GOVERNMENT PRICING TRIBUNAL
OF NEW SOUTH WALES

SYDNEY WATER CORPORATION

PRICES OF DEVELOPER CHARGES FOR WATER, SEWERAGE AND DRAINAGE SERVICES

Determination No 9, 1995 **14 December 1995**

REPORT TO THE PREMIER ON THE DETERMINATION OF MAXIMUM PRICE UNDER SECTION 1 l(1) OF THE GOVERNMENT PRICING TRIBUNAL ACT, 1992

Report No. 91995 (Matters SRD/95/1-4)

Maximum prices to be charged by the Gosford City Council and Wyong Council for water supply and sewerage developer charges for the provision or upgrading of water supply and sewerage services for new developments.

Maximum prices to be charged by the Sydney Water Corporation and Hunter Water Corporation for water supply, sewerage and drainage developer charges for the provision or upgrading of water supply, sewerage, and where required, drainage facilities for new developments.

In June 1995 the Tribunal reported, to the Premier on its investigations for the determination of maximum prices to be charged for water supply, sewerage and drainage charges by the major metropolitan water suppliers, Sydney Water Corporation (SWC), Hunter Water Corporation (HWC), Gosford City Council and Wyong Municipal Council (Reports 1-4, 1995).

The Tribunal noted that it had not been able to complete its investigations on prices for developer charges for the provision or upgrading of water supply, sewerage and, where required, drainage facilities for new developments. It noted that the issues were being considered by a Water Industry Forum, consisting of representatives of the Tribunal's secretariat, the water agencies, government agencies, environment groups and the housing development industry. The Tribunal anticipated making the outstanding determinations during the second half of 1995.

This report gives a comprehensive review of the issues affecting the four water agencies in respect of the outstanding determinations for developer charges and completes the Tribunal's determination of Matter SRD/95/04 covering SWC. A separate determination of maximum prices for Sydney Water Corporation (Determination 9, 1995) is made in Attachment 1 to this report.

Determinations for HWC, Gosford City Council and Wyong Municipal Council (Matters SRD/95/01, 02 and 03) will be made in the near future when the Tribunal has completed its assessment of the financial implications of the methodology on these agencies.

In making its determinations the Tribunal has had specific regard to the matters noted in Sections 14A and 15 of the Act. The services concerned were declared government monopoly services in an Order dated 27 August 1992.

1 .1 Overview of developer charges

Developer charges are up-front charges paid by developers to water agencies to recover part of the infrastructure costs incurred in servicing new developments.

Developer charges can serve two related functions. Firstly, they provide a source of funding for the infrastructure required for new urban development. Secondly, and importantly, developer charges provide signals regarding the costs of urban development which encourage less costly forms and areas of development. Charges for infrastructure for new developments should signal the true relative costs of providing such infrastructure. This will ensure that the charges do not distort the form and sequence of urban development.

This report and associated determinations aim to introduce a more consistent approach to the calculation of developer charges. They seek to establish an approach which signals the cost of new development without excessive effects on housing affordability.

As noted in the Tribunal's 1993 report into water and related services [1], New South Wales metropolitan water agencies have used a range of methods to calculate developer charges. Different levels of cost recovery have been achieved between agencies and within each agency. The Government Pricing Tribunal completed its main report on water and related services in 1993. Chapter 13 of this report dealt with the complex issues surrounding developer charges.

1.2 Recommendations on the approach to developer charges

Chapter 13 of the Tribunal's 1993 main report made two proposals on developer charges:

Proposal 13.1: . . . the Tribunal proposes that developer charges should:

- *involve full net cost recovery*
- *reflect variations in the costs of servicing different development areas*
- *result in new developments meeting the costs, but no more, of the services provided through developer charges and/or annual charges*
- *cover infrastructure expenditures which can be clearly linked to the development in question and are able to be forecast reliably*
- *be applied to existing and fringe areas alike*
- *be calculated transparently so that developers can understand and assess the calculated charges.*

Proposal 13.2: The Tribunal endorses, in principle, the net present value approach for calculation of developer charges. A working party comprising representatives of the Tribunal secretariat, the Public Works Department and suppliers in the Sydney, Central Coast and Hunter regions has been directed to examine the application of this approach on a uniform basis.

[1] Government Pricing Tribunal, *Inquiry into Wafer and Related Services*, 1993, Chapter 13, pp 201-205.

The net present value approach is a standard, commercial approach to project evaluation. Using this approach, the developer charge is:

1. the sum of the capital expenditures over time required to service the development

2. less the expected net operating profits (or losses) over time from providing services to that area or catchment

3. where the total amounts in 1 and 2 are adjusted to be expressed in today's dollars (the reason for this is explained below)

The total expenditures and revenues in 1 and 2 are paid or received as a chain of amounts over time. To enable a comparison to be made, each amount must be expressed as the value today of that expenditure or revenue made or received at a different time.

An expenditure made today is more costly in today's dollars than one which may be deferred. If the agency uses its own funds, deferral enables these funds to be profitably used until they are needed. If the agency borrows to finance the expenditure, it avoids financing costs for the period of deferment. To equate an expenditure today with a deferred expenditure, the deferred expenditure must be discounted at some rate to reflect these benefits (ie the opportunity cost of capital).

Equally, a net revenue received in the future is worth less than that same revenue received today. A future net revenue from servicing an area must be discounted at the same discount rate to reflect the opportunity cost of that revenue and the effect of inflation.

When the chains of expenditures and net revenues are reduced to net present values they can be compared to show the amount required in today's dollars for the agency to fully recover its costs.

1.3 The Tribunal's preferred methodology

Under the Government Pricing Tribunal Act, 1992, the Tribunal may set maximum prices or may determine a methodology for setting maximum prices. Section 14A lists a range of additional matters the Tribunal must take into account when setting a methodology. The Tribunal has chosen to determine a methodology for fixing the maximum prices for developer charges. In accordance with Section 13A(3) this section explains the reasons for this decision.

Developer charges are levied to recover water infrastructure costs incurred to service a large variety of developments. Individual price determination by the Tribunal could not cover the required diversity of developer charges. If agencies had to return to the Tribunal each time they received an application for an assessment of developer charges this would cause unworkable delays. The Tribunal would have to devote considerable time and resources to mechanically calculating charges, and would be completing work much better done by the agencies.

The Tribunal has stressed that developer charges must be calculated by a consistent and transparent methodology and recover efficient costs. However, it is impractical and inefficient to have the Tribunal do the great number of actual calculations and updates required. Developers include developer charges in their planning and investment decisions, they need a rapid response when applying for an assessment of charges. The NPV methodology will ensure agencies regulated by the Tribunal recover only the efficient costs of water and sewerage works, while allowing the actual calculations to be completed by the agencies in-house. The methodology will be applied in a transparent manner which can be tested by developers and monitored by the Tribunal.

1.4 Unresolved matters in the Tribunal's main inquiry

While endorsing the use of a net present value approach to developer charges, the Tribunal's main inquiry identified four key issues which remained unresolved:

- whether common cost such as dams and headworks should be included in developer charges
- whether and in what form agencies should publish the financial feasibility studies undertaken when making infrastructure investment decisions
- whether agencies should be compensated for the risk inherent in building infrastructure in anticipation of its use
- how charges calculated using a net present value approach should be indexed through time

These issues have now been resolved in the Tribunal's NPV methodology.

1.5 Consultation with representativegroups

As noted, the Tribunal requested a working party to report on the principles which might underpin a net present value approach to developer charges. The working party was comprised of representatives from the Tribunal secretariat, the then Public Works Department, Sydney Water Corporation, Hunter Water Corporation, Gosford Council and Wyong Council. It reported to the Tribunal in 1994.

Section 15 of the Government Pricing Tribunal Act 1992 requires the Tribunal to consider the effect of its determinations on consumers, the agency, the environment and the NSW Government as owner of the agency. When setting prices directly, the Tribunal conducts impact modelling to ensure it understands the effect of its determination on all these stakeholders.

In the case of developer charges, the Tribunal has chosen to set a methodology for fixing prices and so has also had regard to all matters listed in section 14A. When modelling the impact of a methodology, it is important to know how the methodology will be implemented in practice. The Tribunal saw a need to consult a broader representative group on the practical implementation of a net present value approach. Following the release of the Tribunal's main determinations for water supply, sewerage and drainage prices from 1 July 1995, the Tribunal formed the Water Industry Forum. The Forum comprised representatives from the Tribunal secretariat, the four water agencies, government agencies, environment groups, and the housing development industry.

The Water Industry Forum has proven a valuable means for the Tribunal to understand how the NPV methodology will be implemented in practice. This understanding has been vital in ensuring the Tribunal had the information necessary to properly consider the interests of all stakeholders. The Forum presented its report to the Tribunal in November 1995. The Forum has greatly assisted the Tribunal in resolving many of the practical issues in implementing the NPV methodology.

1.6 Key principles of the Net Present Value methodology

1.6.1 Which costs are to be recovered

Developments should only be charged for the efficient cost of supplying water and sewerage infrastructure. A development will often draw upon part of the service capacity of a number of assets in a catchment or geographic area. Each development should be charged for that share of the service capacity of existing and future assets it will use. The final charge will be the summation of these partial charges. The same rule can be applied where a development uses all the service capacity of an asset.

1.6.2 Development Servicing Plans: transparency and certainty

Each water authority is to prepare a Development Servicing Plan (DSP) for each catchment or geographic area in its jurisdiction. The content of a DSP is prescribed in the guidelines contained in schedule three to this report. Development Servicing Plans will be available to developers and the community generally to assist them in making locational and investment decisions. DSPs will contain sufficient information to allow developers to scrutinise the agency's investment decisions and encourage agencies to use least cost methods.

Hunter Water Corporation has existing area servicing plans already using a type of net present value approach. These can be rapidly updated to reflect the Tribunal's methodology. Sydney Water Corporation, Gosford City Council and Wyong Council need to formalise their preparation of DSPs to cover all areas of their jurisdictions.

Examples of area servicing plans prepared by Hunter Water Corporation and Sydney Water Corporation using old methodologies are included in attachments 2 and 3 to this report. These area servicing plans do not include the new NPV methodology or meet all the requirements for DSPs set out in the guidelines. They are included in this report to provide guidance on the layout, format and detail required in a DSP. In some cases, such as the plan prepared by SWC, a single DSP may cover all assets which service a particular development. In others, such as the plan prepared by HWC, a development may draw service capacity from assets covered by a number of DSPs and the resultant charge will be determined by summing the charges for each DSP.

1.6.3 Calculation of developer charges using the net present value(NPV) approach

Each DSP will contain a net present value calculation of the cost of total service capacity in an area or catchment less the expected net operating profits (or losses) from providing services to that area or catchment. The resultant net cost is then expressed. per hectare or equivalent tenement (ET). A development is charged a multiple of this per hectare or ET charge according to the number of lots in the development.

The components of the NPV calculation are:

K - a capital charge for the NPV of existing and future assets serving the area
R_i - revenue expected to be received by servicing customers in the area in each year (i)
C_i - operating, maintenance and administration costs expected to be spent in servicing customers in the area in each year (i)
r - the cost of capital or discount rate for deriving the net present value of future revenues and costs
n - the forecast horizon for the assessment of future revenues and costs.

Each of these components is discussed in detail in the guidelines. The developer charge (DC) is calculated as:

$$IX = K \cdot NPV_r(R_i - C_i) \text{ for i = years 1, . . . n; } n \leq 30$$

To calculate the charge an agency must use projections of:

- the efficient cost of existing and proposed assets servicing the development
- the amount and timing of any investment in new infrastructure required to be built or advanced in timing because of the development
- the take-up rate of lots in the development and the take-up of asset capacity by those lots
- future annual revenues and costs per equivalent tenement (ET) or hectare.

The guidelines specify how each of these projections should be made.

1.6.4 Selection of the discount rate

The discount rate should reflect the opportunity cost to the agency of funding infrastructure works. In providing infrastructure prior to development, agencies face a number of risks. These-risks include the rate of connection, the cost of construction, and possible changes in interest rates. Each of these risks makes the likelihood of a future expenditure or benefit less certain. Accordingly, these risks must be reflected in the discount rate.

The Water Industry Forum advised the Tribunal that a discount rate of between 7 and 10 percent would be appropriate for the normal activities of water agencies. However, water agencies and environmental organisations considered a higher discount rate of up to 12 percent may better reflect the specific risks associated with urban development.

The Tribunal has determined that the appropriate discount rate on future expenditures and benefits is nine percent (9%). However, the Tribunal has selected a discount rate of three percent (3%) to be applied to past expenditures This reflects that these investments are "sunk". The lower discount rate assists in the management of the impacts of the new approach without adversely affecting future investments or locational decisions. Issues in the choice of discount rate are discussed in more detail in a background paper attached to the Water Industry Forum's report to the Tribunal.

1.6.5 Valuation of assets

Assets are to be valued at their modem equivalent value. Each asset should be valued at the cost of providing the same quality of service using an optimised system design. This will ensure that agencies can only charge for the least cost/most efficient means of providing the service.

In the case of SWC, the Water Industry Forum advised that the current asset values should be reduced by between 34percent and 40percent to better reflect different replacement costs. The Tribunal has determined that a reduction factor of 4Opercent is to be applied by SWC.

1.6.6 Exclusion of some existing assets

As a general rule, an authority should charge for all assets servicing a development. There are, however, some assets for which it is not appropriate to charge. A change in land use may mean existing assets have far greater service capacity than will ever be used. It is inefficient to charge for these assets. Equally, some assets such as very old dams, continue to contribute service capacity long after their construction cost has (or should have been) recovered. Again it is inefficient to charge for these assets.

The guidelines specify that an asset is to be excluded if:

- its capacity is unlikely to be fully utilised over its planning horizon
- the service capacity was created before 1970
- the service capacity was made available by changes in land use

Excess capacity will most commonly exist in infill development of long-established areas. The guidelines will generate price signals in favour of infill development, as against continued urban sprawl.

1.6.7 Demand management and water conservation assumptions

The guidelines require that projections of the demand for water per household or discharges of waste water should have regard to corporate goals and objectives. This includes targets or objectives contained in licence agreements or corporatisation frameworks on water use and water re-use.

Developments may incorporate features which reduce the demands of that development on water, sewerage and drainage infrastructure. This may be achieved through the design of on-site systems, the design of the development or by building-

covenants. In these case, the developer charge should be reduced to reflect these reduced requirements.

1.6.8 Dispute resolution

A developer who is dissatisfied with how an agency has calculated a developer charge has a right to have the dispute arbitrated under section 31 of the Government Pricing Tribunal Act 1992. The dissatisfied developer should first complain to the agency and the chief executive officer of the agency is to have the complaint reviewed. The developer, if still dissatisfied, may required the matter to be decided by an arbitrator who's decision is binding.

The Water Industry Forum strongly supported having mediation available as an option for customers. The Tribunal supports the Forum's unanimous view that mediation should be available to the parties if they so wish. The Forum will compile a panel of possible mediators and will recommend to its constituents that they attempt mediation as a preliminary step to resolve any disputes.

1.7 Impact of the NPV methodology

By use of the NPV methodology, the Tribunal seeks to ensure developer charges signal the true relative cost of new developments without creating excessive effects on housing affordability. Older methodologies distorted the relative cost of infill development, redevelopment and development at the city fringe.

1.7.1 Sydney Water Corporatioh

Sydney Water Corporation has sought to base developer charges on the cost of the assets required to service the development, but traditionally did not seek to recover headworks costs[2] More recently SWC has recovered some headworks costs in Penrith and Rouse Hill.

