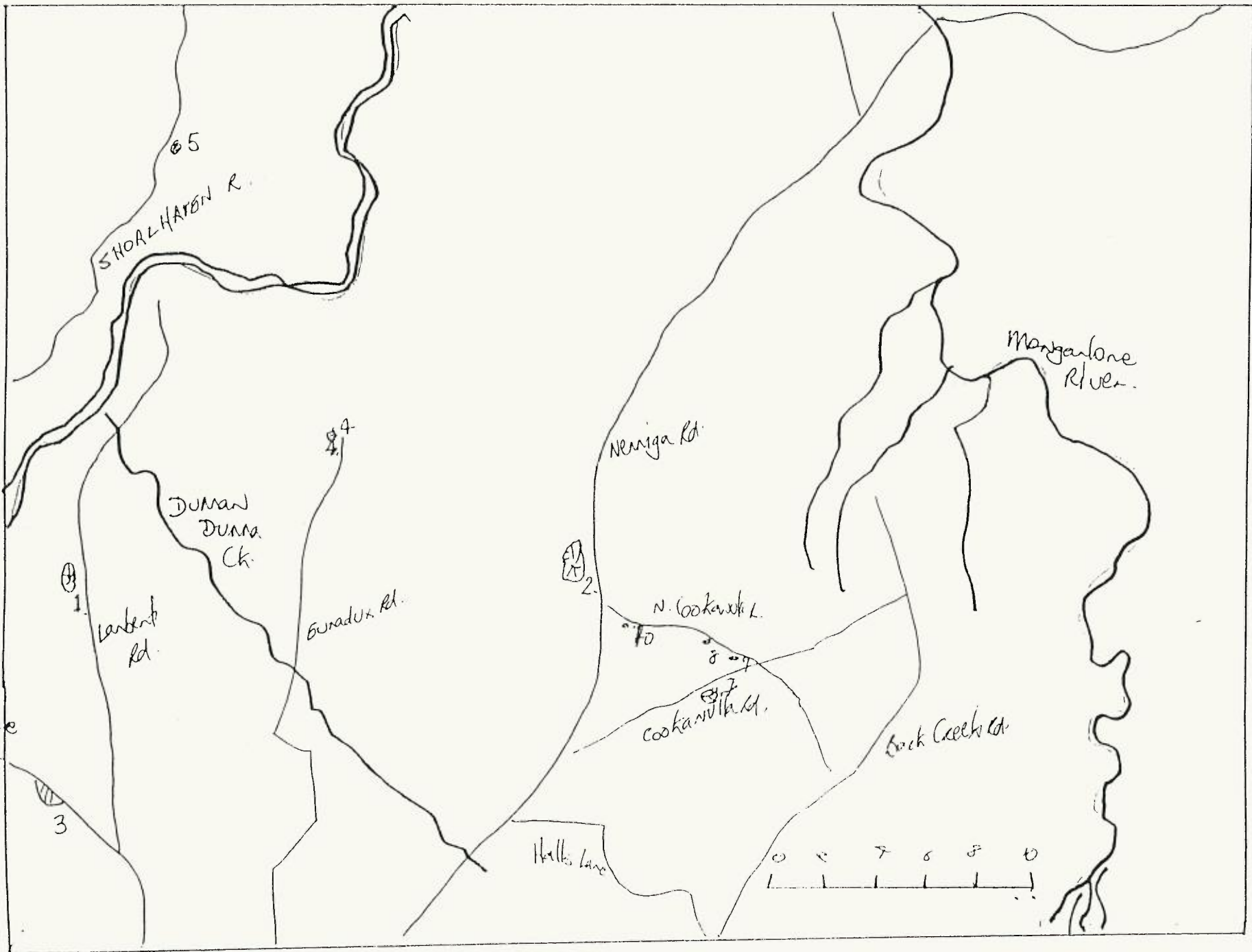
Site description :

Pit is excavated to am minimal extent and although large is rapidly revegetating with Eucalypt spp.

Neriga.

Gravel Pits and Derelict Mines : their Impacts, Management & Rehabilitation

Map 3 The Durran Durra 'Focus Area'



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Bridwood.

3. Unknown (GR 502836) priority : low
location : S. roadside of Kings Highway near Larbert road
intersection
size : 200 x 30
present impacts : none
potential impacts : none

Site Description:

This site exists at a wide road verge and was deep ripped and revegetated with tube stock approximately 4 years ago by the soil conservation service. Tree survival is reasonable however rather stunted (height 1-2 metres). This is the only site to my knowledge which has been rehabilitated.

4. Christmas Creek (GR 563883) priority : low
location : end of Euradux Road
size : 60x 30
present impacts : none
potential impacts : none

Site Description:

Runoff from site is dispersed into bordering Casuarina forest and is of negligible impact. Gravel appears to be of a high quality

5. Crokers (GR 535932) priority : high
location : Off Mayfield Road near Sandy Creek
size : 70x70 + adjacent areas
present impacts : Tunnelling on South side of pit
access road badly eroding
runoff and recharge may contribute to a waterlogging/
salinity problem down slope
potential impacts : will further deteriorate to a significant degree

Site Description:

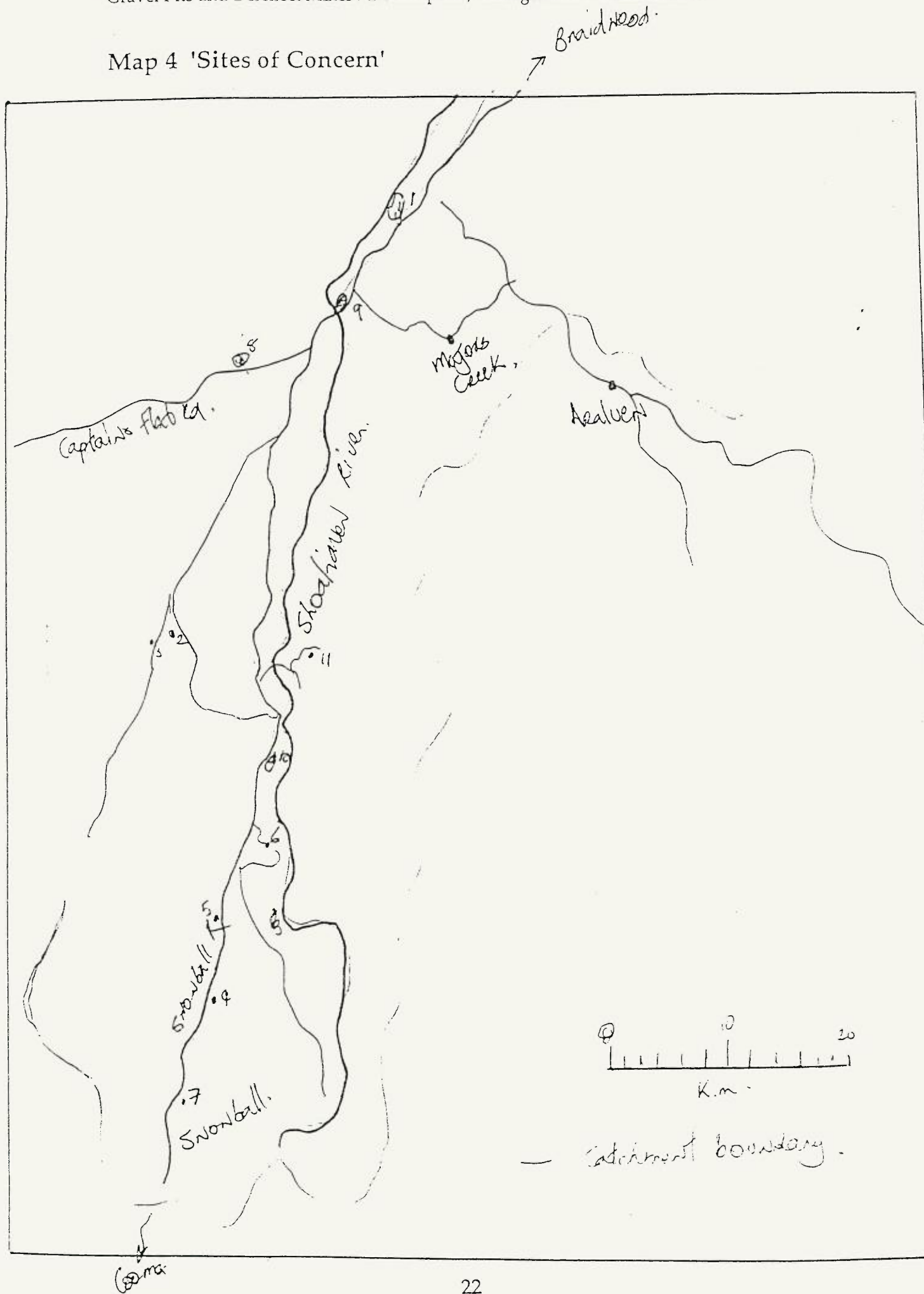
Site is located approximately 400 metres on RHS of road. Evident and escalating degradation of site and surrounds is occurring, particularly associated with the access road. Design of pit is inappropriate with resulting erosion depositing sandy particulate matter over adjoining pasture. Some remedial work apparent but inadequate. Impacts, while considerable are likely to be restricted to those of a land based nature.

6. Barlows. (GR 620843) priority : unknown
location : supposedly off Cookanulla Rd but not found

7. unknown (GR 614862) priority : low
location : supposedly off N. Cookanulla Rd but not found,
presumed revegetated as very small according to map.

8. & 9. Unknown (GR 631857, 634856) priority : low
location : not found and presumed revegetated by pines

Map 4 'Sites of Concern'



8. Ballalaba Indigo

priority : low

location : off Captains flat road
size : 110x60
present impacts : none
potential impacts : with present management practices, non

Site Description:

The Ballalaba Indigo site is a well contained site where careful thought has been given to management structures. With poor management the site could have significant affects but with the competency of present management is of a benign influence on its surrounds.

9. Ballalaba Roadside

priority : Medium

location : on Captains Flat road at Ballalaba Bridge
size : 60x100m
present impacts : some sheet erosion, aesthetic impacts
potential impacts : of low magnitude provided adequate management.

Site Description:

The site borders the Shoalhaven river and neighbouring land is zoned TSR. The site is excavated to 1-3 m depth and has some water containment structures which are, however, in poor condition. As such runoff and run-on issues, particularly from the adjoining road, need addressing. Conflicting site values are evident from correspondence.

