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THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA
PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

DEPARTMENT OF THE SENATE	
P. Dr. PRE.	367
27 MAR 1984	
<i>Mr. Senator [Signature]</i>	
Clerk of the Senate	



R E P O R T
relating to the

RECONSTRUCTION OF
PYROTECHNIC SECTION
AT THE
MUNITIONS FILLING FACTORY
ST. MARYS, N.S.W.

(Fifth Report of 1984).



Parliamentary Standing Committee on Public Works

REPORT

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(Fifth Report of 1984)

MEMBERS OF THE PARLIAMENTARY STANDING COMMITTEE
ON PUBLIC WORKS

(Twenty-Seventh Committee)

Senator Dominic John Foreman (Chairman)

The Honourable Wallace Clyde Fife, M.P. (Vice-Chairman)

Senate

House of Representatives

Senator Gerry Norman Jones	David Bruce Cowan, Esq., M.P.
Senator Bernard Francis Kilgariff	Peter Hertford Drummond, Esq., M.P.
	Leonard Joseph Keogh, Esq., M.P.
	Eamon John Lindsay, Esq., M.P.
	John Saunderson, Esq., M.P.

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EXTRACT FROM
THE VOTES AND PROCEEDINGS OF THE HOUSE OF REPRESENTATIVES
NO. 49 DATED 8 DECEMBER 1983

PUBLIC WORKS COMMITTEE - REFERENCE OF WORK - PYROTECHNICS
SECTION - MUNITIONS FILLING FACTORY, ST MARYS, N.S.W. :
Mr Burford (Minister for Housing and Construction),
pursuant to notice, moved - That, in accordance with the
provisions of the Public Works Committee Act 1969, the
following proposed work be referred to the Parliamentary
Standing Committee on Public Works for consideration and
report: Reconstruction of pyrotechnic section at the
munitions filling factory, St Marys, N.S.W.

Mr Burford presented plans in connection with the proposed
work.

Question - put and passed.

WITNESSES

Colombo, D.W., Esq., Project Manager, Department
of Housing and Construction, Canberra,
Australian Capital Territory

Goldfinch, R.F., Esq., Chief Hydraulic Engineer,
Department of Housing and Construction,
Canberra, Australian Capital
Territory

Lyon, K.T., Esq., First Assistant Secretary,
Resources Division, Department of
Defence Support, Canberra, Australian
Capital Territory

Terrill, P.G., Esq., Controller, Defence
Shipbuilding Division, Department of
Defence Support, Canberra, Australian
Capital Territory

Tozer, N.H., Esq., General Manager, Munitions
Filling Factory, Forrester Road,
St. Marys, New South Wales

Williams, M.B., Esq., Chief Architect, Defence,
Department of Housing and Construction,
Canberra, Australian Capital Territory

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PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS

**RECONSTRUCTION OF PYROTECHNIC SECTION,
MUNITIONS FILLING FACTORY, ST MARYS, N.S.W.**

R E P O R T

By resolution on 8 December 1983 the House of Representatives referred to the Parliamentary Standing Committee on Public Works for investigation and report to Parliament the proposal for reconstruction of the Pyrotechnic Section at the Munitions Filling Factory, St Marys, N.S.W.

The Committee has the honour to report as follows:

THE REFERENCE

1. The proposal referred to the Committee is for the construction of six industrial-type single storey production buildings and associated engineering works and amenities buildings to accommodate improved and updated munitions filling equipment being acquired by the Department of Defence Support. The new equipment and facilities will provide a much safer and more efficient environment for the handling of potentially dangerous materials. The estimated cost of the proposed work is \$13.0 million at August 1983 prices.

(1)

THE COMMITTEE'S INVESTIGATION

2. The Committee received written submissions and drawings from the Department of Defence Support and the Department of Housing and Construction, and a Sectional Committee took evidence from their representatives at a public hearing at St Marys on 7 February 1984.