The largest components of SWC's developer charges have been major works such as large water trunk mains dnd sewer carriers. Charges were based on the actual cost of works constructed within the past 25 years to serve that particular release area. Since 1988 the SWC has determined major works charges on the basis of area, rather than per lot, to encourage compact development.

SWC has used a number of models to calculate its developer charges, making it difficult to model the exact impact of the NPV methodology on SWC's charges. The Tribunal's 1993 report found that within the SWC region, cost recover-y varied from 6lpercent to 100 percent[3]. The NPV methodology will create uniform rates of cost recovery and provide more appropriate signals of the relative cost of servicing developments in different locations.

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[2] Headworks include dams, water treatment plants and sewerage treatment plants. Major works include reservoirs, large water and sewer mains, pumping stations and drainage outfall systems. Reticulation includes water and sewerage reticulation local to the development in question and lead-in mains.

[3] Government Pricing Tribunal of NSW, *Inquiry* into Wafer *and Relater* Services, 1993, Chapter 13, p 201.

Table 1 gives cost comparisons on a number of typical developments in the Sydney area using older models and the NPV method. The key point to note is the range of outcomes under past approaches. Such variations highlight the uncertainties which were of concern to developers. The Tribunal considers the NPV methodology will provide a more consistent and transparent approach which provides more appropriate signals.

Examples of charges under existing and proposed approaches-SWC $per lot

Area	Existing approaches			Proposed NPV methodology
	Nearby areas	Released charge	Discounted capital cost Methodology'	
Inner city	$0	$1,250	$640	$250
Western Sydney	$3,000 to 4,600	$7,800	$8,150	$4,920
Western Sydney	$3,000 to 4,600	N/A	$9,940	$6,720
South Coast	$2,900 to 3300	N/A	$6,900	$3,800
South Coast	$8,630	$3,350	$8,220	$5,210

Notes:

1 The discounted capital cost methodology has been adopted by SWC for some developments since 1991/92. It is based on capital costs including opportunity cost of capital but does not reduce the charge to compensate for receipt of future net revenue from the development.

2. The final charge under each methodology will depend on the level of Building Better Cities funding received.

3. Figures are for examples of possible developments in each area. Actual charges will vary between developments and the assets required to service the development.

1.7.2 Hunter Water Corporation

The Hunter Water Corporation already uses a net present value approach to calculate developer charges. Under this approach, the HWC forecasts future net revenues from each development and offsets these against the initial investment using standard discounted cash-flow techniques. The developer charge is then calculated as the up-front payment required for the HWC's investment to break even.

The HWC approach, adopted in 1992, provided the starting point for the NPV approach adopted by the Tribunal in this report. However, the Tribunal has some concern on two aspects of the HWC's current approach:

1. HWC has used a relatively high discount rate in calculating the offset for future net revenues. This has the effect of increasing the calculated developer charge.
2. HWC has not allowed for the time value of money (see section 1.2 above) in calculating capital costs. Due to the often long lags between the expenditure on assets and subsequent income, this reduces the calculation of developer charges.

The Tribunal's NPV approach overcomes these problems. The Tribunal will make its determinations for HWC has completed modelling the impact of the new methodology

7.7.3 Gosford City Council and Wyong Council

Gosford City Council has levied developer charges but considers that its current charges are generally well below the cost of the infrastructure provided to the development.

Gosford levies a uniform headworks charge which under-recovers capital costs. Previous analysis provided to the Tribunal estimates that when recurrent charges are taken into account about half the costs are recovered. Taking headworks and major works together, the recovery rate appeared to be 83 percent to 87 percent".

At present Wyong fully recovers reticulation and major works costs but only part of headworks costs. In the Tribunal's 1993 report, developer charges were estimated to recover about 63 percent of the costs[5], somewhat lower than the 83 percent to 87 percent rate of recovery estimated by Gosford.

Gosford and Wyong councils are undertaking further modelling of the impact of the NPV methodology. The Tribunal will make its determinations for Gosford and Wyong when this modelling is completed.

1.8 Housing affordability

The NPV methodology will lead to some increase in the general level of developer charges compared to many of the past approaches used. At least part of this increased cost recovery will be passed on to the purchaser of the land through higher land prices in new areas. This in turn will affect house prices in existing areas.

Full cost recovery through developer charges gives the clearest price signal about the varying costs of developing in different areas and at varying densities and levels of service.

1.9 An on-going role for the Water Industry Forum

The Tribunal has asked the Water Industry Forum to continue its work in providing advice on the practical application of the NPV methodology. The Forum will monitor the NPV approach over the next twelve months and report any unanticipated problems to the Tribunal.

Thomas G. Parry
Chairman
14 December 1995

[4] Government Pricing Tribunal of NSW, *Inquiry* info ***Wafer and Related*** Services, 1993, Chapter 13, p 204.

[5] Government Pricing Tribunal of NSW, ***Inquiry info Wafer and*** *Related* Services, 1993, Chapter 13, p 204.

Attachment 1: Sydney Water Corporation

DETERMINATION OF THE METHODOLOGY FOR FIXING MAXIMUM PRICE UNDER SECTION 14A OF THE GOVERNMENT PRICING TRIBUNAL ACT, 1992

Determination No 9, 1995 (Matter SRD/95/4)

Methodology to be used in setting maximum prices to be charged by the Sydney Water Corporation for water supply, sewerage and drainage developer charges for the provision or upgrading of water supply, sewerage, and where required, drainage facilities for new developments.

The reasons the Tribunal has chosen to make this determination by setting a methodology in terms of section 13A(1)(b) of the Government pricing Tribunal Act, 1992 are set out in Schedule 1 to this determination.

1. A Net Present Value (NPV) methodology is to be used by Sydney Water Corporation (SWC) to calculate developer charges for water, sewerage and drainage infrastructure works.

2. Details of the methodology are set out in the guidelines in Schedule 2 to this determination.

3. The methodology applies from the date of Gazettal of this determination for all new developments or stages of developments unless:

   a) a compliance certificate has been issued by SWC pursuant to Section 73 of the Water Board (Corporatisation) Act, 1944 for that development *or* stage, or

   b) SWC has given a written "notice of requirements" pursuant to Section 74 of the Water Board (Corporatisation) Act, 1944 in respect of a development in which case the assessment stands for the period specified in the notice of requirements

4. The parameters of the NPV calculation for SWC are:

   a) A three percent (3%) real discount rate on existing assets
   b) A nine percent (9%) real discount rate on future assets
   c) A forecast horizon for expected net revenue of 30 years
   d) An efficiency factor of forty percent (40%) to be applied to existing asset values

SCHEDULE 1: THE TRIBUNAL'S PREFERRED METHODOLOGY

Under the Government Pricing Tribunal Act, 1992, the Tribunal may set maximum prices or may determine a methodology for setting maximum prices. Section 14A lists a range of additional matters the Tribunal must take into account when setting a methodology. The Tribunal has chosen to determine a methodology for fixing the maximum prices for developer charges. In accordance with Section 13A(3) this section explains the reasons for this decision.

Developer charges are levied to recover water infrastructure costs incurred to service a large variety of developments. Individual price determination by the Tribunal could not cover the required diversity of developer charges. If agencies had to return to the Tribunal each time they received an application for an assessment of developer charges this would cause unworkable delays. The Tribunal would have to devote considerable time and resources to mechanically calculating charges, and would be completing work much better done by the agencies.

The Tribunal has stressed that developer charges must be calculated by a consistent and transparent methodology and recover efficient costs. However, it is impractical and inefficient to have the Tribunal do the great number of actual calculations and updates required. Developers include developer charges in their planning and investment decisions, they need a rapid response when applying for an assessment of charges. The NPV methodology will ensure agencies regulated by the Tribunal recover only the efficient costs of water and sewerage works, while allowing the actual calculations to be completed by the agencies in-house. The methodology will be applied in a transparent manner which can be tested by developers and monitored by the Tribunal.

SCHEDULE 2: GUIDELINES FOR METHODOLOGY TO BE USED IN CALCULATING DEVELOPER CHARGES

1 Introduction

In its Final Report, Inquiry into Water and Related Services, the Tribunal emphasised the importance of ensuring that developer charges reflected the costs of providing water and waste-water infrastructure for urban development. In the absence of recurring charges which vary between different locations to reflect the 'true' costs of providing such services, up-front developer charges need to:

- provide better signals for resource allocation and usage
- provide better signals to reflect the environmental effects of urban development
- ensure the financial viability of extensions of urban water infrastructure.

However, the Tribunal is also mindful of the possible effects of such up-front charges on housing affordability. In setting the parameters for the calculation of developer charges the Tribunal will have regard to management of the impacts on affordability while ensuring that the charges provide a clear signal on the relative costs of urban development.

The Tribunal's Final Report endorsed in principle the use of the net present value (NPV) approach to the calculation of developer charges. In order to provide the framework for the implementation of the NPV method for calculating developer. charges, the Tribunal:

- will from time to time set key parameters such as cost of capital, efficiency adjustment factors for asset values and the period of the analysis
- has published these guidelines for the calculation of developer charges
- has established the Developer Charges Forum to advise on issues associated with the calculation and levying of developer charges.

These Guidelines, which form the basis for calculating developer charges, should be read with reference to the principles outlined in the Tribunal's report 'Inquiry into Water and Related Services', October 1993.

The starting point is the principle that, subject to the need to maintain housing affordability, new development (and redevelopment) should **meet** the full efficient cost of the infrastructure provided for the development through either developer charges or annual charges. In general this objective is met by developers' constructing local distribution systems and paying for their share of off-site infrastructure works to service the development (allowing for future net annual revenues>. In calculating developer charges the following factors need to be taken into account:

- major infrastructure works (existing or planned) serving the development,
- assets to which any new development should contribute and the proportion of those assets serving the development
- value of the infrastructure
- risk borne by the authority that is providing the infrastructure and the appropriate return to cover this risk

- contribution, in the form of future net annual charges, which will be paid by future occupiers of the development towards the efficient cost of infrastructure works less the future expected annual operating, maintenance and administration costs of providing water related services. (This contribution must be deducted from any upfront charge.)
- the impact on housing affordability of applying a developer charge.

2 Coverage of methodology and guidelines

The NPV methodology and these guidelines are to be used by Sydney Water (SWC), Hunter Water (HWC), Gosford City Council and Wyong Council. Subject to any specific limitations included in the Tribunal's determinations for each agency, the NPV methodology is to be used for

1. all new developments from the date of the Tribunal's endorsement of these guidelines for use

2. all redevelopments from the date of endorsement of these guidelines for use, and

3. existing staged developments other than in respect of stages where a current development certificate has been issued by the authority.

In the interests of equity, current charges should be used for existing developments (i.e. developments or stages of development for which a relevant certificate was issued prior to the date of endorsement of these guidelines and such certificate is still current).

The Tribunal may set different parameters for the. NPV model for each of the authorities. This will provide a necessary degree of flexibility in the model's application.

3 Maximum prices

Charges calculated using this methodology are maximum prices (Section 13A and Section 14A of the Government Pricing Tribunal Act 1992). The authority and developer can negotiate a charge below this maximum charge. In these circumstances, the Treasurer must agree to the negotiated charge (Section 18 (2) of the GM' Act).

This could be achieved through specific case-by-case approvals. Alternatively, a more general approach for negotiation within defined limits may be possible.

4 Relationship to price paths and annual determinations

Existing developer charges are not the subject of review in accordance with these guidelines. An existing developer charges would exist where a consent certificate for the development or stage has been issued by the water authority as at the date of endorsement by the Tribunal of these guidelines. Adjustments to existing developer charges will be made in the annual determinations and/or five year price paths.

5 Calculation of developer charges using the net present value (NPV) approach

The net present value approach calculates the developer charges as:

- the cost of the assets used to service the development
- less the future net operating profits (or losses) expected to be derived from providing services to the development area.

The components of this calculation are as follows:

K - the capital charge for the existing or future assets calculated on a NPV basis which will serve the development or release area (see section 6.4)

R_i - the future periodic revenues expected to be received from customers in the development area in each year (i)

C_i - the future expected annual operating, maintenance and administration costs of providing services to customers in the development area

r - the cost of capital to be used in the calculation of the net present value of future revenues and costs

n - the forecast period for the assessment of future revenues and costs.

The definition and derivation of each of these components is discussed in detail below. The developer charge (DC) is calculated from estimates of each component as follows:

$$DC = K + NPV_r(R_i - C_i) \text{ for } i = \text{years } 1,.\ n;\ n \leq 30$$

This charge is assessed for the development as a whole. Calculation of this charge requires estimates/projections of:

- the efficient cost of existing and proposed assets servicing the development
- the amount and timing of any investment in new infrastructure required to be built or advanced in timing due to the development
- the take-up rate of lots in the development and the take-up of asset capacity
- future annual revenues and costs per equivalent tenement (ET) or other appropriate charging criteria (eg hectare).

The following sections describe each of the components of the calculation in more detail and provide guidelines for the estimation or projection of costs and revenues.

6 Assessment of asset costs

6.1 Identification of relevant assets

Water authorities may seek to obtain contributions for providing, extending or augmenting services which the developments will, or are likely to, require. In assessing the costs of assets to be included in the developer charge, water authorities shall demonstrate that there is a nexus between the development and the assets which are to serve that development. These assets should be clearly identified in the Development Servicing Mans described in Section 12 of these guidelines. The efficient

cost of these assets should be taken from an asset register or other source acceptable to the Tribunal (Such costs may be expressed as a cost per equivalent tenement (ET)).

Assets which are provided to service the development may be assets:

- which were already in the ground prior to the implementation of this methodology,
- constructed after the implementation of this methodology but prior to the commencement of the development, or
- which are constructed or to be constructed after the development.

6.2 Valuation of existing assets

Assets should be valued on the basis of replacement, or modem equivalent asset, costs. As a transitional measure, a reasonable proxy of these costs may be used Where necessary, proxies for replacement costs may be established by:

1. the Tribunal setting adjustment · factors to be applied to a utility's initial construction costs, or
2. the utility undertaking case studies to estimate relativities between initial construction costs and replacement costs. The case studies and estimates would be subject to external, independent review and discussion with relevant parties.

However, the Tribunal is concerned that such estimates should reflect the least cost and most efficient means of providing the service.

Where MEA costs are used, cost estimates should be based on the provision of the same quality of service using a modem equivalent asset within an optimised system design. The MEA value will vary from indexed historical costs as a result of relative productivity improvements due to technological change, variations between planned and actual urban development patterns and densities, and any past sub-optimal investment or development decisions. The values should not automatically assume the replacement of the assets in the same form or configuration. The Tribunal is concerned to ensure that prices reflect efficient costs. Where asset values based on actual costs exceed efficient costs, given today's knowledge and technology, asset values should be reduced accordingly.

The revision of asset values to MEA may create disincentives for the authorities to develop new technologies where these would devalue some of their current assets unless the anticipated rate of technological change is incorporated into the model.

In calculating the value of existing assets, the cost of design, construction and administration should be included.

The Industry Forum on Developer Charges will provide an opportunity for discussion and agreement on a set of efficient costs and may maintain a register of suitable unit costs for assets as a reference point for calculation of developer charges contributions.

6.3 Apportionment of assets

In respect of assets shared by a number of development service plans or forming part of a system, it is necessary to calculate the relevant capital charge for the system based on expected system utilisation estimates. The per unit capital charge can then be applied to each development on the basis of the expected capacity utilisation within the development. Typically, each asset will need to be assessed in terms of its design criteria and the calculated demand for the area to be serviced by it.