10. Cunningham's/ Blacks (GR 385367 Krawaree)

priority : low/medium

location : On East side of Snowball Rd near Wyanbene Hill
size : 400 x 100m
present impacts : minimal
potential impacts : minimal

Site Description:

The site is perched on a ridge with the Shoalhaven river 1 km east. Due to drainage and site characteristics the current operation has a benign environmental impact. However, proximity to River would suggest conservative management of the site.

11. Griffins Roadside (GR 405403 Krawaree)

priority : medium/high

location : better check the map for this one
size : 40x30m
present impacts : undercutting road
potential impacts : no road

Site Description:

This site although small is designed in such a way as to concentrate runoff through the access track and down the side of the gravel road. In doing so it is eroding the road. Design of access is innappropriate.

3.2 Commercial Extraction Sites

While the principal focus of the survey undertaken was on gravel pits, a number of commercial extraction sites of a derelict as well as current status were inspected on an incidental basis. This sub section reports on just two of them; those of the clay pit located on the Mayfield Rd and the now derelict sand and gravel extraction operation (1975-1982) located on Mulloon Creek to the immediate North of the Kings Highway.

There are however quite a number of such sites. However ones located in close proximity to the Shoalhaven River or tributaries are documented in table 2 (Sand/ Gravel Extractive Industries : Shoalhaven River)

Table 2 Sand/ Gravel Extractive Industries : Shoalhaven River

Site/Location	Reference	Period of Operation	Max. volume extracted	Length of creek Affected
Shoalhaven R. near Warri	1771713	1990 to present	100,000cM pa	875m
Mulloon River near Bungendore	1617470	1975-1982	no data	1km
Shoalhaven river	139089A (not licensed)	1975	no data	no data
Mongarlowe R. near Mongarlowe	MLA No 84	1986	no data	no data
Mongarlowe R. near Braidwood	MLA No 72	1982	no data	no data
Reedy Creek	MLA's No's 343 & 347	1980	no data	no data
Reedy Creek	PLA No 67	1980	no data	no data
Reedy Creek	MLA No 68	1980	no data	no data
Mongarlowe R.	MLA No 35	1982	no data	no data

(source : Tim Cooney, Department of Land and Water Conservation)

i. Mulloon Creek Sand/Gravel Extraction Site

The Mulloon Creek derelict sand /gravel extraction site (grid reference 385970) covers an area adjacent to the Mulloon Creek stretching approximately 1 km. The operation together with other influences has caused substantial alteration of the character of the creek with large areas of unvegetated bank and undercutting evident. The stockpiling and excavation of materials has altered some areas of the adjacent land leaving them unstable to further erosion.

Photo 1 Mulloon Creek Derelict Sand/ Gravel Extraction Site

(undercutting of the creek has occurred as a result of its changed character as a result of poor extraction techniques and lack of site rehabilitation)

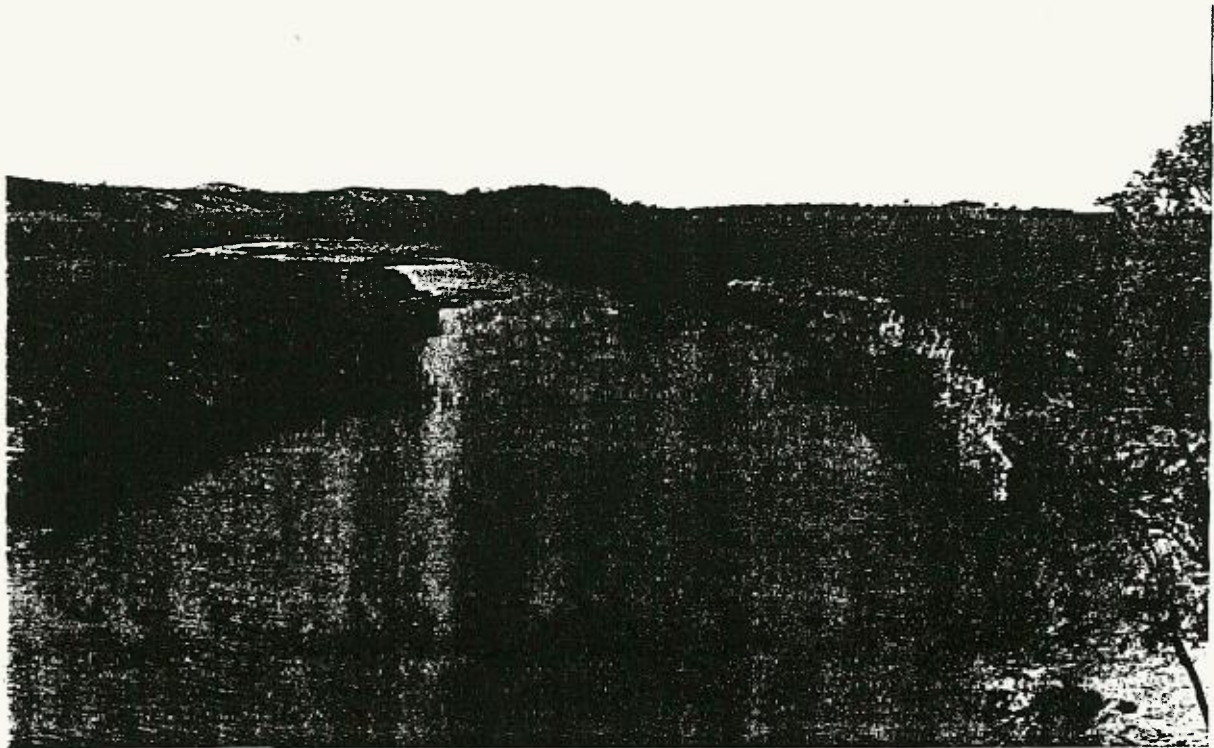
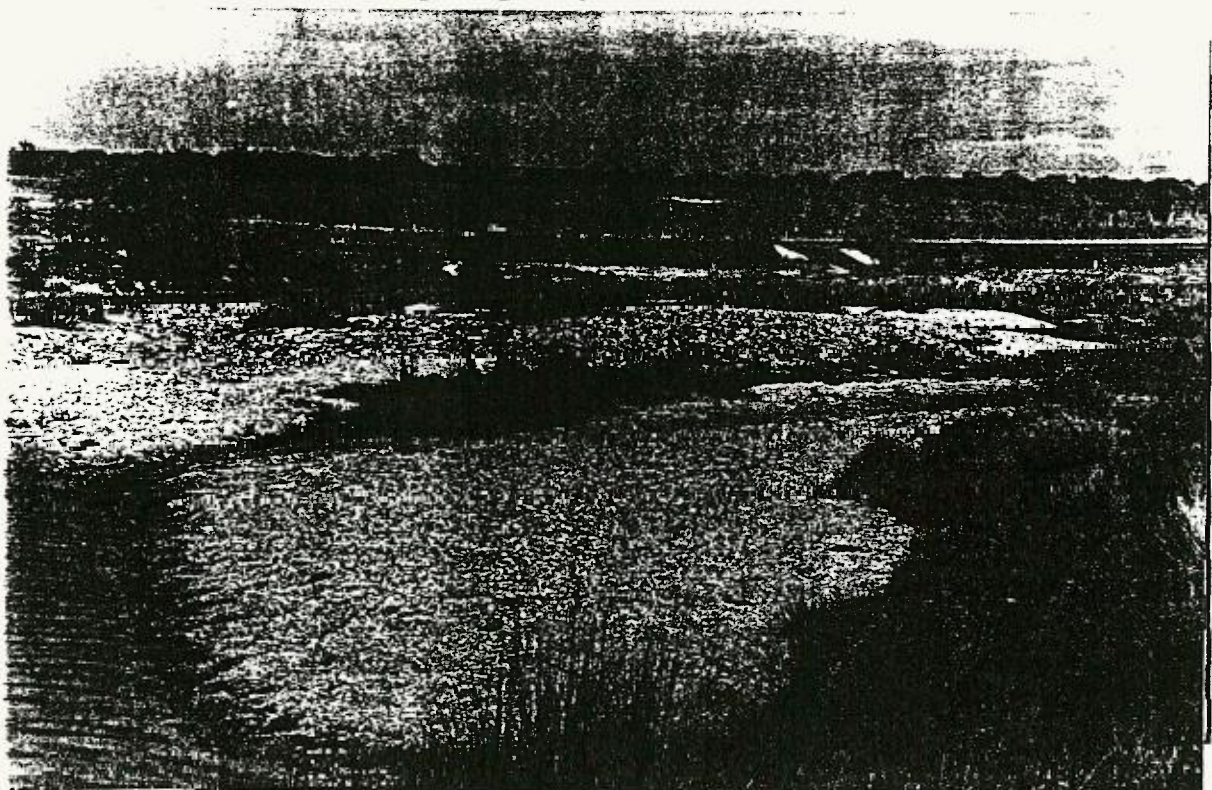


Photo 2 Mulloon Creek Derelict Sand/Gravel extraction site

(view South towards Kings Highway)



ii Mayfield Road Clay Pit

The Mayfield Rd Clay pit (grid Reference 545045) is a commercial operation covering an approximate area of 800 x 700 metres. The sites has minimal water control features creating a high susceptibility to erosion. However, because the pit is extracted to some considerable depth and the construction of a sediment control dam at the sites lowest point means that impacts to date appear minimal.

However, the limited depth of the sedimentation dam which appears to be collecting some quantity of such sediment together with the low infiltration characteristics of the site means that in a large rainfall event considerable quantities of sediment would be washed off site into the nearby Boro Creek. Furthermore, the design and operation of the site appears haphazard with no effort to minimise the total area of extraction at any one time. Staged rehabilitation of the site in conjunction with tits ongoing operation would seem appropriate.

Additionally, there is some evidence in the form of stone chippings found on the edge of the site⁹ that the area has some Aboriginal heritage significance.

Photo 3 Mayfield Road Clay Pit
(note the sediment control dam located on the upper right of the photo)



⁹ Richard Baker, personal communication

3.3 Derelict Mines

3.3.1 Alluvial Gold mining

The limited time available to the author was not sufficient to allow a survey of gold mining sites within the catchment. However, some discussion of its possible and observed impacts is contained within Section 4 (Environmental Impacts).