3. Prior to the public hearing, the Sectional Committee inspected the Pyrotechnic Section of the Munitions Filling Factory, including the sites for the proposed new buildings.

4. The Committee's proceedings will be printed as Minutes of Evidence.

BACKGROUND

5. Munitions Filling Factory, St Marys The Munitions Filling Factory was established at St Marys during World War II, and commenced filling and assembly of ammunition for the Armed Services in 1943. Following the war the factory was mostly closed down and partially leased (and ultimately sold) to private industry. The Pyrotechnic Section was retained and used mainly for the breaking down of obsolete ammunition.

6. In the early 1950s Australia's only other filling factory, Explosives Factory, Maribyrnong, was inadequate and additional capacity was needed. The Government therefore decided to build a modern filling factory at St Marys on a site adjacent to the wartime factory.

7. The old Pyrotechnic Section was incorporated as part of the new factory which was completed in 1957. A number of buildings in the Pyrotechnic Section were rehabilitated and new equipment was installed as part of that construction project.

8. Today, the factory at St Marys is a self-contained facility for manufacturing, filling and assembling a wide range of service ammunition and other explosive stores. It is divided functionally into the following major sections:

- Fuse, Detonator, Initiator and Cap
- Shell Filling and Cartridge Assembly
- Pyrotechnic
- Bomb
- Magazine
- Administration (including Workshops and Boilerhouse)

9. Pyrotechnic Section The Pyrotechnic Section manufactures a variety of devices, known as stores, that contain chemical mixtures that are burnt to give a variety of effects. These effects include:

- Screening smoke
- White or coloured smoke for signalling or marking
- Coloured light for signalling
- Noise and flash for simulators used in training
- Slow burning for delays (e.g., hand grenade fuzes)
- Flame for marking or incendiary

10. The stores produced include:

- Gun fired projectiles
- Grenades or other hand thrown stores
- Hand held stores
- Air dropped stores

THE NEED

11. Description of the Pyrotechnic Section The Pyrotechnic Section occupies an area of 85 hectares in the northeast corner of the Munitions Filling Factory site. The Section is 1200 metres in length from north to south, and 1000 metres wide from east to west. The Pyrotechnic Section consists of 304 small single or multi-bayed buildings in which the manufacturing processes are carried out.

12. Hazards Most pyrotechnic materials consist of compositions made from chemical powders which are mixed into components. The mixing of these compositions is hazardous due to the explosive nature of many ingredients when in the form of loose powder. In addition, pyrotechnic compositions create environmental problems in the workplace, particularly chemical dusts and the generation of fumes.

13. Existing Accommodation When built during the war years, the Pyrotechnic Section was constructed in a manner that would minimise the effect of explosive hazards. The factory was built as numerous small buildings and each step of a production process would be carried out in a separate building. By utilising small simple steps carried out in separate buildings by one or two operators, the number of casualties would be minimised, as would the amount of damage to the factory, in the event of an accidental explosion.

14. The factory was refitted and updated in 1955-57 to the standards of the day, but the step-by-step production process was generally retained as the appropriate method of production at that time. With the 1950s upgrading, little effort was made to alleviate the dust problem as a clean working environment was not then given the importance that it is today.

15. Little change has occurred since the 1950s, and today many buildings are in poor condition. Building deterioration has been accentuated in a number of instances by inadequate funding for programmed maintenance, and a number of buildings have developed structural defects such as cracked walls and subsided floors. Also, many of them are constructed of materials which do not comply with contemporary standards for explosives processing.

16. Dust remains a major problem in the Pyrotechnic Section. The building interiors have many horizontal surfaces which allow the accumulation of pyrotechnic powders, and machinery services do not conform to current standards and are not able to control the dusty environment.

17. The existing building and support facilities are essentially of World War II technology and as such impose severe limitations on current production processes. Because of the fragmented production facilities and techniques, it is not possible to substantially restructure processes, and install large-scale automatic plant and machinery, with a consequential upgrading of the working environment to current standards for occupational health and safety.