6.4 Calculation of capital charge to the development for existing assets

Given the estimate of the value of the assets, a capital charge may be calculated as follows:

- Estimate the period for full take-up of asset capacity. If information is readily available, actual take-up rates to date should be used. If not, the water authority could use an average based on similar release or development areas' take-up rate or other (better) estimates if available. An estimate of the take-up of existing unused capacity should also be made.
- Estimate the capital charge per ET (or hectare) necessary to equate the net present value of the stream of charges which would be derived from annual per ET (or hectare) charges and the costs of the assets.
- Calculate the charge for the development by multiplying the per ET (or hectare) charge by the number of ETs (or hectares) proposed in the development.

The Tribunal will set the cost of capital. A real cost of capital will be used and the resultant per ET (or hectare) charges may be indexed by the average increase (or decrease) in annual charges determined by the Tribunal.

Where:

1. the full capacity of an asset will be taken up by a development; or
2. the period of development covered by the DSP includes the full take-up period for the relevant asset,

the same calculation can be achieved through the following steps:

- The capital cost of the assets are fully assigned as a cost for the number of ET's in the DSP.
- The capital charge per ET is the NPV of a stream of projected contributions predicted by the DSP.
- The charge per ET may be iterated or calculated as the capital cost divided by the NPV of the ET takeup rate.

6.5 Exclusion of existing assets

In general, all assets providing services to the development should be included when calculating developer charges. The costs of an existing asset should be excluded from the calculation of developer charges:

1. if its capacity is unlikely to be fully utilised over the planning horizon relevant for that asset, or

2. if the required capacity was created before 1970, or

3. if capacity was made available by changes in land use patterns.

Exclusion due to excess capacity will occur most commonly in the case of infill development in long-established areas. If an asset was constructed to service earlier development and changes in land use have made surplus capacity' available then it is appropriate to delete the asset from any subsequent contribution calculation. This will reduce the contributions payable for developments utilising these assets and encourage the use of under-utilised assets.

6.6 Estimation of costs of assets yet to be constructed

Two methods are available for inclusion of the costs of assets yet to be constructed. In either case it is essential that feasible options for meeting future needs be examined, including pricing and demand management options, and that the lowest cost alternative be chosen. In the first case, the assets may be specific to the development or related developments. In such cases, it may be assumed that if the development did not proceed, the assets would not be built. In other cases, such as dams, the expenditure is driven by growth widely dispersed throughout the system. In such cases, the development may affect the timing of the expenditure rather than whether the expenditure will occur at all.

In the first case the expected future expenditures would be included in the stream of future incomes and expenditures and discount& back to current values. If the assets will serve more than the area covered by the development, the capital charge applicable to the whole asset should be apportioned on the basis of the share of the capacity of the assets expected to be taken up by the development.

In some cases the development may temporarily use the capacity of an existing asset before construction of a new asset has been completed. If so, inclusion of the costs of both the existing and new assets would result in double counting. Only the costs of the new assets should be included.

Where the assets are part of a more general expansion of the system (i.e. the second case), the effect of a decision to proceed with development or not may be to alter the timing of the expenditure. In such cases, expected expenditures should be included using the second method which involves:

1. estimating the extent to which the development would bring forward the timing of the expenditures, compared with the timing if this development did not proceed

2. calculating the difference in the net present value of the expenditures due to the change in the timing of the expenditures

3. including the calculated cost as a cost to the development only if it exceeds the cost of any equivalent existing assets used by the development. The costs of the comparable existing assets would be excluded from the calculation.

[1] "Surplus capacity" exists wheie the asset has capacity which is unlikely to be fully utilised over the relevant planning horizon.

In practice, standard per ET (or hectare) factors could be calculated for major planned works to avoid the re-calculation of steps 1 and 2 for each development.

Step 3 is necessary to avoid the double counting which would occur if the costs of both existing assets and the additional NPV cost for advancing future assets were included.

6.7 Demographic assumptions

Demand for services will, in part, be driven by assumptions on population growth and density (eg occuparicy rates). Forecasts of population and densities should have regard to the latest projections published by the NSW Department of Urban Affairs and Planning for the same or a comparable local government area. Demographic assumptions used should be locality specific (eg at the LGA level) for local works and system wide (eg for all Sydney) for headworks such as dams and treatment plants.

6.8. Demand projections

Projections of the demand for water per household or discharges of waste water should have regard to corporate goals and objectives and estimates of future costs and revenues. This includes targets or objectives included in licence agreements or corporatisation frameworks.

7 Projection of operating costs

The operating, maintenance and administration costs (excluding depreciation and interest) of providing services to a development area should be based on the most efficient and lowest cost means of providing the services. The calculations should assume that current service standards will continue rather than anticipate possible increases in service standards. Subject to the Tribunal passing through costs, the costs of meeting higher standards will be recovered through periodic charges.

The costs should reflect costs associated with the specific services provided. System-wide averages should not be used if the costs of providing services to the development area vary significantly from the system-wide operating, maintenance and administration costs,

8 Projection of operating revenues

Operating revenues should be projected on the basis of the efficient operation of the authority's assets to best meet the needs of its customers given current service standards. On this basis, additional revenues to fund future backlog sewerage programs, for example, should be excluded. Unless differential charges have been approved by the Tribunal, it should be assumed that residential charges are uniform across the region of operation.

The Tribunal will set the parameters to be used for the projection of future revenues by each authority. These will incorporate the 4-5 year price paths to be agreed with each authority and take into account the structural changes for prices proposed in the Tribunal's report, Inquiry into *Water and Mated Services.*

Estimates of future revenues will also depend on projections of future lot take-up in the development area. These will necessarily be specific to each proposal.

9 Discount rate

The Tribunal may set different cost of capitals for each water supplier. The real cost of capital will contain two components:

1. the risk free cost of capital. A proxy for this may be the Commonwealth bond rate or an indexed bond benchmark,

2. the business risk to the authority of providing infrastructure for future urban development which may vary.

In providing infrastructure prior to development,' authorities face a number of uncertainties. These include the rate of connection, the cost of construction, and interest rates. To compensate authorities for accepting these risks, a risk adjusted return ***on*** capital investment should be built into developer charge calculations.

Typically, this return should represent the risk taken by the authority. Where the authority reviews charges regularly, for example, every five years, the risk factor should be less than for an authority which sets a charge (adjusted only for inflation) for the life of a scheme. The return on existing assets will be less than that on new assets.

10 Period of analysis

Future operating costs and 'revenues should be projected over a 30 year period. Theoretically, operating revenues and costs 'could be projected over the life of the assets. In practice, a 20 year period is a long period for the analysis of a return on investment. However, in recognition of the long planning cycles and asset lives, the Tribunal considers that the inclusion of future incomes and expenditures should extend out beyond the twenty years. The discounting of future values reduces the impact of forecast errors, the further out in time these errors occur.

11 Adjusting for impacts

The impact of calculated developer charges will depend primarily on the valuation and treatment of past assets. It seems that, for some developments, the charges calculated using the methods outlined in these guidelines would be higher than those currently charged.

The Tribunal is concerned that developer charges should provide signals on the relative costs of servicing urban development. However, it is also concerned about the effect on housing affordability and needs to balance competing interests.

The Tribunal may seek to manage these impacts through transitional adjustment arrangements.

This adjustment may vary between authorities reflecting concerns with regard to the relative impacts of the charges.

12 Transparency

The Tribunal wishes to establish mechanisms which ensure that developer charges are fair and transparent. Transparency in the water authority's processes for calculating developer charges will assist in reducing the extent of regulation required and the likelihood of disputes.

In order to provide a transparent approach the Tribunal requires that, at a minimum, the water authorities provide the following information for each development.

The water authority is to prepare a Development Servicing Plan (DSP). The DSP is to specify, amongst other things:

- a summary of the contents of the DSP
- relevant land use planning information
- the extent of the catchment/supply zone
- the extent of services required to be staged over the anticipated development period
- estimates of future capital and operating costs
- standards of service that will be provided and design parameters
- estimates of lot and dwelling production including demographic assumptions
- timing of works and expenditures related to anticipated development and demographic assumptions
- the calculated developer charge and how it is projected to move through time
- a reference to other relevant DSPs.

The water authorities are to allow developers access to the models used in calculating the charge and provide copies to local councils and development industry associations.

Once the relevant certificate has been issued, the calculated developer charge is to be registered with the Tribunal and should be published in an appropriate document at least annually.

13 Dispute Resolution

The Tribunal prefers that appeals be avoided as much as possible through a transparent and consultative process. These guidelines, in conjunction with the transparency requirements and the Industry Forum provide such an approach.

Despite this, it is possible that a developer may wish to appeal the charge levied by the water authority. A developer who is dissatisfied with how an agency has calculated a developer charge has a right to have the dispute arbitrated under section 31 of the Government Pricing Tribunal Act 1992. The dissatisfied developer should first complain to the agency and the chief executive officer of the agency is to have the complaint reviewed. The developer, if still dissatisfied, may required the matter to be decided by an arbitrator who's decision is binding. (Copies of relevant section of the Act are attached).

The Water Industry Forum strongly supported having mediation available as an option for customers. The Tribunal supports the Forum's unanimous view that mediation should be available to the parties if they so wish. The Forum will compile a panel of possible mediators and will recommend to its constituents that they attempt mediation as a preliminary step to resolve any disputes.

EXTRACTS FROM GOVERNMENT PRICING TRIBUNAL ACT, 1992

Determination of methodology for fixing prices

14A. (1) A determination of the Tribunal of the methodology for *fixing* the price for a government monopoly service may be made in any manner the Tribunal considers appropriate.

(2) In making such a determination, the Tribunal may have regard to such matters as-it considers appropriate, including, for example, the following:

(a) the government agency's economic cost of production;

(b) past, current or future expenditures in relation to the government monopoly service;

(c) charges for other monopoly services provided by the government agency;

(d) economic parameters, such as:

(i) discount rates; or

(ii) movements in a general price index (such as the Consumer Price Index), whether past or forecast;

(e) a rate of return on the assets of the government agency;

(f) a valuation of the assets of the government agency;

(g) the effects of pricing on environmental outcomes (including the sustainability of eco-systems) and the use of natural resources by the government agency.

Matters to be considered by Tribunal under this Act

15. In making determinations and recommendations under this Act, the Tribunal is to have regard to the following matters (in addition to any other matters the Tribunal considers relevant):

(a) the cost of providing the services concerned;

(b) the protection of consumers from abuses of monopoly power in terms of prices, pricing policies and standard of services;

(c) the appropriate rate of return on public sector assets, including appropriate payment of dividends to the Government for the benefit of the people of New South Wales;

(d) the effect on general price inflation over the medium term;

(e) the need for greater efficiency in the supply of services so as to reduce costs for the benefit of consumers and taxpayers;

(f) the protection of the environment (within the meaning of the Protection of the Environment Administration Act 1991) by appropriate pricing policies that take account of all the feasible options available to protect the environment;

(g) the impact on pricing policies of borrowing, capital and dividend requirements of the government agency concerned and, in particular, the impact of any need to renew or increase relevant assets;

(h) the impact on pricing policies of any arrangements that the government agency concerned has entered into for the exercise of its functions by some other person or body.

Disputes regarding application of determination of methodology

31. (1) A customer who is dissatisfied with the way in which a government agency appiies the methodology in a determination referred to in section 14A may complain to the agency.

(2) The chief executive of the agency is to review the complaint or cause it to be reviewed.

(3) The customer, if still dissatisfied, may request the agency that the matter be reviewed by way of arbitration by an arbitrator, who is to be appointed by agreement between the customer and the agency. The agency is, subject to this section, to comply with any such request.

(4) Costs of the arbitration are to be borne equally by the agency and the customer.

(5) The regulations may exclude classes of determinations from the operation of this section and may make provision for or with respect to reviews and arbitration under this section, including:

(a) the times within which complaints and requests are to be made;

(b) the circumstances in which complaints and requests may be dismissed without consideration;

(c) the determination of costs of arbitration.

(6) Subject to this *section* and the regulations, the Commercial Arbitration Act 1984 applies to any such arbitration.

ATTACHMENT 2: AREA SERVICING PLAN FOR HARRINGTON PARK PREPARED BY SYDNEY WATER CORPORATION

DEVELOPMENT SERVICING PLAN

FOR

HARRINGTON PARK

Developer Contributions for Water
and Sewerage Infrastructure

Sydney Water

Contribution Approved by the Managing Director : 21 November 1994

TABLE OF CONTENTS

1.0 INTRODUCTION

Land within Camden Local Government Area at the locality of Harrington Park has been rezoned and will be progressively developed for residential and business uses. In order to accommodate the increased demand for water related infrastructure to serve the area, amplification, upgrading works and some new works will be required. This Development Servicing Plan (DSP) describes the expected development and resultant demand for water related infrastructure. The Plan outlines the existing, new and amplified water related infrastructure which has/will be provided by the Sydney Water and developers under contract and outlines the associated costs and contributions.

1.1 The Development Area

Harrington Park is a release area forming part of the NSW Government's Urban Development Program (UDP) which identifies the need for new land releases and subsequent rezoning in order to secure orderly, economic urban development.

Harrington Park release area, for the purposes of this plan, is known as Camden SRA 2A and was rezoned for urban development on 15 August 1986 covering an area of about 310 hectares. Previously, the land was zoned non urban and used for rural purposes by the major landowner, the Fairfax family. An area of about 13 hectares of existing lots comprising about 22 holdings, some capable of subdivision, is also included in the rezoned area.

Local Environment Plan 39 applies to the 'area and allows a flexible mix of residential uses, together with associated uses of neighbourhood, business, special uses and open space. Environmentally sensitive areas are protected by rural zonings which restrict allotment sizes and types of dwellings. The area of about 13 hectares of existing lots fronting Stewart Street and Sharman Close has been further rezoned by LEP 46 (gazetted 13.1.89) to allow predominantly single dwelling development. The development in this area is presently serviced by Sydney Water water-mains but there is no reticulated sewerage service. Therefore, allowance will need to be made in the design of the sewage pumping station for the sewering of this area.

Development in Camden SRA 2A is anticipated to proceed over a 16 year period with current UDP projections indicating 3,300 lot equivalents on full development. When completed, the development will link the Harrington Park locality with the existing residential village of Narellan.

1.2 Water/Sewer Related Infrastructure Requirements

The existing and new water related infrastructure which has or will need to be provided by the Sydney Water and developers under contract will cater for the demands created by the new uses.

A total infrastructure system must be operated, maintained and amplified. Infrastructure includes: headworks such as dams, sewage treatment plants and major works such as water and sewage pumping stations, service reservoirs, large water mains and sewer carriers, reticulation mains required to deliver water and sewer services to development, and lead-in works which link a particular development to the existing system.

The Sydney Water has a program of capital works for the headworks and major works described above that provides for Harrington Park with applicable costs being recouped via developer contributions. However, the funding and construction of lead-in works will be the responsibility of the lead developer. Funding and construction of all reticulation works is also a developer responsibility.

1.3 Current Development Status

Development of the area has commenced with the dominant Fairfax/Taylor Woodrow Joint Venture development being officially opened in 1993.

The Sydney Water has issued a notice outlining its servicing requirements in response to an application for a Section 27 Certificate for the first stage received on 17 January 1994 covering 132 lots.

1.4 Developer Contributions

When development approval is issued by the consent authority, in this case Camden Council, a condition will be included in the development consent notice requiring that satisfactory arrangements be made with the Sydney Water for the provision of services. The developer submits an application with fee to the Sydney Water for a Section 73 compliance certificate to ascertain the Sydney Water requirements. This application can be made at any of the Sydney Water regional or business offices. To expedite the process, the developer can lodge the compliance certificate application with the Board at the same time that the development application is lodged with the consent authority.