3.3.2 Non Alluvial Mining

The Upper Shoalhaven contains a number of sites of non alluvial mining as evident from the Braidwood 8827 (1 :100 000) Geological Map (edition 1 1975) and the Canberra (1: 250 000) metallogenic map (sheet SI 55 16) together with accompanying mine sheets¹⁰. The Department of Mines, Wollongong Regional Office retains some records of most sites of mining activity within the catchment and has in place a process where sites of greatest environmental impact within the state may be prioritised for rehabilitation¹¹. Due to the limited time available to the researcher, only the Mulloon Copper Mine, which was considered to have the highest potential impacts, was surveyed. However, had time permitted the Boro Silver mines could have been valuably included.

Mulloon Copper Mines (1970-1922)

The Mulloon Copper Mines are located in the Mulloon Creek area, South of the Kings Highway approximately 3 kilometres before the Great Divide. The mines were in operation from the early 1870's to the 1920's and included at one time a small smelting complex, part of which is still in evidence today. The main area of mining activity occurred on what is now the 'Mulloon' property with a smaller site, the Mt Fisher/Griffin mine located on a neighbouring property to the North.

The Main area of mining exists in 3 distinct sites located in close proximity to the Mulloon Creek. (Refer map 5 : Mulloon locational map). In keeping with the nomenclature initiated by Barry McGowan, who has assessed the sites considerable heritage values, and who pointed out their possible detrimental environmental impacts the author, these will be referred to as sites A, B and C.

¹⁰ Department of Mines 1975 Part 1. Mine Data Sheets to accompany Metallogenic Map , Canberra 1: 250 000 sheet.

¹¹ Dobro Inanovic , Regional Inspector of Mines, Department of Mineral Resources ; personal communication

Map 5 Mulloon Copper Mine Location Map

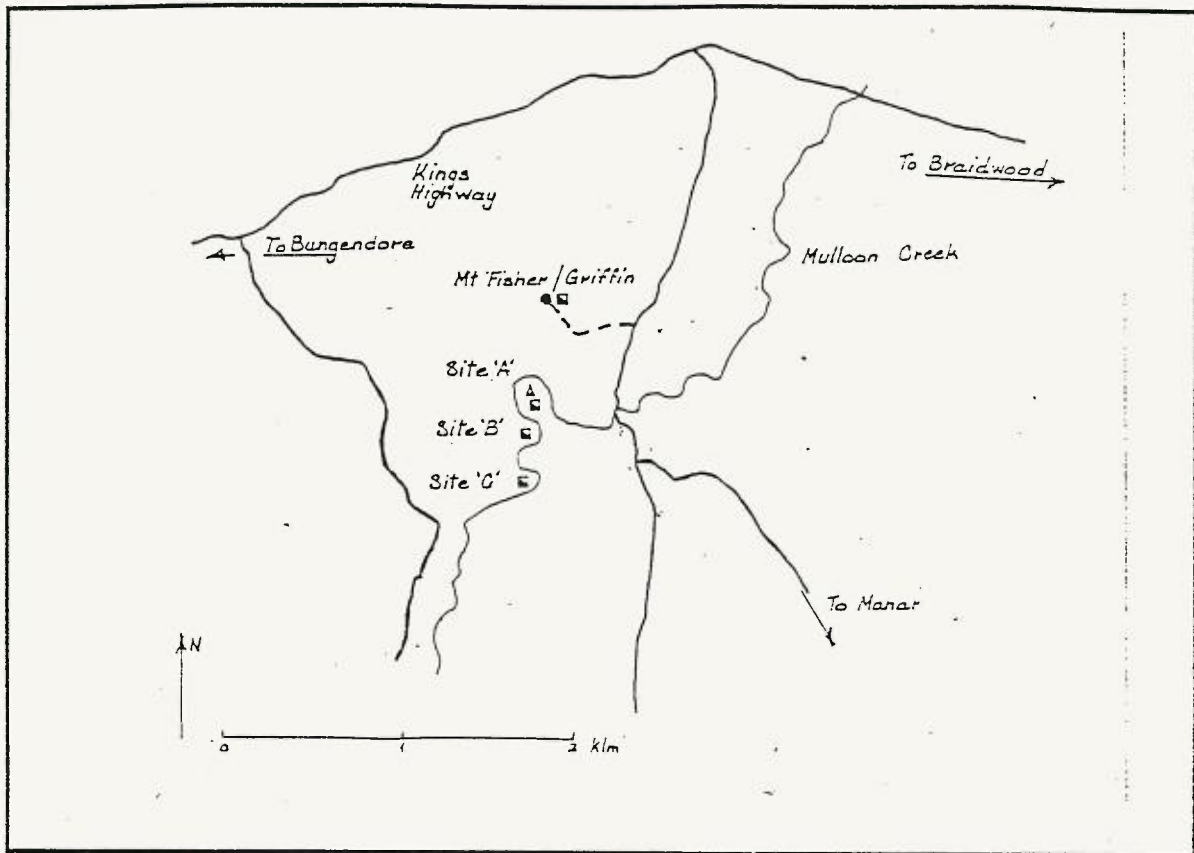


Photo 4 Mulloon Tailings Dumps, Site A
(approximately 20 metres from Mulloon Creek)



Site A

Site A is located in close proximity to the Mulloon Creek and includes the before mentioned smelter site and a number of remnant hut sites. The area of concern consists of a large tailings dump within which are located a number of shafts, most of which are filled with woody debris and some of which contain ponded water. The tailing dumps are of a red oxidised nature of broken rock fragments commonly of coarse nature supported at intervals by stone retaining walls. The dumps extend over a largely unvegetated area of approximately 60 metres by 20 metres and at their closest point are approximately 20 metres distant from Mulloon Creek. However, during periods of high rainfall it is evident that the Creek would rise to cover the lower portion of the tailings dump.

Site B

Site B is located on the Western more inaccessible side of the river and is similar in nature to Site A. Tailings dumps occur over an area of approximately 70 x 30 metres and are set back from the Creek line by a distance of approximately 40 metres and 8- 10 metres height. Some of the tailings in this dump are of a grey unoxidised nature.

Site C

Site C is also located on the Western side of the Creek line and is still further distant from the watercourse. Although only observed from a distance the tailings dumps appear similar in character and size to sites A and B.

Comment

The nature of the Mulloon sites are of some concern owing to their close proximity to a major watercourse as well as their chemical status. It is possible that the tailings consisting of a grey sulphide ore may be producing runoff and through flow that is acidic to the point that the resulting leachate is releasing heavy metals into the Creek and into the Shoalhaven catchment system. Stream transport (particularly in flood periods) as well as erosive processes may be transporting tailings materials further down the catchment. No discolouration of the creek is currently evident, however a small area of ponded water below one section of the dumps contained a greenish grey sediment. A white plastic pipe however embedded in the ground near the site indicates that drilling has taken place in the recent past.

After inspection of the site the author notified the regional inspector of mines and Kerry Brooks of the Sydney Office of the Department of Mineral Resources of the existence of the site and the possibility that the tailings dumps were a source of acid and heavy metal contamination to the Upper Shoalhaven Catchment. Subsequently, the site is to be professionally assessed as to its most appropriate management and extent, if any, adverse environmental impacts. It may be the case that with the tailings dumps long exposure to erosional processes including exposure to flood waters has removed and dispersed the majority of any contaminated materials.

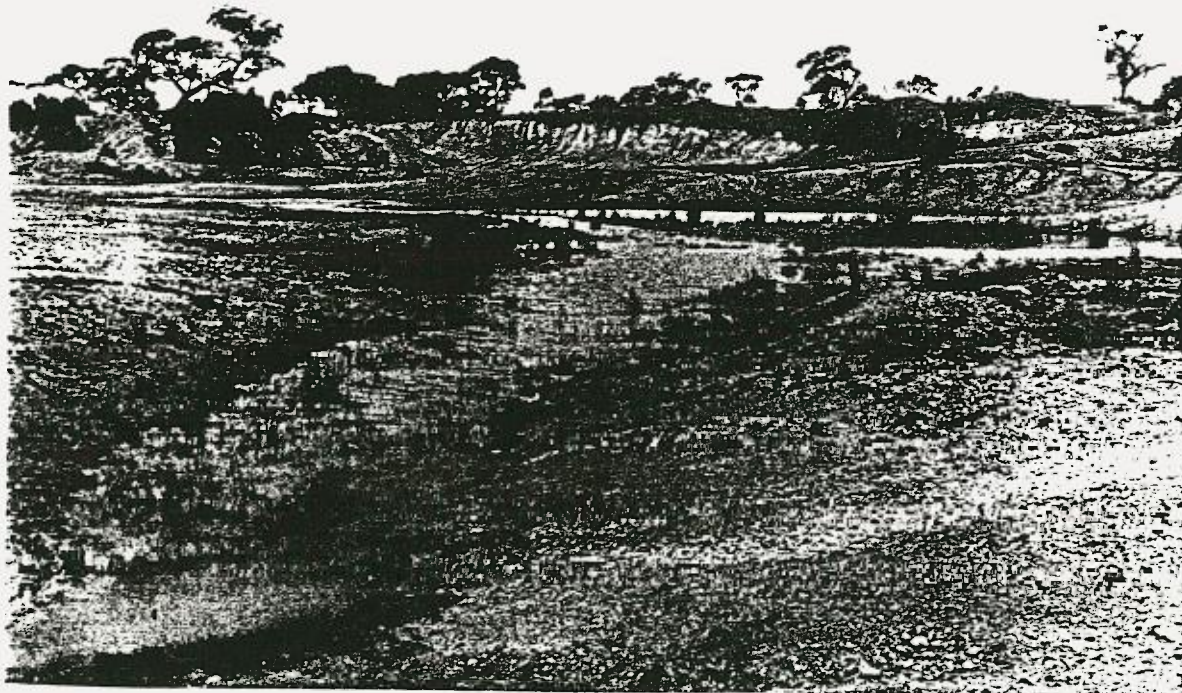
Section 4. Environmental Impacts

This section discusses and summarises the particular impacts reported in the survey data. As most survey work was done on the impacts of gravel pits this will be given greater attention and gold mining and other derelict mine sites proportionally less.

4.1 GRAVEL PITS & SIMILAR EXTRACTION SITES

Gravel and sand extraction sites have a broad range of impacts on catchment quality, however, it should be remembered that they cover a very limited area within the catchment and as such their impacts and importance as a land management issue needs to be balanced against that of pastoralism which has more fundamentally altered the Upper Shoalhaven Catchment environment. From the indications gained from the survey results here are likely to be in the vicinity of 120-150 gravel and sand extraction sites within the catchment. However it is probably as few as twenty which have a potential to cause significant impacts - normally a factor of their size, management and proximity to water courses.