18. Committee of Inquiry into Occupational Safety and Health at Munitions Filling Factory In August 1980 the Sydney Morning Herald published a series of allegations concerning health and safety problems (of both employees and nearby residents) due to environmental problems, poor working conditions, and unsafe practices at the Munitions Filling Factory. The responsible minister, the Minister for Productivity, immediately appointed a Committee of Inquiry to investigate the substance of the allegations and to make appropriate recommendations on occupational health, safety and environmental matters.

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19. The Committee presented its report to the Minister for Productivity in September 1980. Although it found most complaints unfounded, the Committee of Inquiry was critical of some aspects of factory operations, and of certain facilities.

20. The Committee was generally critical of the working environment in some sections of the factory, mainly caused by poor building layouts and ineffective plant. In particular, the design of the buildings in the Pyrotechnic Section caused gloomy working conditions, and there was insufficient space to provide machinery incorporating plant for the abatement of noise and dust pollution.

21. The Committee found the areas of red phosphorus processing and coloured smoke mixing and handling to be particularly unsatisfactory. Activities in these areas introduced problems in handling dirty and dusty ingredients, and pressing operations produced a significant dust hazard creating a dirty work area. The air conditioning in these areas did not provide for dust extraction and ventilation was poor.

22. The Committee of Inquiry made a number of recommendations. It recommended, inter alia, that present day overseas practice be examined with a view to implementing modern techniques; that existing facilities be reviewed with the object of eliminating health hazards; and that improved plant design and methods be introduced to reduce manual effort and operator contact with substances involving health risks.

23. Adoption of NATO Safeguarding Principles In 1979 the then Department of Productivity adopted the revised NATO Safeguarding Standards for munitions establishments. Among other things, the standards set out required separation distances between buildings, minimum distances between explosive storages and inhabited areas, appropriate levels of protection by mounding, and appropriate construction standards for buildings -

all in accordance with the particular hazard classification of materials being handled. The adoption of these standards has introduced an additional need for change as some existing production and magazine storage facilities do not comply with them.

24. Review of Pyrotechnic Section Against the background of the Report of the Committee of Inquiry, and the implementation of the revised NATO Safeguarding Standards, the Department of Defence Support has developed proposals for major reconstruction of the Pyrotechnic Section. A review of the Section was undertaken which included an overseas visit by a factory engineer to assess modern production processes and manufacturing techniques for pyrotechnics in similar factories in the United Kingdom, Sweden, Germany and the United States.

25. The review identified deficiencies in the Pyrotechnic Section which resulted in the re-equipping of existing buildings for some twenty process lines of varying capability.

26. In addition, major changes were considered necessary in the following key areas:

- Coloured Smoke Production
- Red Phosphorus Area
- General Mixing Area
- Illuminating Ammunition Facility, and
- Press Facility

These areas do not meet hygiene and pollution standards, nor do they permit efficient production of munition stores.

27. Specifically, the problems with the areas proposed for re-development are as follows:

Coloured Smoke: The existing small process buildings contain a number of small bays which do not lend themselves to accommodating modern and mechanised process equipment, and are not conducive to clean working conditions.

Red Phosphorus: The Committee of Inquiry found this area to be dusty and dirty; due firstly to the physical properties of the materials which are processed, and secondly, to the design of the building together with air conditioning facilities. It also found that the work area was small and congested, and that plant provided to control air temperature and humidity was not equipped with an efficient filter system. The Committee of Inquiry was of the opinion that the working environment did not comply with present day standards. In addition, the Departmental review determined that this area is unsuitable for the installation of modern equipment.

General Mixing: This area consists of twenty-seven small, single bay, production process buildings. They are widely located and contribute to the inefficiency of supervision, materials supply, and production flow, and are totally inadequate in size for the housing of mechanised processes.