The impact of the development on the Sydney Water systems and the location of existing works are identified to determine reticulation requirements and the level of headworks/major works contributions. After reviewing the characteristics of the development and service requirements the Sydney Water will issue a notice of requirements or indicative requirements if council consent is yet to be granted.

The Water Board (Corporatisation) Act 1994 provides authority for the Sydney Water to levy contributions on development which benefits from new or amplified infrastructure. Contributions or works that may be required are as follows:

i) Where a previous developer has constructed local reticulation works that will

benefit the subject development (a lead-in) the current developer will have to pay that proportion of the costs attributable to the subject development.

ii) Contributions to recover costs associated with capital expenditure by Sydney Water for headworks and major works.

iii) Provide a point of connection to each and every lot created through the construction of reticulation mains under contract. This work constructed at the cost of the developer by sub-contiactors is transferred, to Sydney Water ownership for the nominal sum of one dollar.

iv) Provide lead-in works, described in 3.4 and 3.9, necessary to provide water and sewerage services to the development area. This work is also constructed under a nominal sum contract.

v) Pay fees associated with design compliance review and quality assured construction for reticulation and lead-in works.

The balance of this Plan is principally concerned with establishing the headworks and major works contributions under Item ii) above.

2.0 DEMAND

2.1 Anticipated Development

The UDP anticipates a yield of 3,300 lots or lot equivalents for the currently residential zoned land at Harrington Park. This yield has been adopted for the purpose of this Development Servicing Plan. The land is expected to develop over a period of 16 years. As the contribution is calculated on an asset by asset basis, the capacities of the assets vary. The capacity of each asset is listed in Appendix B.

2.2 Infrastructure Costs

The infrastructure costs payable by the Harrington Park development have been calculated on the basis of the capacity of the infrastructure items to be utilised by the Harrington Park development. If an infrastructure work only partly serves Harrington Park then only the cost of the capacity to be utilised by the development has been attributed to Harrington Park.

2.3 Design Assumptions - Water

Maximum Day Demands are calculated on an allowance of 45 kilolitres/ hectare/day for residential and commercial land, and 75 kl/ha/d for industrial laud. A peaking factor of 2.1 is applied to this to obtain the Maximum Hour Demands. Reservoirs, pumping stations and inlet mains are sized for maximum day demands whilst outlet mains are sized to deliver Maximum Hour Demands.

2.4 Design Assumptions - Wastewater

In order to project flows and demand, the Board converts development projections to a measure called equivalent population (EP). One EP is approximately equal to 1 resident and one worker is equivalent to 0.13 El?. One EP generates a flow of 270 litres/EP/day. This flow rate provides some flexibility in the system to accommodate the range of flows experienced over the life of the development. Using results of system analyses, the Board has adopted the equivalent population design rates of 3.5 EP per lot which equates to 45 EP per hectare based on the assumed yield of 13 lots per hectare.

Sewers are sized to accept design wet weather flows which comprise of peak dry weather flows together with an allowance for infiltration which typically occurs in the wastewater systems. A factor of 4 (dilution factor) is applied to the peak dry weather flow to obtain the design wet weather flow. Sewage pumping stations are also designed to pump potential wet weather flows in order to prevent overflow of sewage in wet weather events.

2.5 Future Works

Future works will be constructed as required and are dependent on the development rate of Camden releases, both existing and further rezonings. These works are listed in Appendix B. Certain works are required to supplement the existing water supply to Harrington Park. Other works will transport and treat the sewage from Harrington Park.

3.0 INFRASTRUCTURE REQUIREMENTS

The following sections describe the works required to service development within Harrington Park. The major works components are scheduled in Appendix B and illustrated in Appendices D and E.

3.1 Existing Headworks - Water

The area will benefit from existing water headworks, scheduled in Appendix B. The Shoalhaven Scheme was constructed between 1972 and 1991 at a cost of $227.86 M and the Warragamba Pipelines were completed in 1982 at a cost of $26.094 M, all in 1994 dollars. A per lot contribution has been calculated, taking into account the population growth which has occurred since the completion of the scheme and the population growth which is expected to occur until the capacities of the works are fully utilised. In addition, a sedimentation basin was constructed in 1987 to support the Sugarloaf SPS at a cost of $3.806 M in 1994 dollars.

As the Water Board has an integrated water supply system, the cost of specific headworks assets are not attributed to a particular development area. However, from the capital expenditure detailed above, the Board has calculated a cost per lot that is attributable to all development in the Board's area. . This cost has been included in the developer contribution for this area.

3.2 Existing Major Works - Water

The area is within the Macarthur water supply zone and is fed from Narellan South reservoir. The area will benefit from existing major works, scheduled in Appendix B, constructed by the Board between 1985 and 1992 to benefit urban development in the Camden area under developer arrangements. The Board designed this work at a capacity which would accommodate the demands of existing and known future development at the time. A capital contribution per lot has been calculated for each infrastructure item based on the cost of the items in question and the projected total benefiting lots.

The total cost of existing water major works is $18.107 M in 1994 dollars. The works were constructed by Board's day labour before July 1992 when the Board's forces were not exposed to greater levels of competition. Cost of works have been reduced by 25% to reflect efficiencies that could have been achieved if competition existed.

In general, the Board only services development in an area by providing works on a total supply zone basis with the costs of servicing averaged across all benefiting development. However, in the Harrington Park case, after considering the physical relationship of the release area and the other Camden release areas the Board has calculated costs on a sub-supply zone basis. Only the infrastructure which directly

benefits the release area is included in the developer contribution. Some of this infrastructure is part of an integrated system. That is, all parts of the system are required to provide service to a given area.

3.3 Proposed Major Works - Water

The area, in conjunction with the existing Camden releases, will generate a demand for water that will require the construction of a 750 mm main from Narellan South Reservoir to Lodges Road to satisfy ultimate development of the areas served. The construction date will be determined by the rate of development of land in the benefiting area. The total cost of future water major works which will, in part, serve Harrington Park is estimated at $1.864 M. This will serve an estimated 18,500 lots of which 3,300 are within the Harrington Park area.

3.4 Lead-in Work - Water

Development of the area is dependent on the construction of lead-in work consisting of approximately 1.5 km of 450 mm watermain. This work will link the development with the Board's existing water supply system. As this work solely benefits the Harrington Park release area it is to be constructed by the developer under dollar contract arrangements as a condition of the Board servicing the release area.

3.5 Existing Headworks - Sewer

The area will benefit from existing headworks, scheduled in Appendix B. West Camden Sewage Treatment Plant Stage I will be able to provide capacity for all of the 3,300 lots depending on take up rates of any future rezonings. This stage was constructed between 1985 and 1993 at a cost of $41.518 M in 1994 dollars. The capacity of the plant is currently being reassessed and, should the plant be unable to accommodate all of the allotments within Harrington Park, later stages of the release area may be liable for a contribution towards the cost of amplification of the plant.

3.6 Proposed Headworks - Sewer

Construction of Stage II may occur after 1997 at an estimated cost of $31.29 M. Stage II will have the capacity to serve 50,000 EP in total. As discussed in section 3.5 it is unclear whether or not Harrington Park may benefit from this stage. The Board may reassess the situation at the time of each review of this plan.

3.7 Existing Major Works - Sewer

. The area will benefit from existing infrastructure, scheduled in Appendix B, constructed between 1979 and 1987 to benefit urban development in the Camden area under developer arrangements. This work was designed and constructed by the Board at a scale which would cater for anticipated development including Harrington Park. As with existing water major works, a capital contribution for each infrastructure item based on the cost of the items and the projected total benefiting lots has been determined.

The total costs of existing sewer major works is $19.977 M in 1994 dollars. The capacities of these works are listed in Appendix B.

As with water, it should be noted that, in general, the Board only services development in an area by providing works on a total catchment basis with the costs of servicing averaged across the benefiting development. In the Harrington Park case because of the position of the release area in the catchment, the Board has calculated costs for the Harrington Park area on a sub-catchment basis.

3.8 Proposed Major Works - Sewer

The area, in conjunction with the existing Camden releases, will generate loads on the sewer system that will require the construction of Camden Submain Stage 2 and the amplification of SPSs 484 and 440 along with their rising mains. These proposed works will provide for the ultimate development of the areas served. The construction dates will be determined by the rate of development of land in the benefiting area. The likely timing of construction is scheduled in Appendix B. The total cost of these works is estimated to be $4.7 million and will benefit an additional 10,500 lots.

3.9 Lead-in Work - Sewer

Development of the area is dependent on the construction of lead-m works consisting of a sewer rising main and a sewage pumping station. These works solely benefit the Harrington Park area and are to be constructed under dollar contract arrangements by the developer as a condition of development of the area.

3.10 Reticulation Works - Water and Sewer

As indicated in 1.4, developers will be required to construct reticulation works under nominal sum contract arrangements at the developer's cost, to provide a point of connection for both water and sewer to each lot created to the Board's standards applying at time of construction.

4.0 CALCULATION OF THE DEVELOPER CONTRIBUTION

4.1 Principles of Calculating the Contribution

Developer contributions for headworks and major works are based on full-cost recovery approach, ie the Net Present Value (NPV)[1] of cash flows from capital contributions and periodic service and usage charges should equal the capital investment made by the authority and associated operating costs[2] at an appropriate risk adjusted rate of return.

The steps outlined describe the contribution setting process.

i) Any existing assets[3] which will service the development, and which were constructed within the the last 25 years are identified. Current value asset costs (Modem Engineering Equivalent Replacement Asset (MERA) are used where available. If these are not available Historic Values are used and inflated to current dollars.

ii) The value of any future works required to serve the development are estimated.

iii) All existing assets constructed prior to July 1992 are written down by an efficiency factor of 25% if built by the Corporation's day labour work force. In reference to item (i) this is only applicable to those assets which are evaluated at their historic costs.

iv) In cases where existing assets have spare capacity[4], a constant annual rate of capacity take up is assumed from the time the asset becomes available for service until the capacity is exhausted or until the end of the analysis period, which ever is the shorter.

In some instances individual infrastructure items are not considered in isolation but as part of an integrated system. Under this approach the total capacity of the system is taken to be the capacity of each individual item, or groups of common items. Under a system based approach a constant annual rate of capacity take up is assumed from the time the capacity became available until exhaustion of the capacity or until the end of the analysis period, whichever is the shorter.

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1 NPV is a forward looking approach which considers future cashflows generated from investments made by an authority.

2 Developer Charges in the NSW Industry, Government Pricing Tribunal.

3 Assets with no spare capacity should be excluded from the analysis.

4 Based on the initial capacities, if available.

v) Estimates are made of the capacity take up of the lands benefiting from the proposed works. These estimates are based on information from the Department of Planning developed as part of the Urban Development Program, and the views of local government and the development industry. In addition, land and housing market cycles, historical development rates achieved in comparable areas, servicing constraints and oppurtunities are also examined in preparing the forecasts.

vi) An appropriate risk adjusted cost of capital is determined. This includes the inherent risks associated to the project, ie the risks associated to future capital investments, operating costs and the uncertainties associated to the projected lot developments.

vii) The developer contributions are calculated by using the NPV approach endorsed, in principle, by the NSW Government Pricing Tribunal. The basic formula for assessing the developer contribution is:

Developer Contribution = Attributable Capital Cost - NPV of Net Operating Income.

(The Net Operating Income is the difference between annual periodic revenues and operating costs" .)

viii) The attributable capital costs for each asset is calculated using the NPV methodology.

ix) All existing and future assets are discounted[6] at their appropriate rate of return[7] and an attributable capital cost for each asset item is determined.

x) The operating revenues and costs associated with the development are estimated.The present value of the operating revenue is deducted from the present value of the operating cost to determine any surplus or deficits. This is then added or deducted from the attributable capital costs.

xi) The total developer contribution is the sum of all attributable capital costs plus (minus) any operating surplus (deficit).

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5 Total direct and indirect costs including overheads.

6 Discounting only brings the future cash flows to the present.

7 A risk free rate is used for existing assets and a risk adjusted rate should be used for all future assets and operations.

xii) The total developer contribution is adjusted each year for any:

- movements in CPI;
- deductions of existing assets which have reached their capacity and no longer provide servicing to the development; and
- additions of new assets capital contributions that service the development.

xiii) The charges are presented over the next five years with adjustments specified in (xii), with the exception of the movement in CPI.

4.2 Calculation of the Contribution for Specific Development Proposals

As the West Camden Sewage Treatment Plant may be amplified before development of Harrington Park has been completed, different contributions for the existing and proposed amplification have been calculated. The charges are illustrated in Appendix C.

The net present value of the capital costs is calculated by applying a 3.2% real. discount rate to existing works and a 12% real discount rate to proposed works. The 12% rate includes a 5% return and a risk factor. In addition, the net present value of the operating costs and revenues associated with the development has been estimated over a 25 year period. The following lot production was used for the purposes of calculating the operating costs and revenue streams:

1994	130	2002	230
1995	330	2003	160
1996	360	2004	130
1997	430	2005	100
1998	400	2006	90
1999	400	2007	70
2000	190	2008	60
2001	170	2009	50

The costs of all existing works constructed by the Board's day labour prior to 1 July 1992 have been discounted by a 25% efficiency adjustment. It should be noted that the cost of the Shoalhaven component of the water headworks has not been adjusted as they were constructed by external contractors.

4.3 Developer Contribution Per Lot

The contribution varies over time depending on the stages of various infrastructure being utilised by the development and the predicted operating surplus. The expected movement of the contribution through time is outlined in Appendix C in 1994 dollars. The following contributions will apply in the 1994/95 financial year:

Existing water headworks		$ 895
Existing water major works	$1,029	
Proposed water major works	$ -	
Existing sewer headworks		$4,002
Proposed sewer headworks	$ -	
Existing sewer major works	$2,205	
Proposed sewer major works	$ -	
Less operating surplus	$ 338	
TOTAL Contribution per lot	$7,793	

Reticulation and lead-in works will be constructed by the developer and are therefore not included in the above contributions.

4.4 Review

The capital contribution and operating surplus or deficit for each year will be adjusted annually in line with movements in the CPI (Sydney).

The Board anticipates that it will review the plan after each 5 years with the first review on 1 July 1999. Matters for review could include lot production, proposed investments, discount rates and changes to standards.

4.5 Alternative Payment

As an alternative to payment over time, the lead developer might elect to pay the contributions upfront in 1994 dollars. Such payment must include a 5% return on investment to the Board for existing works and a 3% risk adjusted rate for future works.

5.0 DEVELOPER FUNDED WORKS

5.1 Recovery from Subsequent Developers

A developer of Site A may be required to construct works which incidentally benefit another potential development, Site B. The cost of the works attributable to that development as calculated by the Water Board will be recovered on development of Site B when that developer applies for and meets the Board's Section 27 compliance certificate requirements. The initial developer of Site A will then be refunded those costs as calculated by the Water Board at present day costs as development of Site B proceeds.

In Harrington Park, any developer will be appropriately refunded costs in respect of reticulation works which incidentally benefit another developer in accordance with the above principle. Further, the Fairfax/Taylor Woodrow Joint Venture will be reimbursed for the benefit received by other developers from the lead-in works described in sections 3.4 and 3.9, again under the above principle.

APPENDIX A

The development servicing plan (DSP) is a record of the Board's proposed servicing approach and related developer contribution for the release area. The plan has been prepared on the basis of information available at the time of investigation. Variations to relevant environmental or other regulations, standards or guidelines, the development scope, density, timing and type are likely to prompt alteration of the package and timing of work and related contribution. The DSP has been finalised as early as possible in the development train.