Photo 5 - Back Creek Gravel Pit after 2 inches of rain; September 1995.



The primary impacts of extraction sites are on sedimentation and turbidity of streams and watercourses. This is especially evident at sites such as Back Creek pit where an inspection of air photos shows sediment plumes coming out from the gravel pit area. Such impacts are normally not apparent, as discussed in the introduction, until a major rainfall event is experienced - perhaps as infrequent as 5-10 years. However, extraction sites are especially vulnerable to these events as they have little or no cover and because their often compacted nature generates large amounts of runoff which carries sediment in to our rivers and streams. As such a precautionary approach is needed in respect of their operation and rehabilitation.

Their second most significant impact is in my opinion an aesthetic one - ie their impact on the appearance on the landscape. Derelict sites such as the Doughboy pit on the Kings Highway are as much as scar on the landscape as areas of severe dryland salinity. This relates to how we view the catchments environment in regard to whether we see it as a infinite product to be exploited or a resource to be managed.

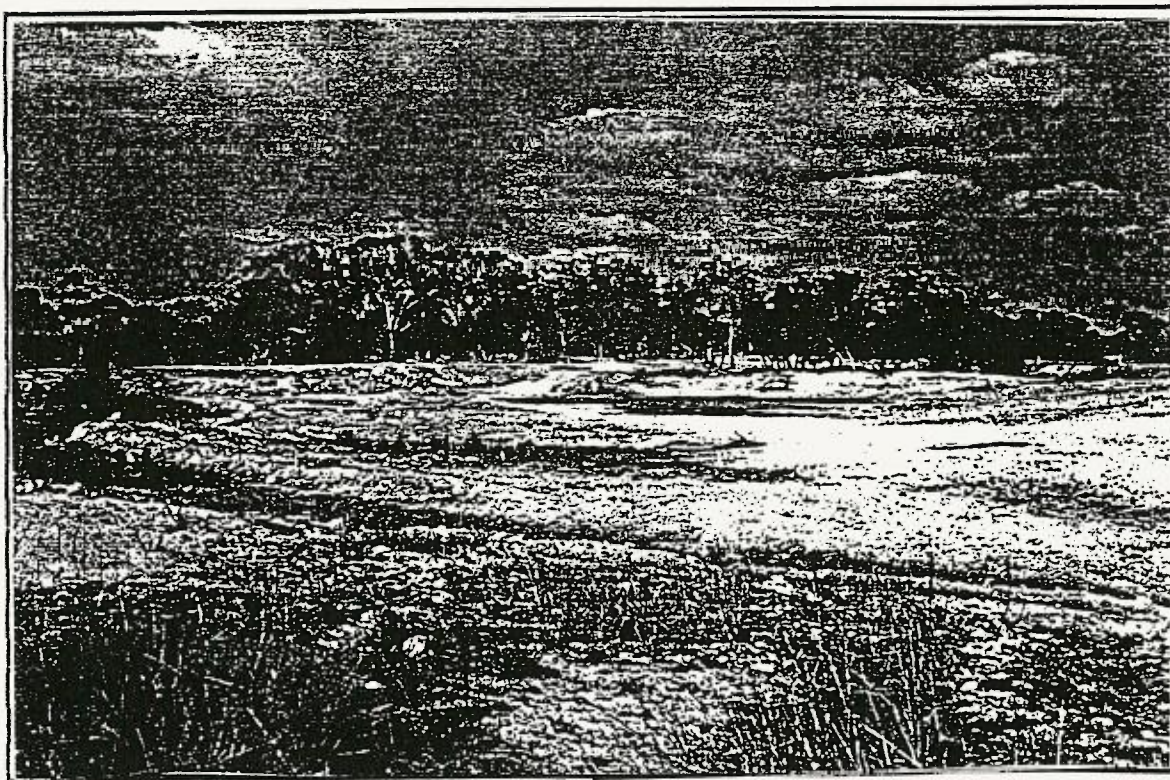


Photo 6 Doughboy TSR Derelict gravel pit
This site is directly adjacent to the Kings Highway

Other impacts are less apparent and include alteration of landscape hydrology with possible impacts on ground water tables and the occurrence of dry land salinity. Habitat loss, particularly that of endangered species is another consideration as are heritage values, Aboriginal as well as European. Weed infestation was found to be a problem in some areas. There is also some concern that wave action from the proposed Welcome Reef dam could act detrimentally

on such sites if not rehabilitated. Other risks associated with gravel pits is contamination of these sites from chemicals, fuels and oils used in the operation.

The impacts of gravel and sand extraction sites are probably best viewed cumulatively with the impacts from other land management practices. It is in totality that they affect our environment, our waterways, our landscape. However, they must be tackled individually, breaking the task of sustainable natural resource management into its component solutions. As such, the distinct task of improving the way in which we manage and rehabilitate gravel and sand extraction sites offers an opportunity to maintain and improve the quality of the catchment we live in.



Photo 7 Half Moon Lagoon located within the Mongarlowe Goldfields

4.2 GOLD MINING

The scope and resources of this investigation was not sufficient to specifically investigate any detrimental impacts on the catchment environment resulting from gold mining. However, a brief discussion of issues is possible, drawing largely upon communication with Barry McGowan, a historian who is currently completing a heritage survey of historic mining sites in the district¹².

¹² Barry McGowan 1993 Historic Mining Sites in the Monaro Tablelands Districts of New South Wales: A report to the NSW Department of Planning and the Australian Heritage Commission. Unpublished.

McGowan (1993) makes frequent reference to the eroded nature of many sites, particularly those associated with water races (eg Nadgigomar Creek, Black Springs, Yellow Springs). Some of the sites, such as Warri sluicing Company site, are located within the inundation area of the proposed Welcome Reef dam and may have environmental as well as heritage implications if the project proceeds.

Gold mining activity has changed the character of many streams in the area as well as the drainage patterns in areas of water races. This has created streams with greater quantities of sediment that are shallower and wider which has destabilised their flow patterns and natural equilibrium. In many other areas gold mining activity has inverted soil profiles bringing clays and finer dispersive materials to the surface which are then vulnerable to secondary erosional impacts. Despite the significance of these impacts on the landscape it would appear that in many places have revegetated and restabilised. However, the issue does require further investigation.

4.3 DERELICT NON-ALLUVIAL MINE SITES

Only the Mulloon Copper Site was surveyed and researched beyond a superficial level. However, it would appear that the extent and nature of derelict mines within the Upper Shoalhaven Catchment currently cause minimal impact to catchment environment today. However, the possibility of heavy metals from these sites is a very real one. This may occur in association with acid leachate from mine tailings or from mercury amalgam and other contaminants used in ore processing. None the less, considering the time passed since these mines were operating such materials are likely to have been leached out of their original environment by now and have been more broadly dispersed with few options to their management available.

Section 5. Operation, Management and Rehabilitation

This section briefly discusses issues in the operation, management and rehabilitation of gravel pits in order to facilitate a minimisation of their environmental impacts. The necessary techniques should be familiar to those concerned with their management or are readily at hand^{13,14} so emphasis is therefore placed on strategic approaches.

5.1 OPERATION

Key aspects of gravel pit management is diverting water away from the site as well as containing it within the site. This minimises the transport of particulate matter from the pit which has been here assessed as being the most significant environmental impacts of such sites.

This may be in part accomplished by the stockpiling of top soil or the upper layers of gravelly material which contain sources of endemic seed and a more suitable environment for plant growth (this is despite minimal differences in appearance).

Access tracks should be carefully designed - these were often the major source of impact and not the pit itself. Access tracks should not be located at the lowest portion of the pit - ie the down slope section as water will be funnelled out of the pit onto this vulnerable area.

Sites should be designed so as to minimise their aesthetic impacts. This could mean leaving strips of vegetation or to orientate the working face of the pit away from the dominant line of site.

5.2 MANAGEMENT

Once total costs of gravel pits are accounted for including their environmental and rehabilitation costs it may be more effective, economically and environmentally to have a fewer number of gravel pits and to increase the productivity of the remaining ones. The added transportation costs may be less than the added costs and difficulties associated with a large number of smaller pits.

¹³ Soil conservation Service 1985 Guidelines to Meet Requirements For Information on Soil and Land Stability in Proposals for Open cut Mining and Rehabilitation.

¹⁴ Australian Mining Industry council 1989 Mine Rehabilitation Handbook

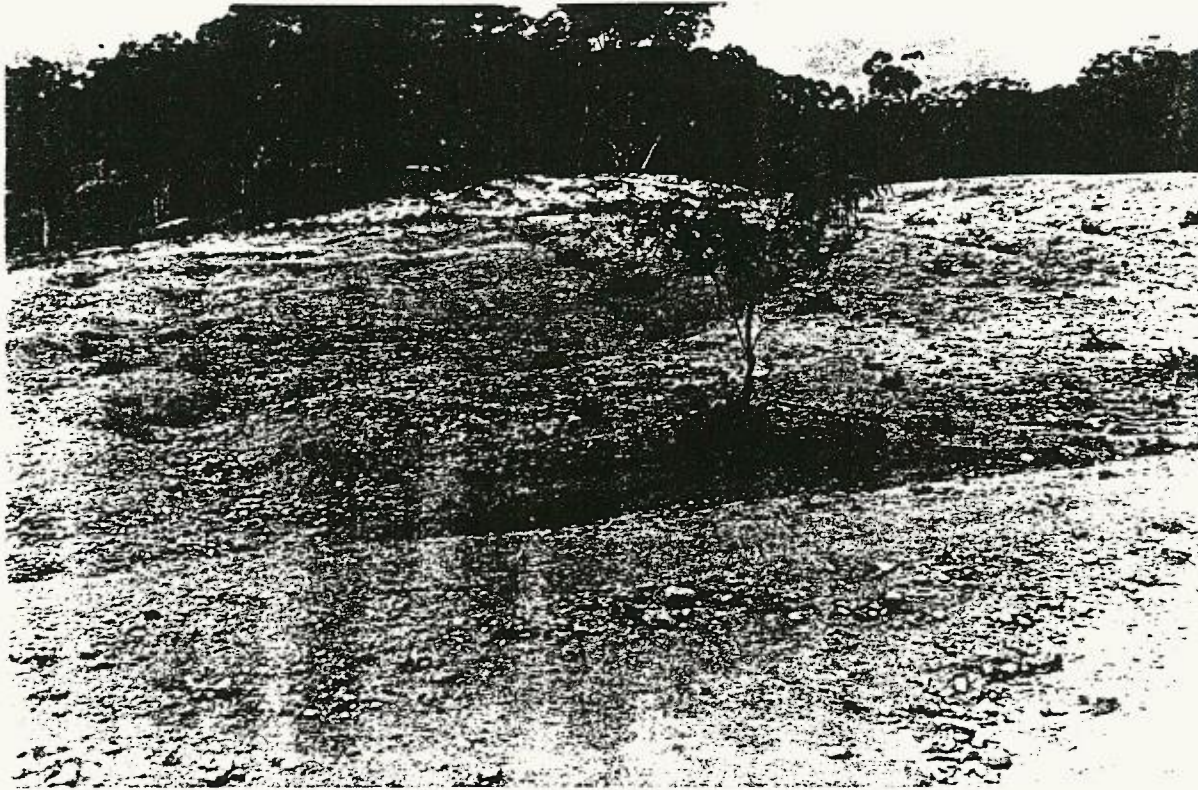


Photo 8 Crokers Gravel pit: The poor design and maintenance of the access road and the pit itself has caused substantial rill erosion.