Illuminating Ammunition: The Committee of Inquiry considered conditions in this building to be unacceptable and well below the standards required for explosives processing. Although the composition being used was not particularly dusty, the Committee observed a considerable amount of dust on the floor and near the press. The Departmental review determined that the four existing buildings were not suitable in size for the effective and efficient operation required for this process.

Pellet Pressing: Presently there are three press buildings. The Departmental review has determined that one of them does not meet the safety distances now required for Classification 1.1 explosives, and the other two do not meet current structural standards for facilities for the containment of an explosion.

28. **Summary** The existing buildings in the Pyrotechnic Section, being designed around the processes of the 1940 era, have allowed for neither the introduction of new automated process technology nor the provision of a suitable standard of working environment. Those buildings in which semi-automated processes have been installed are characterised by a lack of space and congestion in the work area, and there are problems in maintaining cleanliness.

29. Current safety standards and the need to upgrade working conditions by eliminating dust, noise and other hazards necessitate replacement of these out-dated sub-standard facilities.

30. The work required is extensive, necessitating a major reconstruction of the Pyrotechnic Section. There is a need to provide purpose designed buildings for particular production activities, and to install modern automated, and where possible, remotely controlled equipment.

31. Committee's Conclusions The existing accommodation in much of the Pyrotechnic Section is generally unsuitable for modern pyrotechnic manufacturing practices.

32. There is a need to redevelop the Pyrotechnic Section of the Factory.

THE PROPOSED WORK

33. The Proposal The proposed works comprise:

- Construction of new buildings for the following facilities:
 - Coloured Smoke
 - Red Phosphorus
 - General Mixing
 - Illuminating Ammunition
 - Pellet Pressing
 - Size Reduction
- and construction of:
 - General Change Room
 - Four Tea Houses, and
 - associated external services and landscaping
- Rehabilitation of
 - existing Coloured Smoke Press Building
 - Red Phosphorus Change Room
- Demolition of 31 obsolete buildings

Construction details are at Appendix "A".

34. A key concept of the proposal is to integrate the processes involved for a particular product type within each purpose designed building. This integration has been made possible by the use of automated and remotely operated equipment which removes operators away from danger zones, and the use of new building designs which can contain the effects of accidental explosions.

35. The new buildings will be designed and sited in accordance with current standards and practices for buildings within the Munitions Filling Factory, and in accordance with the Provisional Master Plan for the Establishment.

36. Coloured Smoke The proposed Coloured Smoke facility will be used for the manufacture of a variety of stores such as coloured smoke grenades, spotting charges, smoke generators, and distress signalling devices.

37. It will consist of a building separated into two parts; one for mixing and pelletting, the other for assembly and packing of coloured smoke stores. The new facility will replace four production process buildings, three storage buildings, two toilets and one tea house.

38. The new building will be an integrated facility, and its layout will enable maximum effective use of modern process plant and materials handling and transferring equipment, and will provide an acceptable hygienic working environment.

39. Red Phosphorus The Red Phosphorus facility will produce stores such as marine markers, spotting charges, and a variety of red phosphorus strikers. It will include provision for the future manufacture of additional stores being developed overseas utilising red phosphorous based compositions.

40. It will consist of a building separated into two parts; one for mixing and pressing, the other for assembly and packing. This new facility will replace five production process buildings, one stove house and two toilets.

41. The design of the new Red Phosphorus facility will take into account the need for adequate work space, and will pay appropriate attention to worker health and safety, and personal protection from dust, as well as from solvent fumes used in the cleaning or equipment.

42. General Mixing This new facility is required for the mixing of chemicals used for the production of tracers, incendiary, smoke and flash, whistle, ignition, signal (star) and delay compositions.

43. The facility will consist of one main building and two remote mixing cells to handle the mixing requirements of a wide range of pyrotechnic stores, including some of a particularly explosive nature. It will replace twenty-seven small and widely separated process buildings.