Consultation

The Board has used the draft DSP as a basis for negotiation with the key developer and land-holder. Consideration has been given to alternative servicing solutions and staging plans which satisfy the Board's standards of service. In addition, the lot development train proposed by the developers has been evaluated in the context of historical data on lot production in comparable release areas.

Review

The DSP will be reviewed at five yearly intervals.

APPENDIX B

WORKS REQUIRED TO PHYSICALLY SUPPLY HARRINGTON PARK (EXCLUDING LEAD-INS AND RETICULATION)

	YEAR IN SERVICE	YEAR CAPACITY UTILISED	HISTORICAL/ PROPOSED COST IN 1994 $M	ASSET CAPACITY
EXISTING HEADWORKS WATER ***				
Sugarloaf sedimentation basin	1987	2011	3.806	78,000 lots
Warragamba Pipelines	1982	2009	26.094	1,892,829 ep
Shoalhaven Scheme	1972-1991	2013	227.855	1,604,709 ep
EXISTING MAJOR WORKS WATER				
Narellan Distribution Mains	1985	2009	10.934	18,500 lots
Sugarloaf WPS Amplification	1988	2012	0.776	16,000 lots
Narellan Sth Reservoir	1992	2014	6.397	18,500 lots
PROPOSED MAJOR WORKS WATER				
750 mm Main - Narellan Sth Reservoir to Lodges Rd	1999	2014	1.864	18,500 lots
HEADWORKS SEWER				
West Camden STP Stg 1*	1985-93	2000	41.518	33,303 ep
West Camden STP Stg 2**	2001	2013	31.290	50,000 ep
EXISTING MAJOR WORKS SEWER				
Camden Submain Stg 1 (chn 00-chn168)	1978	1998	0.183	8,000 lots
Camden Submain Stg 1 (chn 168-chn1433)	1978	1998	6.096	18,500 lots
Camden South LL Carrier (chn 00-chn830)	1975	1999	1.157	8,000 lots
SF'S 484 (Narellan) - Stage 1	1987	1999	2.177	6,000 lots
SPS 484 (Narellan) - Stage 2 Civil Works	1987	2011	2.177	15,000 lots
Rising Main from SPS 484	1987	1999	2.395	6,000 lots
Narellan Submain	1987	2011	3.717	6,000 lots
SPS 440 Civil Works Stage 1	1979	2004	1.002	18,500 lots
SPS 440 and RM Stage 2	1986	1999	1.073	8,000 lots
PROPOSED MAJOR WORKS SEWER				
SPS 440-Stage 3 Amplification	1999	2014	0.70	10,500 lots
Camden Submain Stg 2 and Camden Sth LL Carrier Amplification	1998	2014	1.500	10,500 lots
SPS 484 and RM Stage 2	1999	2014	250	10,500 lots

* Providing at least 2,240 lots capacity - existing works; asset capacity in equivalent population

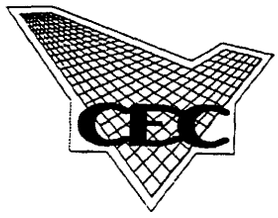
** Providing 1,060 lots capacity - proposed works; asset capacity in equivalent population

*** As the Water Board has an integrated water supply system, the costs of specific headworks assets are not attributable to a particular development area. However, from the capital expenditure detailed above, the Board has calculated a cost per person that is attributable to all development in the Board's *area.* A per lot contribution has been included in the developer contribution for this area.

Developer Charge Schedule Over Time

Year	Asset Description	Efficient Charge	1 1994	2 1995	3 1996	4 1997	5 1998	6 1999	7 2000	8 2001	9 2002	10 2003	11 2004	12 2005	13 2006	14 2007	15 2008	16 2009
	Existing Water Headworks:-																	
1991	Shoalhaven Dams	$770	770	770	770	770	770	770	770	770	770	770	770	770	770	770	770	770
1982	Warragamba Pipelines	$84	84	84	84	84	04	84	84	84	84	a4	84	84	84	a4	84	84
1987	Sugarloaf Detension Basin	$41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
	Existing Waler Major Works:-																	
1985	Narellan Mains	6611	611	611	611	611	611	611	611	611	611	611	611	611	611	611	611	611
1988	Sugarloaf WPS Amp	$53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
1992	Narellan Sth Reservior	5365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365	365
	Proposed Water Major Works:-																	
1999	750mm Main-S Res to Lodges Rd	$133	0	0	0	0	0	133	133	133	133	133	133	133	133	133	133	133
	Total Waler		1,925	1,925	1,925	1,925	1,925	2.057	2.057	2.057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057
	Existing Sewer Headworks:-																	
1994	STP Slage 1	54.002	4,002	4.002	4,002	4,002	4,002	4,002	4.002	0	0	0	0	0	0	0	0	0
	Exisling Sewer Major Works:.																	
1975	Camden S Lower Level Carrier	$142	142	142	142	142	142	142	0	0	0	0	0	0	0	0	0	0
1978	Camden Submarn Stg 1 (0-168)	$22	22	22	22	22	22	0	0	0	0	0	0	0	0	0	0	0
1978	Camden Subm Slg 1(168-1433)	$327	327	327	327	327	327	0	0	0	0	0	0	0	0	0	0	0
1979	SPS 440 W Camden Stg 1-Civil Wks	$57	57	57	57	57	57	57	57	57	57	57	57	0	0	0	0	0
1986	RM &SPS 440 W.Camden Stg 2	$118	118	118	110	110	118	0	0	0	0	0	0	0	0	0	0	0
1987	SPS 484 Narellan Slage 1 . Civil Wk	$160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
1987	SPS 484 Slge 1	$332	332	332	332	332	332	0	0	0	0	0	0	0	0	0	0	0
1987	Rising Main from SPS 484	$365	365	365	365	365	365	0	0	0	0	0	0	0	0	0	0	0
1987	Narellan Submain	$682	682	682	662	682	682	682	682	602	682	682	682	682	682	682	682	682
	Proposed Sewer Major Works:-																	
1998	Camden Submain Slage 2 & Carrier	$328	0	0	0	0	0	328	328	328	320	328	328	328	328	328	326	328
1999	SPS 440 Stage 3 -Amp	$147	0	0	0	0	0	0	147	147	147	147	147	147	147	147	147	147
1999	SPS 484 Slg 2 & Rising Main	$612	0	0	0	0	0	612	612	612	612	612	612	612	612	612	612	612
	Proposed Sawer Headworks Work																	
1997	STP Slage 2	$5,370	0	0	0	0	0	0	0	5.370	5,370	5,370	5.370	5,370	5,370	5.370	5,370	5,370
	Total *Sewer*		$6,207	66.207	$6.207	$6,207	$6.207	$5,982	55,987	$7,356	$7,356	$7,356	$7,356	$7,299	$7.299	$7,299	$7,299	$7,299
	Total Charge		$8.131	$8.131	$8.131	$6.131	$0.131	$8.039	$8,044	$9.413	$9,413	$9,413	$9,413	$9,356	$9,356	$9,356	$9,356	$9,356
	Less Operation		338	338	338		53	338	($338	6 $338)	($338)	($338)	($338)	($338)	($538)	($338)	($338)	($338)
	Nel Charge		57.793	$7.795	$7,793	57,793	$7,793	$7,701	$7,706	29.075	$9.075	$9,075	$9,075	$9,018	$9,018	$9,018	$9,018	$9,018

ATTACHMENT 3: SEWERAGE STRATEGY FOR WARNERS BAY/VALENTINE PREPARED BY HUNTER WATER CORPORATION



CONSULTING ENGINEERS

Prepared ***for***

SOUTHERN REGION

WARNERS BAY/ VALENTINE SEWERAGE STRATEGY

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EXECUTIVE SUMMARY

The Planning Engineer Southern has initiated a programme to review the major wastewater transportation systems within the Southern Region in order to allow a more accurate and up-to-date determination of the Major Works Charges applicable to the Region.

In June 1993, the Hunter Water Corporation's Southern Region commissioned Systems Investigation to review the Warners Bay / Valentine wastewater transportation system. The area contributing to this transportation system is outlined on **Exhibit 1.**

The Warners Bay / Valentine Catchment consists of areas contributing flows to Warners Bay No 1, Warners Bay South, Eleebana No 1 and No 2, Valentine No 1, No 2 and No 3 and Belmont No 6 Wastewater Pumping Stations.

The existing and ultimate sewage loadings expressed in terms of "equivalent tenements" (ET) for each of these pumping station catchments and their degree of development is summarised below.

Pumping Station Catchment	Existing (ET)	Ultimate (ET)	Percentage Developed
Warners Bay 1	3,200	5,004	60%
Warners Bay S	1,299	3,240	40%
Eleebana No 1	614	684	91%
Eleebana No 2	150	150	100%
Valentine No 1	1,899	2,861	67%
Valentine No 2	276	276	100%
Valentine No 3	34	34	100%
Belmont No 6	703	944	74%
Totals	8,175	13,193	60%

Based on a predicted uniform growth rate of 1%, the Eleebana No 1 catchment would be fully developed by 2010, Belmont No 6 by 2020 and both Warners Bay No 1 and Valentine No 1 by 2035. The Warners Bay South catchment is not likely to be fully developed until well into the second half of the next century.

The principal components of the Warners Bay / Valentine transportation system are outlined on **Exhibit 2**. All these components have been analysed with existing loadings (Section 3) and it was identified that there is a shortfall in capacity at Warners Bay No 1, Eleebana No 1 and Valentine No 1 pumping stations and in some carriermains within the Warners Bay No 1, Warners Bay South and Valentine No 1 catchments.

The components have also been analysed with ultimate loadings (Section 3) and augmentation works have been identified which will provide adequate system capacity to eliminate overflow.

The proposed augmentation works form the basis of a staged amplification strategy (Section 4) based on a uniform exponential growth rate throughout the contributing catchments of 1%. The strategy assumes the transportation system will be amplified in stages, each stage having adequate capacity for fifteen (15) years growth.

Prior to any amplification of the transportation system it is recommended that a detailed inspection and monitoring programme be implemented to accurately quantify the condition and performance of the system. This approach is in accordance with the 20 Year Sewerage Strategy Position Paper (Ref j) which emphasises performance measurement (eg inspection, flow gauging, inflow/infiltration studies), dynamic modelling, cost effective rehabilitation etc.

To implement the amplification strategy the following capital works are required:

STAGE	AMPLIFICATION DESCRIPTION	COST
Stage 1 - 1993	Line 3, MH B6260 - B6258 (84m of 225mm)	$ 12 141
	3 Pumps Warners Bay No I, Replace Switchboard (150 L/s @ 24 m, 165 kW)	$223 220
	Warners Bay No 1 Rising Main (1955 m of 300 mm)	$443 394
	Additional Pump Eleebana No 1, Modify Switchboard (360 L/s @ 29 m, 225 kW)	$105 435
	4 Pumps Valentine No 1, Replace Switchboard (296 L/s @ 66 m, 880 kW)	$ 592 229
	4 Pumps Belmont No 6, Replace Switchboard (367 L/s @ 35 m, 880 kW)	$443 070
	Sub-Total	**S1 819 489**
Stage 2 - 2010	Line 10, MH B6076 - B6074 (133m of 15Omm)	$ 16984
	Warners Bay No 1, New impellers	$ 12401
	Line N6400, MH D9807 - 9802 (5 18m of 375 mm)	$265 198
	Line N11091, MH D9867 - D9808 (15m of 375 mm)	$ 3 264
	Additional Pump Eleebana No I, Modify Switchboard (360 L/s @ 29 m, 300 kW)	$105 435
	Line N7600, N6430, MH D53 15 - D53 12 (186 m of 225 mm)	$ 26 883
	Line N6430, MH D5306 - D8655 (828 m of 450 mm)	$ 229 021
	Valentine No 1 Rising Main (1565 m of 375 mm)	$ 434 171
	Sub-Total	**S 1 093 357**

Table Continued ....

STAGE	AMPLIFICATION DESCFUPTION	COST
Stage 3- 2025	Line N11846, N12696, MI-i F3659 - F138 (235 m of 150 mm)	$ 30‘093
	Warners Bay No 1, New impellers	$ 12401
	Line N6400 MH D9808 - D9807 (43 m of 225 mm)	**S 6172**
	3 Pumps Warners Bay South (130 L/s @ 20 m, 75 kW)	$134244
	Warners Bay South Rising Main (564 m of 300 mm)	**$ 127 915**
	Warners Bay South, New 3.4 m Wet Well	**$ 141531**
	Valentine No 1, New impellers	$148 057
	Sub-Total	**$ 600 413**
	TOTAL CAPITAL COST	**S 3 513 259**

TABLE OF CONTENTS

VOLUME 1

□□□□

EXHIBITS

Exhibit 1 - Site Location
Exhibit 2 - Arrangement of Sewerage Transportation System

FIGURES

Figure 1 - Warners Bay No 1 Carriermain Schematic
Figure 2 - Warners Bay South Carriermain Schematic
Figure 3 - Eleebana No 1 Carriermain Schematic
Figure 4 - Valentine No I Carriermain Schematic
Figure 5 - Valentine No 2 Carriermain Schematic
Figure 6 - Belmont No 6 Carriermain Schematic

VOLUME 2

APPENDICES

Appendix A - Carriermain Analysis - Existing Loadings
Appendix B - Carriermain Analysis - Ultimate Loadings
Appendix C - Pump Station / Rising Main Analysis - Existing Loadings
Appendix D - Pump Station / Rising Main Analysis - Ultimate Loadings
Appendix E - Summary of Existing / Ultimate Loads for Carriermains
Appendix F - Rising Main and Pump Characteristic Curves
Appendix G - Order of Cost Estimates

1. INTRODUCTION

Major Works Charges (MWC) are charges levied by the Hunter Water Corporation (HWC) on proposed developments "for amplification of the Corporation's works and the headworks in consequence of the proposed development" (Ref 1). The HWC currently levies major works charges for the amplification of its wastewater transportation systems in 59 separate areas, a number of which have sub areas.

Many of the current major works charges require revision and so the Planning Engineer Southern has initiated a programme to review the major wastewater transportation systems within the Southern Region in order to allow an accurate and up to date determination of the major works charges applicable to the Region.

In June 1993 the Planning Engineer Southern invited Systems Investigation to submit a proposal to review the wastewater transportation systems servicing the following wastewater treatment catchment areas and sub areas:

- Warners Bay / Valentine
- Edgeworth
- Belmont North
- Swansea / Caves Beach

This report details the investigation of the Warners Bay/Valentine transportation system which is a sub area of the Belmont treatment works catchment. The study area is outlined in **Exhibit 1.** The contributing area contains the mainly residential areas of Warners Bay, Eleebana, Valentine, Tingira Heights and part of Floraville. It contains the following pumping station catchments:

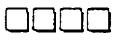
- Warners Bay No 1
- Warners Bay South
- Eleebana No 1
- Eleebana No 2
- Valentine No 1
- Valentine No 2
- Valentine No 3
- Belmont No 6

Warners Bay and Warners Bay South both pump sewage flows into the Eleebana 1 drainage catchment. Eleebana 1 and 2 and Valentine 2 and 3 pump into the Valentine 1 drainage catchment. Valentine 1 pumps to Belmont 6 which pumps to Belmont treatment works. A layout of the sewerage transportation system is shown in **Exhibit 2.**

The objectives of this investigation are to:

- complete a theoretical analysis of the Warners Bay/Valentine wastewater transportation system for both existing and ultimate sewage loadings and to recommend an amplification strategy;

- update the major works charge applicable to the Warners Bay/Valentine sub area of the Belmont treatment works drainage catchment.