The costs of gravel should include the costs of rehabilitation with funds for this purpose being built into expenses or budgets. Extraction sites also require regular monitoring to ensure that their designs and management works are of appropriate standard and have not deteriorated in periods of prolonged disuse.

Access agreements between the landholder and the quarry operator need to be carefully negotiated so as to specify responsibilities in relation to ;

- access
- soil and water management
- site management
- site rehabilitation
- safety procedures

5.3 REHABILITATION

To minimise environmental impacts gravel pits should be progressively rehabilitated. That is the integration of the rehabilitation with the ongoing operation of the gravel pit. Such a strategy has the benefits of minimising the total disturbed area at any one time, improving the effectiveness of rehabilitation (such as seed germination from topsoil stockpiles) and facilitating the gradual absorption of costs of rehabilitation. This strategy is integral to minimising the impacts of sedimentation and turbidity as well as visual impacts.

Other factors to consider are;

- maximising depth of contour ripping (1-1.5 metres if possible) to maximise water storage and availability to regrowth
- sympathetic contouring of batter slopes and landscaping
- maximising on site germination which will contain endemic species.
- the possible use of sediment control dams
- that for successful revegetation, some sites require chemical amelioration (eg gypsum or lime), multipurpose fertiliser and at times topsoil

Section 6. Positions and Concerns of Key Stakeholders

6.1 CONSULTATION

A/ In Relation to Sand and Gravel Extraction

Mulwaree Shire Council

Paul Anderson, director of Engineering Services at the Mulwaree Shire Council was contacted by phone and in writing early on in the project. Mr Anderson responded in writing (see Appendix 7 & 8) and, in addition, provided the author with a shire map which located gravel pits. The reply did not, however, respond to questions relating to the extent of derelict gravel pits, the existence or otherwise of funds intended for gravel pit restoration or the shires strategy for the management and rehabilitation of gravel pits.

Tallaganda Council

The staff at the Tallaganda Shire Council provided a great deal of assistance to the project including regular comment from the Town Planners as well as access to their files¹⁵. The Shire recognises that the knowledge, concerns and values of the community in regard to gravel pits and extractive sites and also, more generally, to natural resource management has changed vastly over the years and that the Shire has catching up to do.

This process is being undertaken with considerable openness and willingness, however it is constrained somewhat by the financial and personnel constraints which the shire operates under. The shire is currently reviewing their current system of management and rehabilitation of gravel pits with particular consideration of reducing the total number of pits in operation as well as implementing a rehabilitation strategy.

Braidwood Rural Lands Protection Board

Roger Darcy, Administrative Officer of the Braidwood Rural Lands Protection Board was contacted in regard o a number of gravel pits located on travelling stock reserves. These include the Back Creek pit, the Ballalaba Roadside pit, the pit on the Doughboy Travelling Stock Reserve in addition to a number of other sites. It is concerned that some of these sites are operating without the authorisation of the Board and that, with the moratorium date for SEPP 37 being passed the Shire has not availed themselves of the opportunity to apply

¹⁵ Particular thanks go to Grant Smithhurst, Bernie Wilder and Gordon Stephens.

for continued access. The Board has requested the Tallaganda Shire to rehabilitate and revegetate these sites.

Sydney Water

Alan Cooper, Catchment Protection Officer with the Sydney Water Corporation was contacted in regard to the potential impacts of extractive sites on catchment quality generally, as well as a number of derelict sites located on the Corporation's property. It has a number of concerns in regard to impacts of such sites on catchment quality and has in the past had correspondence with the Tallaganda Shire in regard to the need for works addressing soil erosion and sediment loss occurring at these sites. However, none of this work has been implemented¹⁶.

Department of Land and Water Conservation

Steve Nichols, the district soil conservationist, provided ongoing comment during the project in line with his supervisory role. He is concerned with the impacts of extractive sites on the catchment quality and would like to see a more strategic approach taken to their management and rehabilitation.

Other Communication

A number of other agencies were consulted during the project including the NSW's EPA, the Catchment Management Officer for the Sydney South Coast region and various other agencies. The NSW National Parks and Wildlife Service were not contacted, however, it may have some particular concerns in regard to habitat conservation and endangered species. Also considering the need to take into account Aboriginal Heritage issues as well as the possible impact of the Native Title Act on extractive site it may be appropriate to contact the Aboriginal Heritage Section of the Heritage Commission or the ATSIC Regional office and Council.

Commercial Extraction Industry Operators

This project did not research the impacts of commercial extraction operations in current operation on the suggestion of the project supervisors nor did it initiate any consultation with them. Generally, it has been presumed that the current framework for their development and management is adequate, or of a lesser priority than other extraction operations. However, because of the size of these operations and their generally closer proximity to watercourses and particularly the Shoalhaven River they do have a potential to have considerable impacts on the catchment environment.

¹⁶ Alan Cooper, Sydney Water, letter 29.10.1995

Owners of Gravel pits and the Broader Community

Owners of gravel pits were not contacted during the research project. However, it is likely that there is considerable concern over the appropriate management and rehabilitation of such sites. Correspondence held by the Tallaganda Council reflect dissatisfaction with the royalty rates, management practices, conditions of access and rehabilitation and off site impacts. Such consultation will need to be given a high priority in the development and implementation of any new management strategy aimed at addressing these issues.

Furthermore, since such sites often impact on aesthetic values (eg the Doughboy derelict site bordering the Kings Highway) and possibly also on recreational values, the broader community may wish to have the opportunity to express their views.

B/ In relation to Derelict Mine sites

During the project the views and concerns of a number of agencies and individuals were sought in relation to the issues surrounding derelict mine sites. These included Dobro Inanovic, Regional Inspector of Mines, Department of Mineral Resources; Gary Dovey, Wollongong EPA; Dr Greg Unwin, Mine Site Rehabilitation Program, Armidale Department of Mineral Resources; Kerry Brooks, Sydney Department of Mineral Resources; and Barry McGowan, currently working under contract to the Australian Heritage Commission assessing the heritage significance of mining in the region.

Generally it was felt that there needed to be further assessment of the area for derelict mine sites causing detrimental environmental impacts. However, the limitations in both time and in geographic area needed to be covered were acknowledged. Various personel at the Department of Mineral Resources were appreciative that the derelict Mulloon Copper Mine had been brought to their attention as they were previously unaware of its existence. However, the metallurgical maps reveal it as well as quite a number of smaller sites in the area.

Generally the Department of Mineral Resources do not see alluvial gold mining sites of a historic nature as their concern, although there is potentially some contamination of sites and waterways from mercury amalgam used in the ore processing operations.

Sydney Water Quality Monitoring Services were contacted in regard to verbal reports that heavy metals had been found in the sediments of Tallowa dam. However, as the nature and quantity of these contaminants was not able to be confirmed.

Barry McGowan : Heritage significance of Derelict mines and alluvial workings

Barry McGowan, who is currently assessing the heritage significance of mining activity in the region has an extensive knowledge of derelict mines in the region. He has some reservations concerning that any potential rehabilitation of these sites is done in a manner consistent with their heritage status. Many of the sites he has assessed in the past 4 years are now included under heritage protection orders. At least on one occasion in the past the actions of a land management agency has adversely affected the heritage values of a site and he is concerned that it is not repeated. He would welcome any inquiries in relation to the management of derelict mining sites and areas.

Section 7. Rehabilitation Funding and other Resources

Part of the brief for this project was to identify any existing security deposits that can be used for immediate rehabilitation as well as to nominate other funding sources for priority sites. This chapter therefore reports on the Environmental Reinstatement Trust Account, collected and held for the purpose of gravel pit rehabilitation by the Tallaganda Council as well as a number of other resources which could be directed towards the rehabilitation of derelict extraction sites.

7.1 THE TALLAGANDA SHIRE GRAVEL PIT RESTORATION TRUST FUND

Under the Local Government Act (1919) shire councils have the power to enter land to extract materials for the purposes of public works provided that compensation is paid to the relevant landholder and that the site is rehabilitated once use is no longer required. To assist in this process the Tallaganda council has operated a system such that a 'gravel' royalty is paid to the landholder, as well as a lesser amount to a 'pit restoration trust fund' (also known by various other names). For those sites on public land such as road reserve or crown land, the Council follows the practice of paying the total amount to the trust fund (ie a rate of 50 cents/cubic metre since October 1989)¹⁷. The rates at which these royalty are paid at has changed over the years as follows;

Table 3 Royalty rates for gravel pits operated by the Tallaganda Council

	owner rate / cM	restoration rate/cM
< Feb 1980	7 cents	0 cents
Feb 1980- July 1982 :	8 cents	2 cents
July 1982- July 1986	10 cents	2 cents
July 1986- unknown	15 cents	10 cents
unknown - Oct 1989	20 cents	10 cents
Oct 1989- present	35 cents	15 cents (50)

¹⁷ File GO30100 Gravel pit procurement : Council minutes, 18 September, 1989

The royalty collection system appears to have been initiated in 1980 in response to concerns over meeting the cost of the councils obligation to restore gravel pits ¹⁸ ;

Gravel Royalties (G3/1)

The rate of 7c per cubic metre has not been increased in approximately five years. Also *no money is being set aside for the eventual restoration of worked out gravel pits. Because this is not done, the council will incur full restoration costs* rather than such costs being debited to the jobs benefiting from the use of the gravel.