44. Building design and construction, including mounds, will conform to modern safety standards. Furthermore, as mixing processes are dusty, close attention will be paid to the control of hazards to worker health and safety together with the effective disposal of wastes.

45. Illuminating Ammunition This facility will manufacture stores which produce extremely bright light for battle and signal illumination purposes.

46. A single building will be provided for the mixing and pressing of illuminating compositions and the assembly of illuminating ammunition. It will replace four buildings which are too small for the effective and efficient operation required for this process.

47. Pellet Pressing The new pellet pressing facility will accommodate the pressing of tracer, incendiary, and high explosive pellets. This process is particularly hazardous as there is a constant risk that pellets may explode.

48. This facility is designed around three press bays with provision for remote operation. Additional bays will be provided for varnishing, wrapping and drying of pellets. The facility will incorporate appropriate dust, drench and wash-down features required for process control, as well as for health and safety reasons, and the building will be protected by mounds.

49. Size Reduction The new Size Reduction facility will provide for the preparation of chlorates and perchlorates which includes unheading, primary crushing, size reduction, sieving and stoving. It will replace sizing processes carried out in three production buildings and two stove buildings.

50. The building will conform to design standards for high explosive work, and it will be protected by mounds. Where possible, ingredients will be handled by vacuum and/or pneumatic conveying equipment with dust extraction systems, to provide a modern, clean and efficient process.

51. Amenities A new general change room for 140 female and 60 male operators will be constructed to replace two outmoded weatherboard and asbestos cement buildings constructed in 1943.

52. The existing change room for operators in the Red Phosphorus section will be extended to accommodate current levels of employment.

53. Four new tea houses will be constructed to replace those existing which would be uneconomic to upgrade to current standards. They will service production areas not covered by the new facilities which generally incorporate tea rooms in their own right.

54. Demolition Proposals It is proposed to demolish 31 existing buildings to clear the sites for the proposed new buildings. The total value of the buildings and shelters proposed for demolition is \$199,217.

55. Summary The proposed reconstruction of the Pyrotechnic Section will allow new technology and equipment to be utilised. Modern methods of production will provide more efficient processes, better utilisation of resources and greater flexibility to manufacture a wider product range. Major advances will be made in areas of occupational health, hygiene and safety by reducing the level of exposure to hazardous materials and conditions.

56. Committee's Conclusion The designs of the proposed buildings are satisfactory.

SITE

57. The proposed works will be sited within the existing boundary of the Pyrotechnic Section of the Munitions Filling Factory, St Marys. The location of each of the buildings is in accordance with the zoning provisions of the draft Master Plan for the factory.

58. The adopted NATO Standards for safety distances between buildings and the perimeter of the factory have been taken into account in selecting the sites for the proposed buildings. The site is generally level.

59. Committee's Conclusion The sites selected are suitable.

ENVIRONMENTAL ASPECTS

60. A Notice of Intent (NOI) covering the environmental aspects of the proposal was submitted to the Department of Home Affairs and Environment in accordance with the provisions of the Environment Protection (Impact of Proposals) Act 1974.

61. The NOI pointed out that the proposal introduces no changes in land use at the Munitions Filling Factory, and the upgrading of the Pyrotechnic Section will have the effect of lessening the impact of the factory on the local environment.

62. Air, water, and other environmental indicators will be enhanced by the proposed changes, and the upgrading will provide a clean and hygienic working environment for employees at the factory.

63. Modern processing techniques and machinery to be introduced will also reduce the risk of accidental explosion and fire; and remote control operations in some areas, special design considerations, and increased safety distances between buildings, will reduce the risk of injury and damage to the factory should a fire or explosion occur.

64. The Department of Home Affairs and Environment, after consultation with the New South Wales State Planning Authority, advised that an Environmental Impact Statement will not be required for the project. However, the Department asked that close liaison be maintained with the N.S.W. State Pollution Control Commission to ensure that pollution of the environment by discharges from the new facilities are minimised.