2. POPULATION AND SEWAGE LOADINGS

2.1 Existing Population and Sewage Loadings

The existing population within the Warners Bay / Valentine catchment is estimated to be 21,573. This estimate is calculated using a lot count of 1:2000 scale sewer sheets and the population densities for each pumping station catchment obtained from 199 1 Census data

Catchment	Density (EP/lot)	Population	Equivalent Tenements
Warners Bay 1	2.7	7,260	2,689
Warners Bay S	3.1	3,980	1,284
Eleebana No 1	3	1,842	624
Eleebana No 2	3	450	150
Valentine No 1	3.1	5,735	1,850
Valentine No 2	2.6	718	276
Valentine No 3	2.6	88	34
Belmont No 6	2.5	1,500	600
TOTALS	2.88	21,573	7,497

TABLE 2.1 - CATCHMENT POPULATIONS

The total loads within each catchment, expressed in "equivalent tenements" (ET), are summarised below in **Table 2.2.**

PUMP STATION	Residential	Industrial	Commercial	School	Hospital	TOTALS
Warners Bay No 1	2,689	392	34	65	20	3,200
Warners Bay South	1,284	10	5	0	0	1,299
Eleebana No 1	614	0	0	0	0	614
Eleebana No 2	150	0	0	0	0	150
Valentine No 1	1,850	0	10	39	0	1,899
Valentine No 2	276	0	0	0	0	276
Valentine No 3	34	0	0	0	0	34
Belmont No 6	600	0	0	0	103	703
TOTALS	7,497	402	49	104	123	8,175

TABLE 2.2 - EXISTING LOADINGS (ET)

2.2 Ultimate Population and Sewage Loading

The ultimate population within the Valentine / Warners Bay Catchment is estimated to be 35,706. This estimate assumes the population densities within each catchment will not change. This approach is conservative as the densities are likely to decrease slightly over time. Population estimates within each catchment are detailed below in **Table 2.3.**

Catchment	Density (EP/lot)	Population	Equivalent Tenements	Percentage Developed
Warners Bay 1	2.7	12,064	4,468	60%
Warners Bay S	3.1	9,830	3,171	40%
Eleebana No 1	3	2,025	675	91%
Eleebana No 2	3	450	150	100%
Valentine No 1	3.1	8,513	2,746	67%
Valentine No 2	2.6	718	276	100%
Valentine No 3	2.6	88	34	100%
Belmont No 6	2.5	2,018	807	74%
TOTALS	**2.89**	35,706	12,327	60.4%

TABLE 2.3 - ESTIMATED ULTIMATE CATCHMENT POPULATIONS

Ultimate loadings **are summarised** below in **Table 2.4.**

PUMP STATION	Residential	Industrial	Commercial	School	Hospital	TOTALS
Warners Bay No 1	4,468	392	59	65	20	5,004
Warners Bay South	3,171	33	24	12	0	3,240
Eleebana No 1	675	0	9	0	0	684
Eleebana No 2	**150**	**0**	**0**	**0**	**0**	150
Valentine No 1	2,746	0	36	79	0	2,861
Valentine No 2	276	0	0	0	0	276
Valentine No 3	**34**	**0**	**0**	**0**	**0**	**34**
Belmont No 6	807	0	22	12	103	944
TOTALS	12,327	425	150	168	123	13,193

TABLE 2.4 - ULTIMATE LOADINGS (ET)

To determine an optimal staging strategy for the upgrading of major components within the transportation system, it is necessary to assume a growth rate for the catchment. A 1% exponential growth rate is considered appropriate for this catchment area (Ref 2). The Lake Macquarie City Council area is 'expected to grow at slightly less than this rate over the next 15 years.

A growth rate of 1% would see Eleebana No 1 Catchment fully developed by 20 10, Belmont No 6 by 2020 and both Warners Bay No 1 Catchment and Valentine No 1 Catchment fully developed by 2035. Warners Bay South Catchment, which is the least developed of all the catchments would not likely reach ultimate development until well into the second half of next century.

For the purposes of this study Eleebana No 2 Catchment, Valentine No 2 and 3 Catchments have been assumed fully developed.

3. SEWERAGE SYSTEM ANALYSIS

3.1 General .

The major components of the transportation systems in each of the sub-catchments within the Warners Bay / Valentine Catchment area have been analysed in accordance with the design criteria detailed in the Public Works Department Manuals of Practice on sewer and sewer pumping station design (Refs 3 & 4)..

The analysis involves static hydraulic modelling which identifies potential capacity problems, within the system. The components are initially analysed with existing sewage loadings to identify those areas which require inspection/monitoring. The components are then analysed with ultimate loadings to identify augmentation works required to provide adequate system capacity to eliminate overflow. These augmentation works form the basis of an amplification strategy (refer to Section 4) and allow the determination of major works charges.

The carrier-mains were analysed using SEWANAL which is a PC-based sewer analysis computer model developed by Systems Investigation. Carriermains of 225mm diameter or greater were analysed and the capacity of each individual manhole length was compared with its sewage loading **(Appendix E).** If a section of carrier-main was found to be overloaded, the hydraulic grade line was calculated to indicate if overflow was likely to occur.

The storage capacity of each pumping station and the pump flow/head requirements for each pumping station/rising main were reviewed.

3.2 Existing Loading

Warners Bay No 1 Catchment

Carriermains

There are approximately 11,935 metres of carriermain greater than 225 mm located within the Warners Bay No 1 Catchment and a layout of the carriermain system is shown in **Figure 1.** This system was analysed under existing loadings and the results are detailed in **Appendix A.**

Under existing loadings the analysis showed no capacity problems in the higher reaches of the sewerage system. Some of the newer carriermains are well under capacity and were obviously laid with future development in minh.

There are two carriers within this catchment area that are significantly overloaded for a portion of their length. The first is a 225 mm section of Line 3 parallel to Walker Street between manholes B6260 and B6258. A hydraulic grade line (HGL) analysis for Line 3 shows build-up to within 16 cm of the surface at MH B6260. This is inadequate and inspection/monitoring is required to determine if augmentation is required.

The second, Line I runs along The Esplanade and is theoretically overloaded for more than half its length. A HGL analysis for Line 1 shows no significant build-up within the manholes and where there is build-up the depth to HGL from the surface is always greater than one (1) metre.

Since 1988 recorded surcharges resulting from stormflow have occurred with reasonable frequency within this catchment. Our analysis indicates that this cannot be attributed to any deficiency in design capacity of the carriermains. Rather, excessive wet weather infiltration &d/or service problems in the carriermains (roots, debris, obstructions etc) is the most likely source of the overflow problems.

An inspection and monitoring programme should be implemented to accurately quantify the condition and performance of the system.

Warners Bay No I WWPS and Rising Main

Warners Bay No 1 Wastewater Pumping Station (WWPS) is situated off John Street, Warners Bay. The station currently houses two (2) dry well pumps (1 duty / I stand-by) each with a **nominal** duty point of 157 L/s @ 3 1 m.

A plot of the rising main curve and pump characteristic **curves (Appendix F)** show an operating point for single pump operation of 185 L/s @ 29 m and in parallel 224 L/s @ 32 m.

The existing loading (3200 ET) produces a theoretical Peak Wet Weather Flow (PWWF) of 256 L/s. The existing WWPS, even with the stand-by pump operating has a capacity of only 224 L/s, which is clearly inadequate.

The pumping station well is a 6.1 metre internal diameter cloverleaf configuration with a wet well volume of 28.8 cubic metres. The current wet well is adequate for existing loadings which require approximately 23 cubic metres **(Appendix C)**.

The existing 375 mm rising main from Warners Bay No 1 WWPS runs 1955 metres along The Esplanade and discharges. into MH F1923 within the Eleebana No 1 Catchment. With existing pump flows the velocity and detention time within the rising main are within acceptable limits.

An increase in pump capacity to an adequate level, however, would increase the *velocity* and pumping head to an unacceptable level.

Warners Bay South Catchment

Carriermains

There are approximately 4,856 metres of carriermain greater than 225 mm located within the Warners Bay South Catchment and a layout of the carriermain system is shown in **Figure 2.** This system was analysed under existing loadings and the results are detailed in **Appendix A.**

Under existing loadings the analyses showed a 300 mm diameter section of Line N6400 (between MH D9807 and MH D9802) is theoretically over-loaded. However, the HGL analysis reveals that although the build-up is significant the HGL is always greater than 0.8 metres from the surface. From MH D9802 to the pump station the carriermain is 450 mm and is adequate for existing flows.

Warners Bay South WWPS and Rising Main

Warners Bay South WWPS is located off Jones Avenue, Warners Bay, on the northern side of South Creek. The pump station houses three (3) submersible pumps (2 duty / I stand-by) each with a nominal duty point of 75 L/s @ 37 m. These pumps were installed in July of this year.

A plot of the rising main curve and pump characteristic curves show an operating point for a single pump of 126 L/s @ 30 m and in parallel of **149** L/s @ **37** m **(Appendix F).**

The existing loading on the station (1299 ET) produces a theoretical PWWF of approximately 107 L/s meaning the pumps have adequate capacity **(Appendix C).**

The wet well has a capacity of 10.92 cubic metres. This is adequate for existing PWWF whidh requires a volume of 9.63 cubic metres to maintain the maximum number of pump starts below ten (10) per hour.

The existing 250 mm rising main runs 564 metres from Warners Bay South WWPS and discharges into MH F1923 located within the Eleebana No 1 Catchment. Friction losses, detention times and velocity for the rising main are considered satisfactory for existing flows.

Eleebana No 1 Catchment

Carriermains

There are approximately 1,609 metres of carriermain greater than 225 mm located within the Eleebana No 1 Catchment and a layout of the carriermain system is shown in **Figure 3. This** system was analysed under existing loadings and the results are detailed in **Appendix A.**

Under existing loadings the analyses showed no significant capacity problems in any of the major carriers within the catchment. The HGL analysis confirmed that overflow from the system is unlikely to occur.

Eleebana No 1 WWPS and Rising Main

Eleebana No 1 WWPS is located off Macquarie Drive, Eleebana adjacent to Lake Macquarie.

The pump station houses two (2) dry-well pumps (1 duty / 1 stand-by) each with a nominal duty point of 360 L/s @ 29 m. A plot of the rising main curve and pump characteristic curves show an operating point for single pump operation of **378** L/s @ **26** m **(Appendix F).** When both pumps are operating in parallel the operating point is 575 L/s @ 34 m.

The existing loading on the station (614 ET) with pumped inflow from Warners Bay No 1 WWPS and Warners Bay South WWPS produces a PWWF of 402 L/s, meaning the capacity of the duty pump is theoretically exceeded by approximately 6% and the stand-by pump may be required for short periods if Warners Bay No 1 and Warners Bay South are pumping simultaneously.

The pump station consists of both a wet well and a dry well. The wet well has a volume of 56.1 I cubic metres which is adequate for PWWF which only requires a volume of 36.2 cubic metres.

The 500 mm CICL rising main from Eleebana No I WWPS runs 8 12 metres and discharges into MH D53 15 within the Valentine No 1 catchment. Velocities, detention times and friction losses are considered satisfactory for existing loadings **(Appendix C).**

Eleebana No 2 Catchment

Carriermains

There are no carriermains within this catchment greater than 225 mm.

Eleebana No 2 WWPS and Rising Main

Eleebana No 2 WWPS is located off Pargo Avenue, Eleebana on the edge of Lake Macquarie.

The pump station houses two (2) submersible pumps (1 duty / 1 stand-by) each with a nominal duty point of 18 L/s @ 26 m. A plot of the rising main and the pump characteristic curves show an operating point for single pump operation of 20.5 L/s @ **24** m **(Appendix F).**

The existing loading on the station (150 ET) produces a PWWF of approximately 13.7 L/s which indicates the pump has adequate capacity. The pump station wet well has a volume of 3.18 cubic metres. This is adequate for PWWF which requires a volume of only I .24 cubic metres.

The existing 150 mm rising main from Eleebana No 2 WWPS to MH D53 15 is considered adequate for existing loadings **(Appendix C).**

Valentine No 1 Catchment

Carriermains

There are approximately 9,5 12 metres of carriermain greater than 225 mm located within the Valentine No 1 Catchment and a layout of the carriermain system is shown in **Figure 4.** This system was analysed under existing loadings and the results are detailed in **Appendix A.**

These analyses showed the majority of the carriers within the catchment have spare capacity and are adequate for existing loadings.

Part of Line N6335A which runs parallel to Dilkera Avenue is overloaded between MH D5267 and MH D5320. A HGL analysis of this section of carrier shows that although build-up occurs, it is always greater than 0.9 metres from the surface and overflow is unlikely to occur.

Valentine No 1 WWPS and Rising Main

Valentine No 1 WWPS is located within Thomas H. Halton Park adjacent to Shepherd's Creek at Valentine.

The pump station houses three (3) dry-well pumps (2 duty / I stand-by) each with a nominal duty point of 165 L/s @ 67 m.

A plot of the rising main curve and the pump characteristic curves shows operating points for single pump operation of 225 L/s @ 58 metres, two pumps in parallel 400 L/s @ 6 1 metres and for three pumps in parallel (including stand-by) **525** L/s @ **63.5** metres **(Appendix F).**

The existing loading on the station consists of pumped inflow from Eleebana No 1 WWPS, Eleebana No 2 WWPS, Valentine No 2 WWPS and Valentine No 3 WWPS totalling 444 L/s and a peak wet weather gravity flow is 154 L/s. The maximum total flow into the station is thus 598 L/s.

With the stand-by pump operating, Valentine No 1 WWPS has a capacity of 525 L/s which is inadequate during a peak wet weather event if all the upstream pump stations are operating.

The pumping station well is a 12.0 m internal diameter concrete well (50% wet, 50% dry) with a wet well volume of approximately 130 cubic metres. The existing wet well is adequate for existing loads which require approximately 54'cubic metres only.

The 600 mm rising main from Valentine No 1 WWPS runs 1565 metres from Valentine to Belmont North and discharges into MH D6791 within the Belmont No 6 Catchment. Friction losses, detention times and velocity for the rising main are considered adequate for existing **flows (Appendix C).**

Valentine No 2 Catchment

Carriermains

The main carrier within the Valentine No 2 Catchment, Line N6224 **(Figure 5), was analysed** under existing conditions and the results are detailed in **Appendix A.**

Under existing loadings the carrier has spare capacity and a HGL analysis confirmed that no problems should be experienced within this catchment.

Valentine No 2 WWPS and Rising Main

Valentine No 2 WWPS is located on the comer of Dilkera Avenue and Allambee Place on the 'edge of Allambee Park at Valentine.

The pump station houses two (2) submersible pumps (1 duty / I stand-by) both with a nominal duty point of 34 L/s @ 11 m. A plot of the rising main and pump characteristic curves show an operating point for single pump operation of 38 L/s @ 10.5 m **(Appendix F).**

The existing loading (276 ET) produces a PWWF of 24.4 L/s which indicates the existing pumps are adequate.

The pump station wet well has a volume of 2.54 cubic metres which is adequate for existing loadings which require only 2.2 cubic metres volume if the number of pump starts per hour is limited to a maximum of ten (IO).

The 200 mm rising main from Valentine No 2 WWPS discharges into MH D3324 within the Valentine No I catchment and is considered satisfactory for existing loadings **(Appendix C).**

Valentine No 3 Catchment

Carriermains

The Valentine No 3 Catchment has only 34 lots draining to the pump station and does not contain any carriers over 225 mm.

Valentine No 3 WWPS and Rising Main

Valentine No 3 WWPS is located at the end of Robertson Road, Valentine.

The pump station houses two (2) submersible pumps (1 duty / 1 stand-by) each with a nominal duty point of 6.4 L/s @ 15m. A plot of the rising main curve and pump characteristic curves indicates an operating point of '7.6 L/s @ **14** m **(Appendix F). This** is more than adequate for the theoretical PWWF of 3.44 L/s.