Recommendation

That the gravel royalty payments be increased to 10 cents per cubic metre - 8 cents to be paid to the property owner, 2 cents to be paid into a gravel pit Restoration Trust fund against which the eventual restoration of all such pits will be charged (*authors emphasis*).

The records of the Tallaganda Council stretching over a number of years were categorised according to pit site. The records for each pit were then tallied and multiplied by the appropriate royalty rate paid at the time. The resulting figures are displayed in table 4 (Tallaganda Shire Gravel Pit Restoration Fund).

These records give a total recorded royalty payments totalling \$20,796.70. However, a total of \$42,000 is present in the fund. This discrepancy may be explained by the lack of royalty payment records for the period from 1980 when the system was initiated to approximately 1991, when such records although perhaps incomplete, do exist. According to council employees, there has been no rehabilitation works carried out at any time up to the present date¹⁹. As such it is expected that no withdrawals have been made from this account.

Royalty Collection system

The royalty collection system appears to be a haphazard one as there are no 'Tally sheets' used for recording quantities of gravel extracted, the relevant pit and royalties owing before mid 1991. Generally, pits which are owned and operated by the council (eg the numerous road side pits) are not identified individually. As such there is no way of correlating royalties collected with the actual amount and location of gravel extracted in these cases. Furthermore, in the case of privately owned pits operated by the Tallaganda council, there has been some dissatisfaction expressed over the years by landowners as to the payment of royalties, the rate paid, and notice given in respect to entering the land.

¹⁸ File GO30100 Gravel pit royalties , Council minute, 18 February 1980
¹⁹ Gordon Stevens, Tallaganda Council; personal communication.

Table 4 Tallaganda Shire Gravel pit Restoration Trust Fund
: gravel extracted and pit restoration royalties

Pit Name	Year of Extraction	Quantity Extracted (cM)	Rehabilitation Royalties paid (\$)
Halls Lane R/s	1991	1080	540
Nerida Hill R/s	1991, 1993	432	216
Mt Boro R/s	1992,1993	321	160.5
Phipps Farm R/s	1993	270	135
Sawyer Ridge R/s	1991-1993	1422	711
Oallen R/s	1992	4991	2495.5
Ballalaba R/s	1992-1992	632	318
Mt Fairy R/s	1992-1993	3255	1627.5
Muloon R/s	1990-1993	8344	4132
Roadside misc.	1991	1998	999
Roadside misc.	1991-1992, 1993	3176 18	1578 9
Roadside sub total			12,921.5
Stewarts Crossing	1991	1080	540
Ballalaba indigo	1991	1218	182.7
Callans	1991-1992	576	86.4
Corong	1991-1993	14,441	2,166.15
Radburns	1992-1993	2128	319.2
J Rolfe	1993	18	2.7
D Kirk	1994	2878	431.7
A McKay	1992-1993	519	77.85
Moores	1993	126	18.9
Hockeys	1993	1470	220.5
D Rouse	1993	306	45.9
Barlows	1992	203	30.45
Izzards	1992	171	25.65
B Boatright	1993	330	49.5
Manar Pits	1987	2745	411.75
Lulhams	1990-1993	1402	701
Balmains	1991-1993	13,635	2,045.25
Crokers	1991-1993	626	93.9
Cunninghams	1991-1993	2134	320.1
Records Total			20,796.7
Total Royalties within Gravel pit restoration trust fund			42,000

Notes within Tallaganda council files indicate that the Roads and Traffic Authority contributes at least part of the funds paid as royalties to landholders and towards the gravel pit reinstatement under its 'General Conditions of Assistance' to councils for works on main roads²⁰. They have been successfully approached at least once about the possibility of paying an increased rate to meet such costs. While this system may have since changed, it may be possible under any current system to procure an increased royalty rate for the purposes of rehabilitation.

It appears that irrespective of the amount of royalties collected, Tallaganda council retains the obligation to fully restore gravel pits it operates once they are worked out or no longer required (ie irrespective of whether the costs of such action may exceed the actual revenue collected for the purpose). This may indeed be the case considering the fact that such restoration funds were not procured prior to 1980 and additionally, that the collection system appears to be somewhat haphazard.

As such the Tallaganda council may have shifted forward the financial burden of such rehabilitation works to the point where it is unable to fulfil its obligations. None the less, a total sum of \$42,000 has accumulated in the gravel pit restoration trust fund and is ready to be directed towards such action²¹.

7.2 AGENCY RESOURCES

- NSW State Government Environmental Trust

At the initiation of the project there was a suggestion that funds located within environmental trusts might be directed towards the rehabilitation of derelict gravel pits. However, since the recent handing down of the NSW Budget, these funds have been allocated towards the restructuring of the forest industries and are no longer available for such use²².

- The Department of Mines Rehabilitation Program

The Department of Mines has a derelict mine site rehabilitation program based at Armidale, and run by Dr Greg Unwin. Regional Inspectors of Mines develop a list of priority sites which are then submitted on an annual basis to the central Armidale office. Specific rehabilitation projects are then selected for action.

²⁰ File GO 30100 Gravel pit procurement : Proposal to Council, 21 August 1989
RE : gravel royalties .

²¹ Bernie Wilder, Acting Town Planner, Tallaganda Council, personal communication.

²² Gary Dovey, Wollongong Office, Environmental Protection agency. Personal Communication 11 October, 1995.

Contact with Dobro Inanovic, Wollongong Office of the Department of Mineral Resources has been contacted in this regard and although new to this position is keen to become active on this issue. He has indicated that he will be following up on two sites of concern, those of the Mulloon Copper Mine/s and the Boro Silver Mine²³.

- The Shoalhaven River Catchment Protection Scheme

The Shoalhaven Catchment Protection Scheme is a joint initiative of the Soil Conservation Service and Sydney Water and is targeted at soil conservation works with the objective of improving catchment quality. Although the scheme is normally targeted at individual landholders on a cooperative basis there is a possibility that rehabilitation priorities such as the derelict extraction site causing undercutting of banks of the Mulloon Creek (to the immediate north of the Kings Highway Bridge) may attract some degree of support.

- Sydney Water

Alan Cooper, Catchment Protection Officer with Sydney Water when contacted on this issue suggested that there was some possibility that Sydney Water may be able to contribute to the rehabilitation of the 'Griggs' abandoned quarry which borders Sydney Water property near Warri Bridge. He has suggested that Kevin Hanley (AWT Real Estate) be contacted in this regard.

- National Landcare Program

Various components of the National Landcare Program may be approached for funding on revegetation and catchment quality improvement issues. The Community Component and the One Billion Trees Program are probably the two most likely sources of assistance. They do however stress the importance of community based approaches. Riparian vegetation restoration projects associated with extraction sites might be the most suitable type of project to meet their program guidelines.

7.3 COMMUNITY BASED RESOURCES

- Landcare and Environmental Action Program

The Landcare and Environmental Action Program (LEAP) is a labour market program designed to assist young people to develop practical skills and experience through projects related to landcare and environmental

²³ Dobro Inanovic, Regional Inspector of Mines, Department of Mineral Resources, personal communication 3 November, 1995.

management. There is currently a LEAP project operating in the Braidwood area and the revegetation of derelict extraction sites could be a worthwhile project. Local organisations can contract to become brokers in implementing specific projects with DEET who covers costs of project administration.

- Landcare Groups

Landcare groups could play an important role in assessing and prioritising derelict extractive industry sites on a sub-catchment based level in addition to the ongoing monitoring of their impacts. The local knowledge of landcare members could especially assist in the location of derelict sites.

Section 8. Conclusions, Recommendations and Strategic plan

8.1 ENVIRONMENTAL IMPACTS

The brief of this research project was to review the environmental impact of derelict mines and quarries within the catchment. This was accomplished through a review of existing data and information and through a process of on site inspections and assessments (section 3). This information provided clear evidence that the present state and operating conditions of gravel pits, quarries and derelict mines caused a detrimental impact on water quality, river and stream character and health, aesthetic and recreational values, land use capability, habitat values and both Aboriginal and European heritage values (section 4).

Perhaps most significantly, the sites as a result of the character of erosional processes in the region and in particular the periodicity of major erosional events, have a high potential to impact further on the catchments environment.

As such it is concluded that derelict gravel pits and other sites of extractive industry cause, and have the potential to cause, significant impacts on the catchments environment.

- 8.1.1 it is recommended that the Catchment Management Committee and its individual members develop and adopt a comprehensive strategy to address the management, operation and rehabilitation of such sites.

The portion of the Mulwaree Shire located within the Upper Shoalhaven Catchment was not surveyed by the project due to the limited time available and the desire to concentrate energies on the larger section of the Catchment occupied by the Tallaganda Council. However, it is evident that a number of derelict quarries do exist in this area and that a further nine gravel pits are in current operation under the management of the Mulwaree Shire. Furthermore it is noted that the Mulwaree Shire possesses a rehabilitation system different to that of the Tallaganda Shire.

- 8.1.2 It is therefore recommended that the Catchment Management Committee initiate a further project in collaboration with the Mulwaree Shire that documents for this portion of the Upper Shoalhaven Catchment the location of extractive sites (both derelict and currently in operation), the nature and extent of any environmental impacts including priorities for rehabilitation in addition to the Shires management and rehabilitation policy and programs.

The issue of the environmental impacts of gold mining sites was not investigated beyond a superficial level due to the limited time available to the researcher. However, preliminary indications are that the extent of such sites and their degree of impact historically on landscape processes are such that the issue warrants further investigation.

8.1.3 It is therefore recommended that the impacts of derelict gold mining on the catchment environment be investigated giving particular attention to any detrimental impacts and suitable strategies and approaches by which to prevent further detrimental impacts.

8.2 GRAVEL PIT MANAGEMENT

The investigation process revealed a number of deficiencies in the present system of management, operation and rehabilitation of gravel pits within the catchment, and in particular of the Tallaganda Council. This deficiency has resulted in much of the impacts associated with these sites (section 3, section 4) and has occurred, in part, as a result of the absence of a clear strategy in keeping with the present level of concerns, knowledge and awareness of environmental management issues.