ESTIMATED COST

65. The estimated cost of the proposed work is \$13.0 million at August 1983 prices, made up as follows:

	\$m
• Building Works and Internal Services	9.1
• External Services and Landscaping	3.9
	<u>13.0</u>

66. In addition, plant and machinery items to the value of \$4.0 million are required to equip the production buildings.

PROGRAM

67. It is proposed to commence works in early 1985 and complete construction in mid-1987.

68. Committee's Conclusion The Committee recommends construction of the work in this reference.

RECOMMENDATIONS AND CONCLUSIONS

69. The summary of the recommendations and conclusions of the Committee and the paragraph in the report to which each refers is set out below:

	<u>Paragraph</u>
1. THE EXISTING ACCOMMODATION IN MUCH OF THE PYROTECHNIC SECTION OF THE MUNITIONS FILLING FACTORY IS GENERALLY UNSUITABLE FOR MODERN PYROTECHNIC MANUFACTURING PRACTICES.	31
2. THERE IS A NEED TO REDEVELOP THE PYROTECHNIC SECTION OF THE FACTORY.	32

(16)

	<u>Paragraph</u>
3. THE DESIGNS OF THE PROPOSED BUILDINGS ARE SATISFACTORY.	56
4. THE SITES SELECTED ARE SUITABLE.	59
5. THE ESTIMATED COST OF THE PROPOSED WORK IS \$13.0 MILLION AT AUGUST 1983 PRICES.	65
6. THE COMMITTEE RECOMMENDS CONSTRUCTION OF THE WORK IN THIS REFERENCE.	68

D.J. Foreman.

(D.J. FOREMAN)
Chairman

Parliamentary Standing Committee
on Public Works,
Parliament House,
CANBERRA A.C.T. 2600

8 March 1984

(17)

APPENDIX A

CONSTRUCTION

1. Building Design and Materials Planning The building planning is essentially linear to provide for an efficient production process.
2. Where appropriate, higher risk production areas have been separated to the maximum extent possible, from manual processing areas. In other instances thick concrete walls have been incorporated as a barrier.
3. Verandahs have been used extensively so that the transfer of hazardous material can be undertaken outside the buildings to the greatest extent possible. Verandahs will also reduce the solar heat load.
4. Structure: The buildings will be founded on reinforced concrete footings supporting reinforced concrete floor slabs, with structural steel columns and roof frames.
5. High hazard areas will be constructed of reinforced concrete walls, floors and roofs, in accordance with the Department of Defence Support's standards for Munitions Establishments.
6. Materials: Production buildings will have brick external walls generally, with off-form reinforced concrete walls to high hazard areas.
7. Windows and skylights will be aluminium framed and have shatterproof glazing. The roofing will be prefinished metal, with sarking and insulation installed over all internal areas.

(18)

8. The change room and tea houses will have brick external walls generally with aluminium framed windows. The roofing will be prefinished metal, with sarking and insulation installed over all internal areas.
9. Internal Finishes: Internal surfaces in production buildings will be smooth to reduce dust collection.
10. Floors will be generally smooth concrete with anti-static finish in selected areas.
11. Walls will have smooth render, and ceilings will be smooth plasterboard or concrete.
12. The change room and toilets will be finished with ceramic wall and floor tiles in wet areas.
13. Rehabilitation Work Rehabilitation work comprises provision of an access verandah on three sides of the existing Coloured Smoke Press Building, and minor extention and renovation of the Red Phosphorus Area change room to improve the present facilities and increase capacity.
14. Building Services Air conditioning: Air conditioning will be provided to production areas to provide controlled conditions for manufacture. Temperature and humidity conditions will be suitable for personal comfort.
15. Heating and Ventilation: Heating and mechanical exhaust ventilation will be provided to change room areas in the production buildings, and to the change room building. The tea houses will have heating and natural ventilation.
16. Hot and Cold Water: Normal cold water service will be provided to all buildings, and hot water will be provided to each sink, basin and shower.