The existing wet well has a volume of 0.95 cubic metres which is satisfactory given the required volume for PWWF of 0.3 1 cubic metres.

The 100 mm rising main from Valentine No 3 WWPS discharges into MH D6407 located in the Valentine No 1 catchment is satisfactory for existing flow. Both friction losses and velocities are considered to be adequate **(Appendix C).**

Belmont No 6 Catchment

Carriermains

There are approximately 2,324 metres of carriermain greater than 225 mm located within the Belmont No 6 Catchment and a layout of the carriermain system is shown in **Figure 6.** This system* was analysed under existing loadings and the results are detailed in **Appendix A.**

The results indicate no overloading within the catchment and the main carrier, Line N1 0411, which receives flow from Valentine No 1 WWPS, is at less than 50% of its full capacity during a peak wet weather event.

Belmont No 6 WWPS and Rising Main

Belmont No 6 WWPS is located in a public reserve off Gerald Street and Ross Street, Belmont.

The pump station houses three (3) dry-well pumps (2 duty / 1 stand-by) each with a nominal duty point of 492 L/s @ 16.5 m. A plot of the rising main and the pump characteristic curves shows an operating point for one (1) pump of 460 L/s @ 18 m and for two (2) pumps in parallel of 661 L/s @ **22** m **(Appendix F). The** existing load on the station consists of pumped inflow from Valentine No 1 WWPS of 525 L/s and peak wet weather gravity flow of 59.4 L/s making a maximum total flow into the station of approximately 584 L/s. The two (2) duty pumps in parallel can accommodate this flow without the need for the stand-by pump.

The pump station well is a 12.0 m internal diameter concrete well (50% dry, 50% wet) and the wet well has an operating volume of 123 cubic metres.

To maintain pump starts at no more than 10 per hour, the pump station requires a volume of 52.6 cubic metres meaning the existing well is adequate.

The 750 mm rising main from Belmont No 6 WWPS to the Belmont WWTW is joined in Glover Street by a 375 mm rising main from Belmont No 4 WWPS. Even with the additional head due to combined pumping, the existing rising main is adequate for existing loadings **(Appendix C).**

3.3 Ultimate Loading

Warners Bay No 1 Catchment

Carriermains

The analyses indicated several carriermains within the catchment do not have sufficient capacity for ultimate loading **(Appendix B).**

Part of Line 3 between MH B6260 and MH B6258 is theoretically overloaded by approximately 150%. A hydraulic grade line analysis indicates that overflow would occur during a peak wet weather event and will require amplification. The required parallel amplification is 84 m of 225 mm diameter pipe.

Line 71 experiences build-up in two areas. From MH B6227 to MH B6225 and between MH B6219 and MH B6217. In both cases, a hydraulic grade line analysis indicates the build-up will always be greater than 0.75 metres from the surface which is considered acceptable.

Part of Line 10 between MH B6076 and MH B6074 is overloaded and will require amplification for ultimate loadings. These two (2) manhole lengths are the only sections of 150 mm main within this carriermain which is predominantly 225 mm in diameter. The required parallel amplification is 133 m of 150 mm diameter pipe.

An analysis of Line 1 indicates over-loading between MH B6009 and MH B6000. Although this carriermain is currently over-loaded, the area draining into this carrier is almost fully developed and a HGL analysis indicates that this carrier is adequate for ultimate development and no augmentation is necessary.

Lines N11846 and N12969 are over-loaded from MH F3659 to MH F138. Manhole F3659 has been nominated as the connection point for the large undeveloped area in the east of the catchment. This would likely be one of the last areas to be developed within this area and the ultimate connection point is difficult to ascertain. However, if the majority of the loading did connect at this point, this length would require amplification. The required parallel amplification is 235 m of 150 mm diameter pipe.

Warners Bay No 1 WWPS and Rising Main

Warners Bay No 1 WWPS will ultimately be required to pump **395** L/s **(Appendix D). This** will more than double the existing pump capacity of 185 L/s.

The increased capacity can be achieved by replacing the existing two pumps with three larger pumps (2 duty / 1 stand-by) and constructing 1955 m of 300 mm diameter rising main to operate in parallel with the existing rising main. The ultimate pump duty requirement for each pumping unit would be 197.5 L/s @ 28 metres.

The existing cloverleaf configuration has inadequate wet well capacity for ultimate loads. An alternative to constructing additional wet well storage would be to convert the existing dry well to a wet well and install submersible pumps in each of the three wells. This would increase the wet well volume by 50% to 42 cubic metres which is adequate for ultimate loads.

Warners Bav South Catchment

Carriermains

An analysis of the carriermains within this catchment indicated significant deficiencies in capacity in Line N6400 **(Appendix B).** For ultimate development Line N6400, between MH D9808 and MH D9807, and downstream of this point between MH D9807 to MH D9802 will require amplification. This section of Line N6400 is currently overloaded and will require amplification shortly as -development proceeds within the next few years. The required parallel amplification is 5 18 m of 375 mm diameter pipe.

The last manhole length in Line N11091, between MH D9867 and MH D9808 is only 225 mm and is overloaded. The remainder of this carrier is 400 mm and 450 mm diameter.

A parallel length of main (15 m) is required to amplify this manhole length to at least a 450 mm equivalent diameter carriermain.

There are several manhole lengths near the top of the catchment in Line N16422 and Line N16365 which are theoretically over-loaded, however a HGL analysis indicates that the build-up is minor and should not result in overflow.

Warners Bay South WWPS and Rising Main

The pumps within Warners Bay South WWPS have recently been replaced (July 1993) and are considered to have adequate capacity until well into next century. However, the catchment is only approximately 40% developed, and ultimately the capacity will need to be increased to 260 L/s.

The increased capacity can be achieved by replacing the existing three pumping units with three larger units (2 duty / 1 stand-by) and constructing 564 m of 300 mm diameter rising main to operate in parallel with the existing rising main. The ultimate pump duty requirements for each pumping unit would be 130 L/s @ 20 metres.

The existing wet well has inadequate volume for ultimate requirements and an additional 3.4 metre diameter wet well will need to be constructed.

Eleebana No 1 Catchment

Carriermains

An analysis of the carriermains within the catchment indicates no significant capacity problems in any of the major carriers with the exception of Line N6369A **(Appendix B). This** carriermain receives pumped inflow from both Warners Bay South and Warners Bay No 1 WWPS. From MH D8729 downstream to the pump station is theoretically over-loaded by as much as 80%, however a hydraulic grade line analysis of this carrier indicates build-up is always greater than 0.9 metres from the surface for a peak wet weather flow event.

Eleebana No 1 WWPS and Rising Main

Although Eleebana No 1 WWPS is performing adequately at present, the required upgrading of Warners Bay No 1 WWPS upstream of this station will necessitate an increase in pump capacity. The station will ultimately be require to pump 715 L/s. This can be achieved by installing two (2) additional pumps to operate in parallel with the existing two pumping units (3 duty / 1 stand-by). There is provision in the existing dry well for two additional pumps. The ultimate pump duty requirement for each pumping unit would be 238 L/s @ 32 metres.

The existing wet well is considered adequate for ultimate development although the maximum number of pump starts per hour is increased to twelve (12) per hour. The existing 500 mm rising main from Eleebana No 1 WWPS is also considered adequate for ultimate development.

Valentine No 1 Catchment

Carriermains

The analyses indicate that the only carriers to experience capacity problems within the catchment will be the carriers receiving pumped inflow from upstream, i.e., Lines N7600, Line N6430, Line N6245 and Line N6355A **(Appendix B).**

The increase in the pumped inflow from Eleebana No 1 WWPS will overload parts of Line N7600 and Line N6430 between the receiving MH D53 15 and MH D53 12. This length will require amplification. Further downstream between MH D5306 and MH D8655 (Line N6430) will also require amplification for ultimate loads. The required amplification is

Part of Line N6355A is currently over-loaded between MH D5267 and MH D5320 however this HGL analysis indicates overflow is unlikely to occur.

With the increase in load in the upper part of the catchment, several lengths on Line N6245 between MH D5353 and MH D5359 become theoretically overloaded, however the HGL analysis indicates the build-up is minor and no overflow is likely to occur.

Valentine No 1 WWPS and Rising Main

Valentine No 1 WWPS has an existing shortfall in pumping capacity and the proposed increase in pumping capacity at Eleebana No 1 WWPS and further development within its own drainage catchment will increase this shortfall. The station ultimately will be required to pump 1020 L/s.

The pumping units at Valentine No 1 WWPS pump against a very high static head (53 metres). The pumping head generated by single stage centrifugal pumps is generally limited to about 55-65 metres. Any significant increase in pumping capacity would therefore require amplification of the rising main to maintain friction losses at an acceptable level.

The increased pumping capacity can be achieved by replacing the existing three pumps with larger units and installing a fourth unit (3 duty / 1 stand-by), and constructing 1565 m of 375 mm diameter rising main to operate in parallel with the existing rising main. The ultimate pump duty requirement for each pumping unit would be 340 L/s @ 65 metres.

The wet well capacity is more than adequate for ultimate loading **(Appendix D)**. The additional capacity in the wet well will also provide a buffer in a peak wet weather event. This may explain why the existing pump station, although theoretically overloaded, appears to be operating satisfactorily. However monitoring is required at Valentine No I WWPS to confirm if this is the case.

Belmont No 6 Catchment

Carriermains

An analysis of the carriermains within this area indicate no capacity problems. The major carriermain Line N1 0411, has spare capacity even with ultimate loads from Valentine No 1 WWPS and gravity flow from the catchment itself **(Appendix B).**

Belmont No 6 WWPS and Rising Main

Although Belmont No 6 WWPS is adequate for existing loadings, the proposed increase in pumping station capacity at Valentine No 1 WWPS will necessitate the upgrading of station capacity. The station will ultimately be required to pump 1100 L/s.

The increased pumping capacity can be achieved by replacing the three existing pumps with larger units and an additional pumping unit (3 duty/l stand-by). The ultimate pump duty requirements for each pumping unit would be 367 L/s @ 3 5 metres.

The existing 750 mm rising main from Belmont No 6 WWPS to the treatment works is considered adequate for ultimate development.

The wet well capacity -is more than adequate for ultimate loading **(Appendix D). The** additional capacity in the wet well will also provide a buffer in a peak wet weather event.

4. AMPLIFICATION STRATEGY

4.1 General

The following amplification strategy assumes the transportation system will be amplified in stages, each stage having adequate capacity for approximately fifteen (15) years growth. This is the minimum expected design life of major components within the pumping station such as impellers and motors.

Stage 1 works, therefore, will be required immediately and will provide adequate system capacity to the year 2010. Stage 2 works will be required in 2010 and will provide adequate system capacity to the year 2025. Stage 3 works will be required in 2025 and will provide adequate system capacity for ultimate development.

It is assumed there will be a uniform growth rate throughout the study area. However, a concentration of development within specific areas may result in a higher than expected load increase on some components of the transportation system and may result in some amplification works being bought forward.

Generally civil works are constructed for ultimate requirements. However, consideration has been given to staging mechanical / electrical works.

Prior to any amplification of the transportation system it is recommended that a detailed inspection and monitoring programme be implemented to accurately quantify the condition and performance of the system. This approach is in accordance with the 20 Year Sewerage Strategy Position Paper (Ref 5) which emphasises performance measurement (eg inspection, flow gauging, inflow/infiltration studies), dynamic modelling, cost effective rehabilitation etc.

Order of cost estimates are detailed in **Appendix G.**

4.2 Proposed Amplification Strategy

Warners Bay No 1 Catchment

Carriermains

Amplification	Size	Length	S taping
1. Line 3 MH B6260 - B6258	225 mm	**84** m	Stage 1
2. Line 10 **MH B6076 - B6074**	150 mm	133 m	Stage 2
3. Line N11846, N12969 MH F3659 - F138	**150** mm	235 m	Stage 3

Warners Bay No 1 WWPS and Rising Main

A proposed staged amplification programme for Warners Bay No 1 WWPS and rising main is outlined in **Table 4.2.1.** The proposed programme is to convert the existing dry well to a wet well and install submersible type pumps in each of the three wet wells in Stage 1.

An alternative option would be to retain the cloverleaf configuration for Stage 1 and install two larger dry well type pumps. The station would then be converted to a submersible type in Stage 2. These two alternative options should be given more detailed consideration at the detailed design stage.

Year	Gravity PWWF	Pumped Inflow	Pump Requirements	Suggested Staging
Stage 1 - 1993	**256** L/s		**256** L/s	Convert dry well to wet well Parallel existing RM with 30(mm Rising Main . New submersible pumps duty point 301 Us @ 24 m.
Stage 2 - 2010	301 L/s		**301** L/s	New impeller. - duty point 341 Us @ 25 metres.
Stage 3 - 2025	**348** L/s		**348** L/s	New impeller - duty point 391 L/s @ 28 metres.
Ultimate	,395 L/s		395 L/s	

TABLE 4.2.1 - PROPOSED STAGING OF WARNERS BAY No 1 WWPS

Warners Bay South Catchment

Carriermains

Amplification	Size	Length	Staging
1. Line N6400 MH D9808 - D9807	225 mm	43 m	Stage 3
2. Line N6400 MH D9807 - D9802	375 mm	518 m	Stage 2
3. Line N11091 MH D9867 - D9808	375 mm	15 m	Stage 2

Warners Bay South WWPS and Rising Main

A proposed staged amplification programme for Warners Bay South WWPS and rising main is outlined in **Table** 4.2.2. At the-present growth rate there is adequate capacity in the pumps until approximately 2025. At this point the pumps will require replacement and the rising main will have to be amplified.

The existing wet well will also become inadequate by approximately 2025 and an additional 3.4 m diameter well will have to be constructed at this point. By delaying the construction of the required wet well until 2025, the maximum number of pump starts is theoretically increased to twelve (12) per hour, however this is not considered to be critical.

Year	Gravity PWWF	Pumped Inflow	Pump Requirements	Suggested Staging
Stage 1 - 1993	107 L/s		107 L/s	
Stage 2 - 2010	126 L/s		126 L/s	
Stage 3 - 2025	145 L/s		145 L/s	Parallel 300 mm RM. 259 Replace Us Pumps 20 duty poin @ metres. Construct additional wet well 3.4 m diameter.
Ultimate	259 L/s		259 L/s	

TABLE 4.2.2 - PROPOSED STAGING OF WARNERS BAY SOUTH WWPS

Eleebana No 1 Catchrnent

Eleebana No 1 WWPS and Rising Main

A proposed staged amplification programme for Eleebana No 1 WWPS and rising main is outlined in **Table 4.2.3.**

An additional pump (same capacity as existing units) is required in Stage 1 as a result of the proposed increase in capacity at the upstream Warners Bay No 1 WWPS. Given projected growth rates, this should be adequate until at least 2010 when a further additional pump will be required. The will increase the station capacity to its ultimate requirements.

For ultimate requirements, the maximum number of pump starts is theoretically increased to twelve (12) per hour, however this is not considered sufficient reason to recommend augmentation of the existing wet well.