It is therefore recommended that;

- 8.2.1 The Tallaganda Council adopts the operational strategy of **reducing the number of gravel pits** it operates while increasing the operating capacity of that remaining number. This strategy, although increasing the transport requirements of materials will provide greater benefits in the ease of site management and rehabilitation, minimising the actual and potential environmental impacts of such sites, and the overall economic efficiency of those remaining sites. Such a strategy would need to be developed with full consideration of the current and projected works program of the Shire and the associated demand on gravel resources
- 8.2.2 That the practice of **staged rehabilitation** be adopted by the Tallaganda Council and other operators of gravel extraction sites such that it is synchronised with the extraction of new material and thus minimising the actual area of workings at any one time.
- 8.2.3 That the practice of extracting gravel from road verges and cuttings be discontinued.
- 8.2.4 That the system of environmental reinstatement (rehabilitation) **royalty collections** be continued however so as to;

- i. increase the amount of reinstatement royalties from 15c per cubic metre to 35 cent/ cubic metre of material extracted and where in the case of public land, or where no payment royalty is required by the sites owner, to an overall rate of 70c/cubic metre. Such increases in revenues will then be directed towards the rehabilitation of derelict pits where insufficient funds exist.
- ii. allow for rehabilitation funds accumulated from one particular pit to be partially reallocated towards other sites as prioritised by a meeting of relevant agencies including landholders, provided that the management and rehabilitation of the original pit is in keeping with principles adopted by council.

8.2.5 That where the Council wishes to continue the use of a site that it enter into an **access agreement** with the relevant landholder (whether public or private) which clearly states conditions of management, rehabilitation and associated time frames. This agreement should include a requirement that the council submits a regular (eg annual) statement to the owner of the site reporting on its condition and management together with any off site impacts.

8.3 COMMERCIAL SITE MANAGEMENT

An assessment of extractive industry sites run on a commercial basis was not included within the scope of the report. Such sites due to their greater size and their frequently closer proximity to major watercourses have a particularly significant potential to impact on the catchments environment. In any case there are sufficient processes in the form of environmental impact statements or statements of environmental effects that accompany development applications for their management and rehabilitation practices to be subject to some scrutiny and control. However, there is some questions on the compliance of these operators which is attested to on sites of derelict operations (section 3).

It is therefore recommended that;

- 8.3.1 commercially operated extractive sites are subject to a greater degree and stringency of **monitoring** which includes a **regular site inspection** by officers of both the Shire Council and the Department of land and Water Conservation.
- 8.3.2 That the instrument of lodging **performance bonds** together with monitoring and inspection criteria is applied to extraction sites where the potential to cause impacts to the surrounding environment is especially significant or where the operator of the site has been negligent in the appropriate management or rehabilitation of the site in question or another site.

8.4 REHABILITATION STRATEGY AND PRIORITIES

Having investigated a significant number of sites and assessed their present and potential impacts it is evident that a number of gravel pits are in more immediate need of rehabilitation works or management structures than other sites. Furthermore it is acknowledged that the survey undertaken requires additional assessments to allow an informed, effective and comprehensive response to this land management issue.

It is therefore recommended that;

- 8.4.1 That the Tallaganda Shire Council undertakes to rehabilitate to the a standard approved by the Department of Land and Water Conservation the gravel pits given a rehabilitation priority of 'High' within a set time frame agreed to by the Catchment Management Committee.
- 8.4.2 That the Catchment Management Committee investigate ways in which the survey of extraction sites undertaken to date may be further extended so as to further identify sites requiring rehabilitation on a priority basis .
- 8.4.3 That the Tallaganda and Mulwaree Shires, in collaboration with other stakeholders, develop a set of principals and standards in relation to the management and rehabilitation of extractive sites. Following their development, and utilising the Shires authority in regard to development approvals and conditions, these principles will then be applied to all extractive industry operators.
- 8.4.4 That the pits within the Mulwaree section of the Upper Shoalhaven Catchment be surveyed, assessed and accordingly be prioritised for rehabilitation and the adequacy of management and operational practices.

Appendices

- | | |
|-------------|--|
| Appendix 1 | List of Active Gravel Pits |
| Appendix 2 | Derelict Gravel Pits |
| Appendix 3 | Mulwaree Shire Gravel Pits |
| Appendix 4 | Extract from the Tallaganda Development Control Plan |
| Appendix 5 | Project Application form |
| Appendix 6 | Letter Steve Nichols, DL&WC |
| Appendix 7 | Letter to Mr Paul Anderson , Mulwaree Shire |
| Appendix 8 | Reply from Mr Paul Anderson , Mulwaree Shire |
| Appendix 9 | Project costs |
| Appendix 10 | Contacts |

Derilict gravel pits cont..

		Griggs	POR 3	
	Durrans Durra 634823, 633826	Hockeys (1 & 2)	POR 137, 115	Halls Lane
	Krawaree 373312	Stoney Ridge Forest	POR 44 Forest (Monga)	Stoney Ridge Rd.
		Doughboy	Roadside (Fairy Mead. P)	
		Reedy Creek	FSR	
	Boro 418046	Red Hill	POR 62	Goulburn Rd
		Smiths	POR 3	
	885-895 E	Grants	POR 135	Braidwood - Nerriga Rd
		Mackays Ballalba	Lot c DP391419	
		Parkers Gap	Forest (Ollalulla P.)	
		Ellis	Roadside (Bendoura P)	
		-	POR 103	

Appendix 3

Mullwaree Shire gravel pits located within Upper Shoalhaven Catchment

Sub catchment	Pit name	Grid reference
Boro Ck.	Snows	511059 (Braidwood 1:100,000)
Jerralong/Boro Ck	Goldmine	6701 (approx area)
Nadgigomar	Cullulla	5512 area reference
Windellema	Bryants	6022
Jacqua Ck.	Jacqua Road Side	Goulburn (1: 100,000)
Bungonia	Langs	Goulburn (1: 100,000)
Jacqua Ck.	Jacqua	Goulburn (1: 100,000)
Bungonia	Carmicheals	Goulburn (1: 100,000)
Bungonia	Kettles	Goulburn (1: 100,000)

Derelict Gravel Pits (will need to split into two pages leaving gaps for entry of further surveys information)

Sub catchment	Grid reference (1: 25,000)	Name	land title	Nearest road
		-	Roadside pits ()	
	635946 Durran	Stewarts Crossing	POR 151	
		Oallen	Reserve	
		Welcome Reef	POR 12	
		Back Creek	PT POR 94	
		Diamond Yards	POR 78, 79	
		-	Roadside (Budawang P.)	
		Sheas	POR 28	
		Nithsdale	- (Bendoura P.)	
		Izzards	POR 127	
Bendoura	Snowball 8826 IIS 323196	Badja	POR 24	Snowball Rd
		-	Roadside (Kwawaree P.)	
Round Mtn.	Krawaree 325405 323402	Glenfield Glenfield 2 (small)	Lots 1/2 DP 777013 (lot 122) lot 222)	W. of Hereford Rd.
Round Mtn.	Krawaree 314340	Gards	Lot 9 DP 431755	Hereford Hall Rd.
	Manar 428897	Gordons/ Manar	PT POR 117	Manar Mulloon Rd
	Boro 473034(?)	Boro	POR 131	
	Durran 563883	Christmas Creek	POR 118	Euradux Rd
	Durran 620843	Barlows	POR 85	Cookanulla Rd
		Pages	Lot 2 DP 594188	
		Baarlijan	Lot 1/2 DP 775992	

Active Gravel Pits

(information from master list given by Bernie Wilder, Acting Town Planner)

Sub catchment	Map Reference (1 :25,000)	Pit name	land title	Nearest road
Boro Ck.	Durrans durra 535932	Crokers	lot A DP156396	Mayfield Rd
		-	POR 115	
		Sapling Yard	POR 149	
		Forest	Forest	
		Sawyers Ridge	POR 506, 424	
	372	Izzards	POR 139	(S of Green Hills Rd)
Bendoura	Krawaree 385367 (large)	Cunninghams/Blk	PT 1 DP1611087	
		Badja	Forest x 2	
		Lullhams	Roadside	
		O'Briens	Lot 1 DP743035	
Boro Ck.	Boro 405068 (?)	Rouses	POR 110	
		Little Bombay	POR 127	
	Budawang Rd	Radburns	POR176	
	Araluen	Benmanang	PT 1/2 DP570392	
Reedy Ck.	Boro 363013 + 368030	Demesters	Lot 7 DP250880	Mt Fairy Rd.
	nr. Majors Creek	Callan/ Parks	POR 230, 250	
Bendoura	Krawaree 405(?)403(?)	Griffins Road	Roadside	
Reedy Creek	Manar 472904	Balmains	POR 118	B-b Rd (Mayfld.R)
Reedy Creek	Boro 370970	Mulloon	Lot 1 DP236824	
Reedy Creek	Boro 433994 (?)	McVillies	TSR	
		Corang	POR 44	
Braidwood/Bendoura	Berndoura 8826 iv 447677	Back Creek TSR	POR 166, TSR	Jembaicume Ck & W of swamp
		Bowlings Hill	Lot 6 DP245647	
Bendoura		Ballalaba	Reserve	

Appendix 4 :

EXTRACT FROM THE TALLAGANDA DEVELOPMENT
CONTROL PLAN

15

PART 3

RURAL INDUSTRY AND MINING

SECTION 1

4.0 AIMS AND OBJECTIVES

General

Aim and Objective

- 4.1 To provide a co-ordinated, orderly and consistent framework for the management of rural industry, mining and extractive land use within the Shire.
- 4.2 The objective of this section of the Plan is to make adequate provision for the use and protection of natural and rural resources, while protecting other land use options and the natural environment.

Environment

Aim

- 4.3 To identify valuable natural and man-made resources, for example, attractive and unspoilt countryside, important areas of high quality agricultural land, significant forest areas, extractive and mining areas, homesteads of historic interest, settings worthy of conservation and locations which may be habitats for rare and endangered flora and fauna.

Society

Aim

- 4.4 To maintain a high quality of life for all members of the community through the provisions of an adequate supply of rural resource materials and processing opportunities.