(19)

17.. **Light and Power:** Internal light and power will be provided in accordance with relevant standards, and emergency lighting will illuminate exit routes in the event of power failure.

18. The electrical installation in hazardous areas will be in accordance with the relevant Australian Standard and the Department of Defence Support's standards for work in Munitions Establishments.

19. **Compressed Air:** Compressed air will be provided to each of the production buildings.

20. **Static Earthing:** Earthing points will be provided to all production buildings to allow for the static earthing of plant and machinery.

21. **Dust Extraction:** Dust extraction equipment will be provided to ensure safe, clean working conditions for personnel, and to prevent air pollution.

22. **Fire Protection:** All production buildings, except for the Size Reduction Facility, will be provided with a sprinkler system. Within each building, high hazard areas will be protected by deluge systems activated either manually or by automatic fire detectors.

23. Fire hydrants and hose reels will be provided, and all buildings will have portable fire extinguishers.

24. **Site Works Building Mounding and Landscaping:** Safety mounding of selected material will be constructed around high hazard areas to protect personnel and the surrounding buildings. Areas adjacent to all new buildings and access roads will be suitably landscaped using native trees.

25. **Vehicle Movement Areas:** The existing roadway system will need minor modification to provide access to the new facilities in the proposed development.

26. **Cleanways and Paths:** Cleanways, which are concrete pathways for the movement of personnel or materials, will be provided to link the new production buildings to the existing system. Pedestrian routes will also be provided for access to each of the tea houses.

27. **Site Services** The Pyrotechnic Section is presently serviced with sewage and stormwater disposal, domestic cold water, fire hydrant and fire sprinkler water, and high temperature hot water. In all of these cases the mains and headworks either need repair, renewal, or upgrading, or additional capacity is required.

28. **Trade Waste Disposal:** Industrial trade waste treatment will be provided to each of the production buildings, to the requirements of the relevant authorities.

29. **Chilled Water:** The present chilled water reticulation system will be replaced by separate chilled water plants to serve each of the new buildings.

30. **Electrical Power Supply:** Two additional sub-stations are required to serve the proposed buildings. These sub-stations will be fed from existing overhead high voltage lines. Medium voltage lines from the sub-stations will run underground to the respective buildings. Some additions, deletions and modifications are required to the existing overhead lines to bring them up to standard.

31. **External Lighting:** Additions to street lighting will be provided in the vicinity of the new buildings.

32. Compressed Air: It is not economical to extend the centralised compressed air system. Separate compressed air plants will therefore be provided for each of the new buildings.

33. Safety Considerations Buildings have been sited at appropriate distances from the perimeter and other buildings within the Factory site.

34. Higher risk areas within the buildings have been separated from other areas by appropriate distances or thick fireproof and/or blastproof reinforced concrete walls. Earth mounding have also been provided to the high hazard areas for protection to/from surrounding buildings.

35. Production buildings have been divided, where appropriate, into smaller fire compartments, and water deluge, sprinkler and warning systems have been incorporated.

36. Floors in all areas will have anti-static finish to prevent electrical sparks.

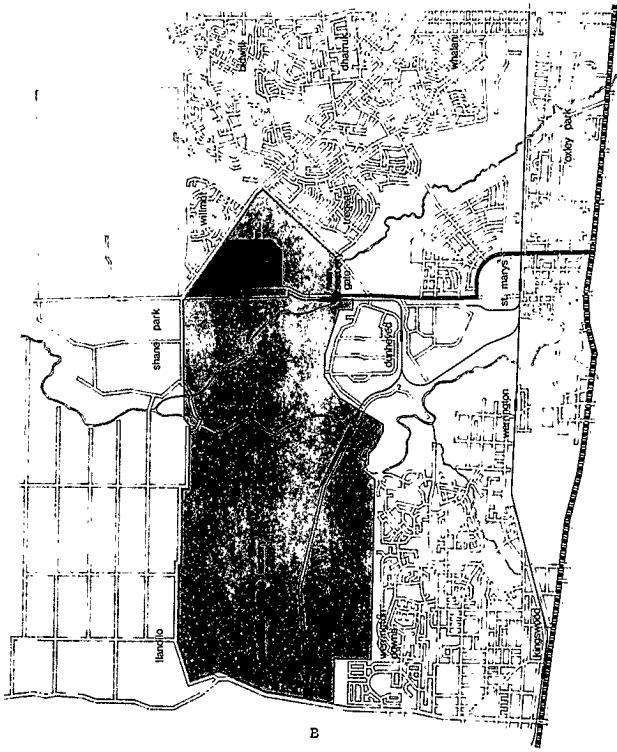
37. Consultations During the development of the proposal, consultations took place with the following:

- Penrith City Council
- Blacktown City Council
- N.S.W. Department of Environment and Planning
- Metropolital Water, Sewerage and Drainage Board
- State Pollution Control Commission
- Prospect County Council
- Telecom Australia
- Water Resources Commission

Legend
1 2 3 4 5 6 7 8 9
inquiries filling factory
st. marys
penrith
prospect reservoir
paramatta
sydney

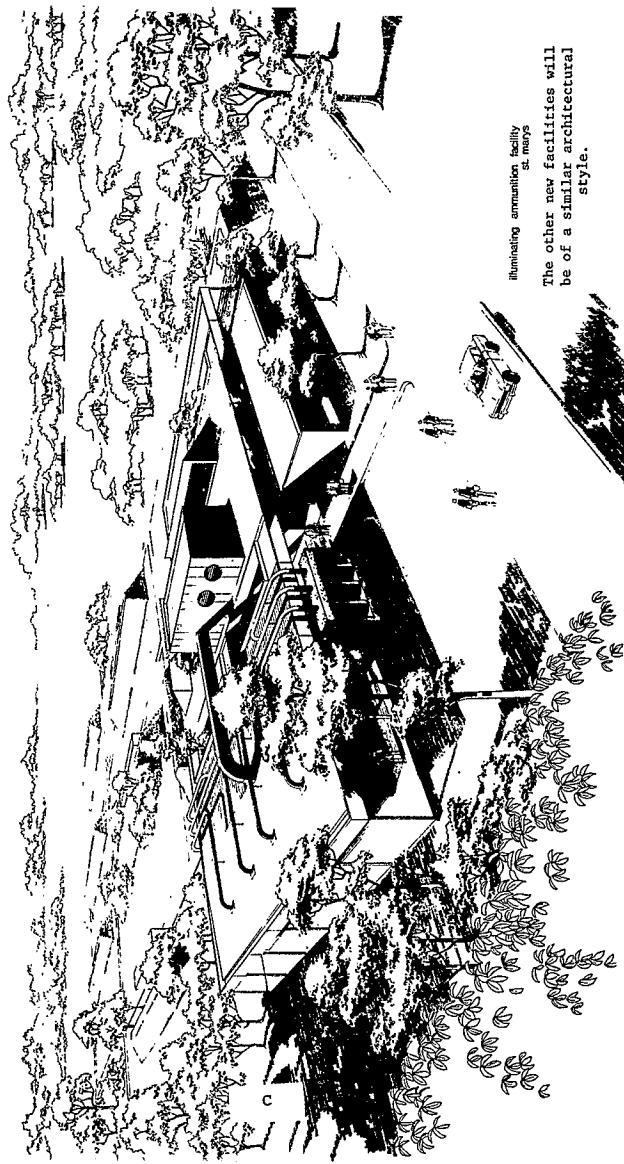


location plan



B

site plan
total complex



Illustrating ammunition facility
at many
The other new facilities will
be of a similar architectural
style.