SECTION 2

5.0 Extractive Industry and Mining

Matters for consideration at the development application stage

- 5.1 Council shall not grant consent to carry out an extractive industry unless it has made an assessment of the following matters.
- 5.1.1 A full description of the site, location and materials, the extent of operations including a time frame and the site management.
- 5.1.2 Emissions from the site into the air including noise and vibration levels, and the requirements of the EPA.
- 5.1.3 The effect of the proposal on water quality, and the hydrodynamics of any water course or underground waters in the area.
- 5.1.4 The proposed rehabilitation measures, including whether or not they will be carried out in accordance with the Soil Conservation Service "Guidelines To Meet Requirements for Information on Soil and Land Stability in Proposals for Open Cut Mining and Rehabilitation".
- 5.1.5 The effect on the Shire road network and the recovery of costs under Section 94 of the Environmental Planning and Assessment Act, together with any Section 94 plan in force at the time of the application.
- 5.1.6 The bush fire regime of the locality and, where the hazard is moderate to very high, any method of:
- reducing the likelihood of fire spreading from the site into surrounding areas;
 - protecting the site from external fire sources.
- 5.1.7 The archaeology of the locality and any matters raised by consultation with the NSW National Parks and Wildlife Service.
- 5.1.8 Any matters, buildings or sites of historical significance.
- 5.1.9 Effects on surrounding land, including the agricultural value of that land, dwellings or other land use which may be in conflict with the proposal. The amenity of that land.
- 5.1.10 Alternative sources of the material to be extracted and whether they should be mined first. This applies especially when mining is to be within 40m of the Shoalhaven River.
- 5.1.11 Any management plan developed for the site, including soil and water management plans, staging plans and plans for alternative uses.
- 5.1.12 Local employment provisions.

- 5.1.13 The existing use of the land, the potential use for agriculture and the protection of extractive material.
- 5.1.14 Any requirement for a Fauna Impact Statement.
- 5.1.15 The visual amenity of the site and any landscaping measures aimed at mitigation of the effects.
- 5.2 Where an Environmental Impact Statement (EIS) is required, these matters are to be included in the EIS. Where no EIS is required, a Statement of Environmental Effects will be required by the Council and will be required to include the above matters. In any case, the applicant will be required to comply with the EIS or the Statement of Environmental Effects, as modified by conditions of consent.

Additional matters

- 5.3 Where a development occurs within the vicinity of known extractive materials, or an existing extractive site, Council will take into consideration:
- 5.3.1 the effect, or likely effect, of that development on any extractive industry as if it were considering the effect of the extractive industry on that development.
- 5.4 In any case, Council will not permit:
- the erection of a dwelling within 500 metres of a known resource, or within 1,000 metres of a known resource which requires, or may require, blasting operations.
 - the erection of a dwelling within 100 metres of a sealed road, used by a resource or within 500 metres of an unsealed road.
 - unless it has taken into consideration the effects of the dwelling on the resource, as if it were considering the effect of the resource on the dwelling.

Appendix 5

062 49 3700

UPPER SHOALHAVEN CATCHMENT MANAGEMENT COMMITTEE PROJECT APPLICATION 1994 / 95

Project No.

* Type or black pen only

1. Name of community group / organisation

Department of Land & Water Management
Tallaganda Landcare Working Group Inc
- Braidwood Landcare Sub Group

Is this group incorporated?
Yes No

2. Project title (in 8 words)

UPPER Shoalhaven
Detect Mine and Quarry Survey

3. Contact person for this project

Name: Steve Nichols
Address: Soil Conservation Service
Phone: 048 -422595 Fax: 048 -422655

4. Project location

Tallaganda Shire and Mulwaree Shire

5. Duration

Start Month / Year: 6 / 95
End Month / Year: 11 / 95

Not earlier than May 95 Not later than Dec. 95

Complete these sections last , after completing Question 14

Summary : Describe what you want to do , why you want to do it and the likely results.

To provide the actual expenses for a final year University student to prepare an inventory of disused mine and quarry sites in the Upper Shoalhaven. This will provide a report listing the sites of greatest environmental impact and identify those that may have existing security deposits that can be used for immediate rehabilitation. Other funding sources will be nominated for priority sites.

The project will be coordinated by the Department of Land & Water Management. Ancillary costs reflect student involvement and supervision costs.

1994 / 95 FUNDING			
Community Group contribution \$	Other Contributions \$	Funding sought from USCMC \$	Annual Project cost \$
\$3800	\$600	\$800	\$5200.00

Appendix 6

The Department of Land and Water Conservation incorporates the former Departments of Conservation and Land Management and Water Resources.



Peter Dougan
11 Gair Place
Waniassa ACT

42 Ryrie St
PO Box 9
Braidwood NSW 2622
Phone (048) 42 2594
Fax (048) 42 2655

Dear Peter,


I have been through your Action plan and it looks fairly good. Prior to your plan arriving I had discussed your program with both Richard and Barry McGowan. One comment was that if you need to reduce the size of the project again, it was suggested that you restrict your activities to the gravel pits and quarries in the nominated subcatchments.

In point 2 one other environmental issue which our department could be interested in is, if any of the problem sites are located on Crown lands. Without a Title Search the easiest manner, although not entirely accurate, would be to collate any title details into your results from Council records. Also note any pits that are obviously on private lands.

Apart from this point, the only other point is whether you can quantify (from scaling the maps, air photos, etc) the areas of each site.

I hope that these points are of interest. If you want to discuss these details any more, please feel free to contact me.

Yours faithfully


S J Nichols
District Soil Conservationist
Braidwood
31 August, 1995



Appendix 7

11 September, 1995

Peter Dougan
11 Gair Place
WANNIASSA 2903
Ph. : 06 - 231 3329

copy

~~Anderson~~
Mr Paul Hunter
Director Environmental Services
Mulwaree Shire Council
28 Montague St
GOULBURN 2580

078 211 933.

Dear Sir,

DERELICT GRAVEL PITS : TCM SURVEY & ASSESSMENT

I am a final year Geography student at the Australian National University and have been contracted by the Upper Shoalhaven Catchment Management Committee to undertake a survey and assessment of derelict gravel pits in terms of their detrimental impacts, if any, on the catchments environment. As such, I am contacting you to seek your assistance in this process and in preparing a report on the matter.

To assist me with my report could you please provide me with the following items of information;

1. A list of gravel pits located within the Upper Shoalhaven portion of the Shires boundaries indicating those that are derelict and those that are in active use (whether regular or occasional in nature).
2. A statement that outlines funds (stemming from royalties or other sources) set aside for the purpose of rehabilitation of pits. I understand that this is normally done on a pit by pit basis according to quantity extracted.
3. An outline of the shires strategy for addressing the rehabilitation of such sites, as well as details of any environmental or operational policy that may relate to gravel pits, their use, regulation and rehabilitation.

75-30 :-

12.75

sep 37.

has sent reply

Owing to the limited time and other resources available for the preparation of this report I will not be making any on site assessments of gravel pits within the Mulwaree Shire's boundaries. However, I would be most grateful for the above information which would contribute to the development of a rehabilitation strategy for the Upper Shoalhaven that would indicate how such issues may be best addressed.

A draft report for the CMC is to be completed by the 19 October, 1995. Accordingly your timely assistance in providing the above information, would be very much appreciated. If you have any queries please do not hesitate to contact me on 06 - 231 3329.

Yours sincerely,

Peter Dougan

PS Please contact David Thompson (TCM coordinator) on 048 - 230 655 if you require clarification of my responsibilities.

Appendix 4

Mulwarae Shire Council



Our Reference:

Your Reference:

When Telephoning Contact:

Mr Peter Dougan
11 Gair Place
WANNIASSA ACT 2903

Dear Mr Dougan

RE: GRAVEL QUARRIES - TCM SURVEY

Reference is made to your recent letter and our discussions regarding the above

Please find enclosed a map of all quarries operated by the Council for the purposes of mining gravel for road construction and maintenance

In relation to questions regarding royalties obtained, you are advised that Council actually pays royalties to land holders rather than receiving such, however, contributions under Section 94 of the Environmental Planning and Assessment Act are sought for road maintenance costs

As you are aware all continuing operations (as defined in State Environmental Planning Policy 37) are required to apply for a development consent to expand their operations. attached to any consent is a Statement of Environmental Effects and Rehabilitation Plan for Councils Assessment. these would form part of any consent issued

Hope this information is of some assistance to your study

Yours faithfully

P J ANDERSON
Director
Engineering Services

20 September, 1995

P.A.M.F.

Appendix 9.

Project Costs

TRAVEL

Total Kilometres :	2,470
Cost per Kilometre :	12c
(at 10.5 Km/l & petrol 75c/l +5c/km running cost)	
Sub total :	\$ 296.40 (\$ 760 Budgetted)

OTHER COSTS

• Maps	
Durrán Durra 1: 25,000	
Manar 1: 25,000	
Cost :	\$ 12.50
• Photos	\$ 35.00
• Phone calls	
19 July - 6 October	\$ 8.61
7 October - 3 November	\$ 40.00
	(estimated)
Accommodation : 1 night (Mongarlowe)	\$12.00
Sub total	\$ 107.61 (\$100 budgetted)

USCM Costs Total	\$ 404.01 (\$ 860 budgetted)
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Appendix 10

CONTACTS :

Paul Anderson Director Engineering Services Mulwaree Shire Council	048 - 21 1933
Tim Cooney Shoalhaven Catchment Coordinator Parramatta Office Department of Land and Water Conservation	02 - 895 7695
Alan Cooper & Keith Sclater Sydney Water Corporation	046-401 160
Roger Darcy Administrative Officer, Braidwood rural Lands Protection Board	048-422 536
Gary Dovey Environmental Protection Authority (NSW) Wollongong	042- 268 100
Dobro Inanovic Regional Inspector of Mines, Department of Mineral Resources, Wollongong	042- 268 340
Barry McGowan Heritage Assessment	06 - 281 6786
Grant Smithhurst Town Planner Tallaganda Shire Council	048 - 422 225
Geoff Sweeney Sydney Water Hydrographic Services	048- 864 474
Dr Greg Unwin (Mine site rehabilitation program) Department of Mineral Resources Armidale	067- 702 107



Total Catchment Management

Community And Government Working Together

Upper Shoalhaven Catchment Management Committee

PO Box 9

BRAIDWOOD NSW 2622

Ph: (02) 4842 2594

Fax: (02) 4842 2655

TCM/Corr/Government

2 February 1998

Mr David Johnston
Department of Mineral Resources
PO Box 536
ST LEONARDS NSW 2065

Dear David,

Re: derelict mines rehabilitation in the Upper Shoalhaven Catchment

As per our phone conversation, please find enclosed a copy of the report *Gravel pits and derelict mines within the Upper Shoalhaven Catchment: their impacts, management and restoration* undertaken by Peter Dougan in 1995 for the Upper Shoalhaven Catchment Management Committee.

I hope the report is useful to you and look forward to receiving your information on the derelict mines rehabilitation program.

Yours sincerely,

Frank Exon
TCM Co-ordinator
Upper Shoalhaven CMC

1/2/98
2/98