The proposed staging of Eleebana No 1 WWPS is outlined below in **Table 4.2.3.**

Year	Gravity PWWF	Pumped Inflow	Pump Requirements	Suggested Staging
Stage 1 - 1993	52 L/s	427 L/s	479 L/s	Additional Pump • Statior duty point 551 Us @ 3; metres.
Stage 2 - 2010	58 L/s	493 L/s	551 L/s	Additional duty point Pun712 L/s Stati@ metres.
Stage 3-2025	58 L/s	580 L/s	638 L/s	
Ultimate	58 L/s	**654** L/s	712 L/s	

TABLE 4.2.3 - PROPOSED STAGING OF ELEEBANA No 1 WWPS

Valentine No I Catchment

Carriermains

Amplification	Size	Length	Staging
1. Lines N7600, N6430 MH D5315 - D5312	**225 mm**	186m	Stage 2
2. Line N6430 MH D5306 - D8655	**450 mm**	**828** m	**Stage 2**

Valentine No 1 WWPS and Rising Main

A proposed staged amplification programme for Valentine No 1 WWPS and rising main is outlined in **Table 4.2.4.**

Theoretically, an increase in capacity at Valentine No I WWPS is required immediately. Consideration was given to increasing the size of the impellers in the existing pumping units but advice from the pump manufacturer indicates that, even with the maximum impeller size, this would result in only a marginal increase in capacity. Consideration was also given to increasing the speed but the manufacturer advised the existing pump casings are not designed to tolerate the working pressures developed at 1440 rpm. The proposed amplification programme is to replace the existing pumping units and install an additional unit in Stage I with the rising main being amplified in Stage 2.

Year	Gravity PWWF	Pumped Inflow	Pump Requirements	Suggested Staging
Stage 1 - 1993	**154** L/s	618 L/s	772 L/s	Replace 887 L/s Pumps 66 m. - duty point @
'Stage 2 - 2010	**182** L/s	**705** L/s	**887** L/s	Parallel 989 375L/s mm 66 RM m. - duty point @
Stage 3 - 2025	210 L/s	779 L/s	989 L/s	New 10 L/ impellers metres duty point @
Ultimate	229 L/s	779 L/s	1020 L/s	

TABLE 4.2.4 - PROPOSED STAGING OF VALENTINE No 1 WWPS

Belmont No 6 Catchment

Belmont No 6 WWPS and Rising Main

A proposed staged amplification programme for Belmont No 6 WWPS and rising main is outlined in **Table 4.2.5.**

An increase in capacity in Stage 1 is required as a result of the proposed increase in capacity at the upstream Valentine No 1 WWPS.

Consideration has been given to increasing the size of the impellers in the existing pumping units but advice from the manufacturer indicates that, even with the maximum impeller size, this would result in only a marginal increase in capacity.

The proposed amplification programme is to replace the existing pumping units and install an additional unit in Stage 1.

Year	Gravity PWWF	Pumped Inflow	Pump Requirements	Suggested Staging
Stage 1 - 1993	59 L/s	989 L/s	1048 L/s	Replace pumps - duty poin 1100 L/s @ 37 metres.
Stage 2 - 2010	70 L/s	989 L/s	1059 L/s	
Stage 3 - 2025	79 L/s	1020 L/s	1100 L/s	
Ultimate	**79** L/s	1020 L/s	1100 L/s	

TABLE 4.2.5 - PROPOSED STAGING OF BELMONT No 6 WWPS

5. REFERENCES

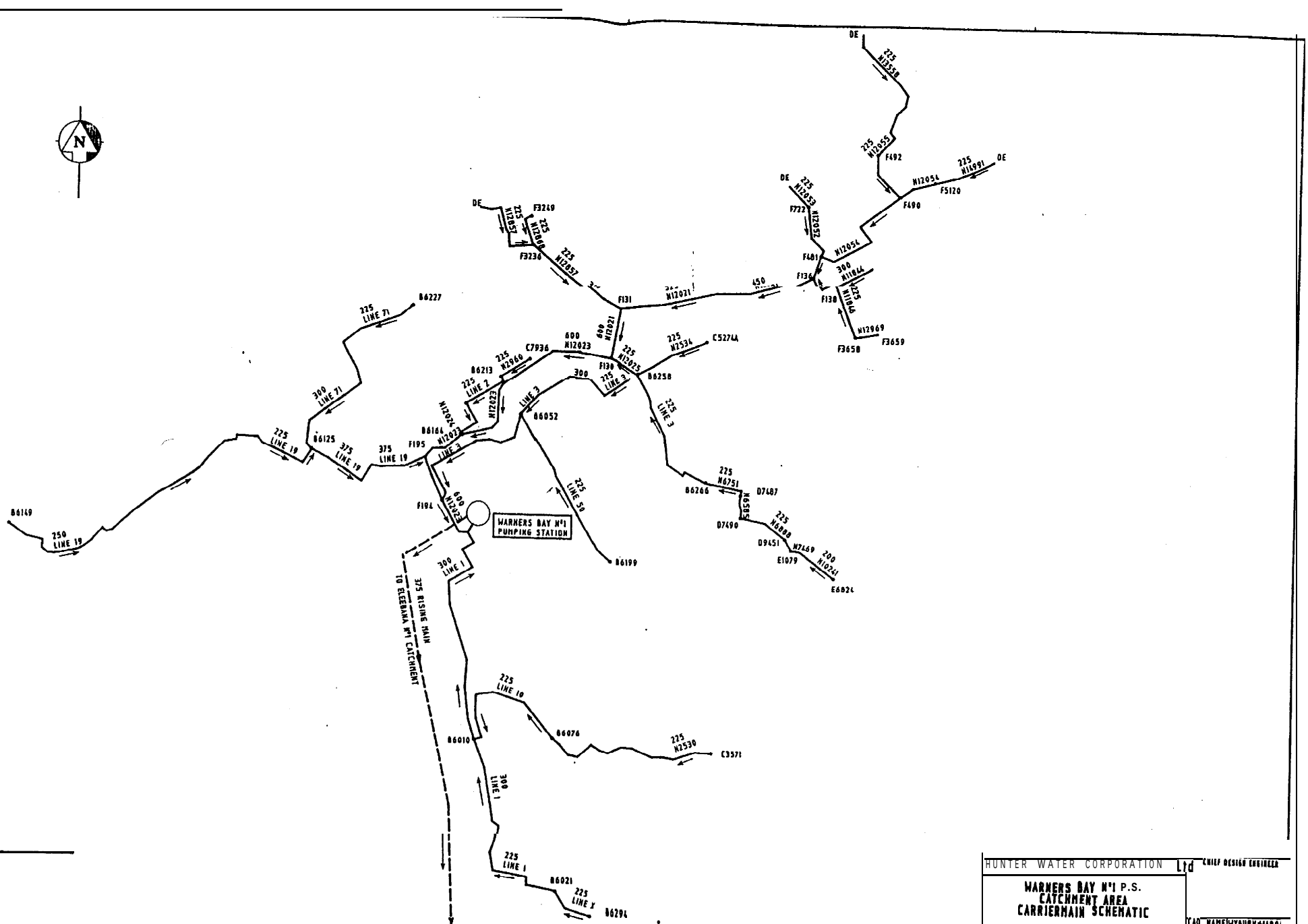
1. Hunter Water Board (Corporation) Act 1991 - Section 50.

2. Draft Hunter Coastal Urban Settlement Strategy - Dept of Planning, 1990.

3. Manual of Practice, Sewer Design - Public Works Department NSW, June 1985.

4. Manual of Practice, Sewage Pumping Station Design - Public Works Department NSW, May 1986.

5. 20 Year Sewerage Strategy, Position Paper - Systems Investigation, Civil Engineering Consulting, Hunter Water Corporation, September 1992.



REVISIONS

HUNTER WATER CORPORATION Ltd

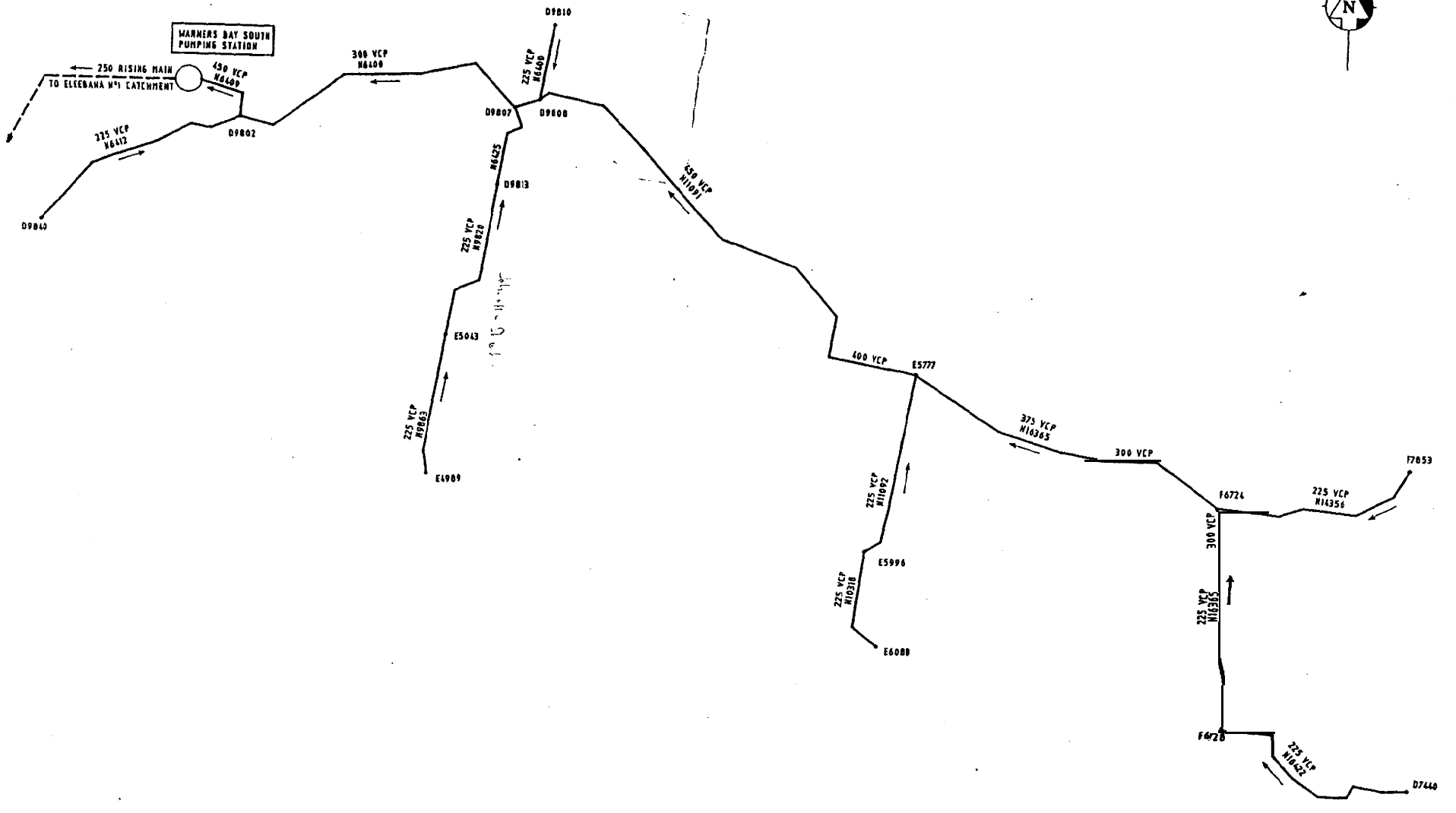
CHIEF DESIGN ENGINEER

WARNERS BAY No1 P.S.
CATCHMENT AREA
CARRIERMAIN SCHEMATIC

SCALE 1 N.A. DES CKD
ARRGT 1 DRN CKD
A C N 053 102 037 DATE 1993

CAD NAME WYBURN4/ARG1

FIG.1 A3



REVISIONS

HUNTER WATER CORPORATION Ltd			
WARNERS BAY SOUTH P.S. CATCHMENT AREA CARRIERMAIN SCHEMATIC			
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ARRGT	-	DRN	CKD
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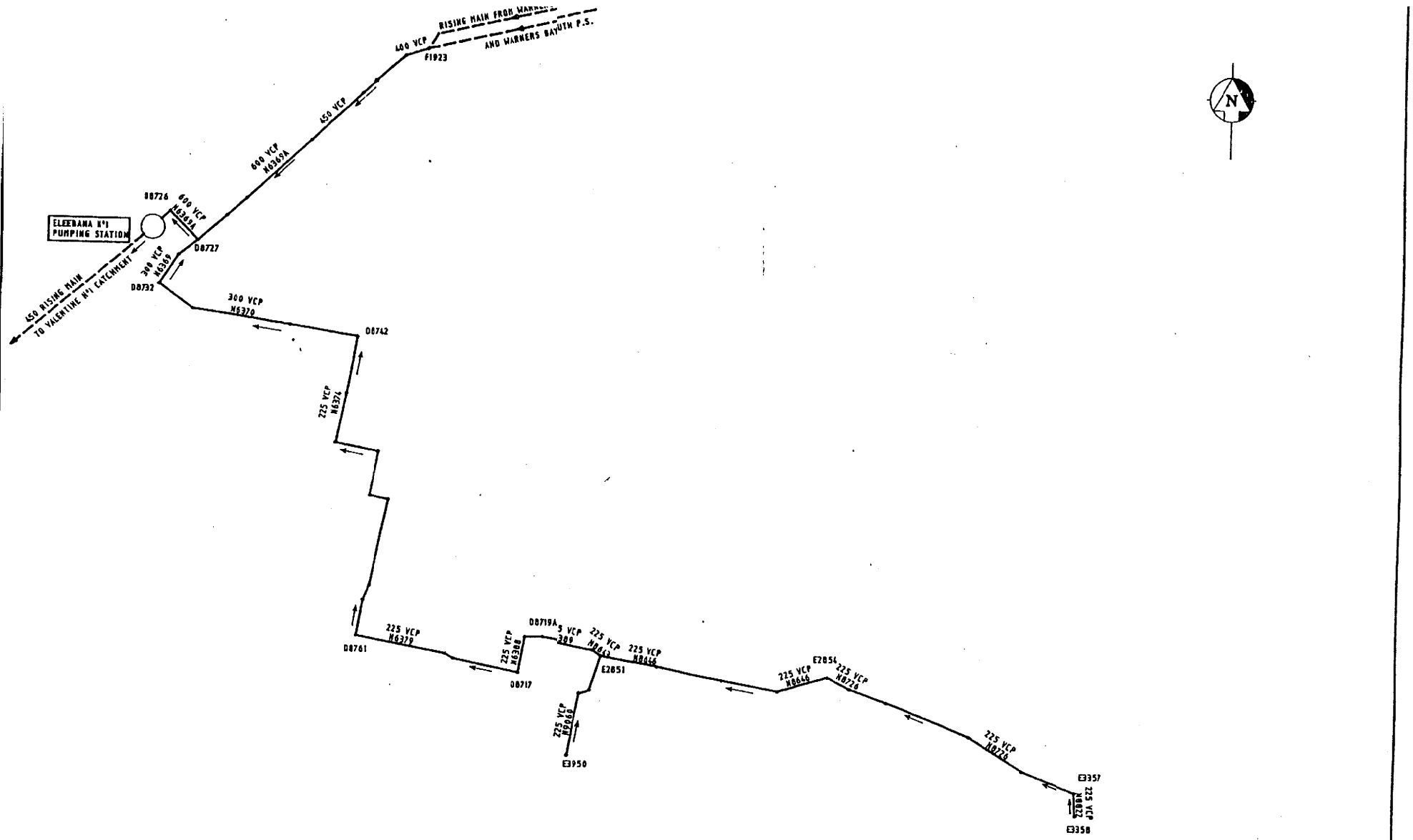
FIG. 2		A3	



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HUNTER WATER CORPORATION Ltd			
ELEEBANA N°1 P.S. CATCHMENT AREA CARRIERMAIN SCHEMATIC			
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ARRGT		DRN	CKD
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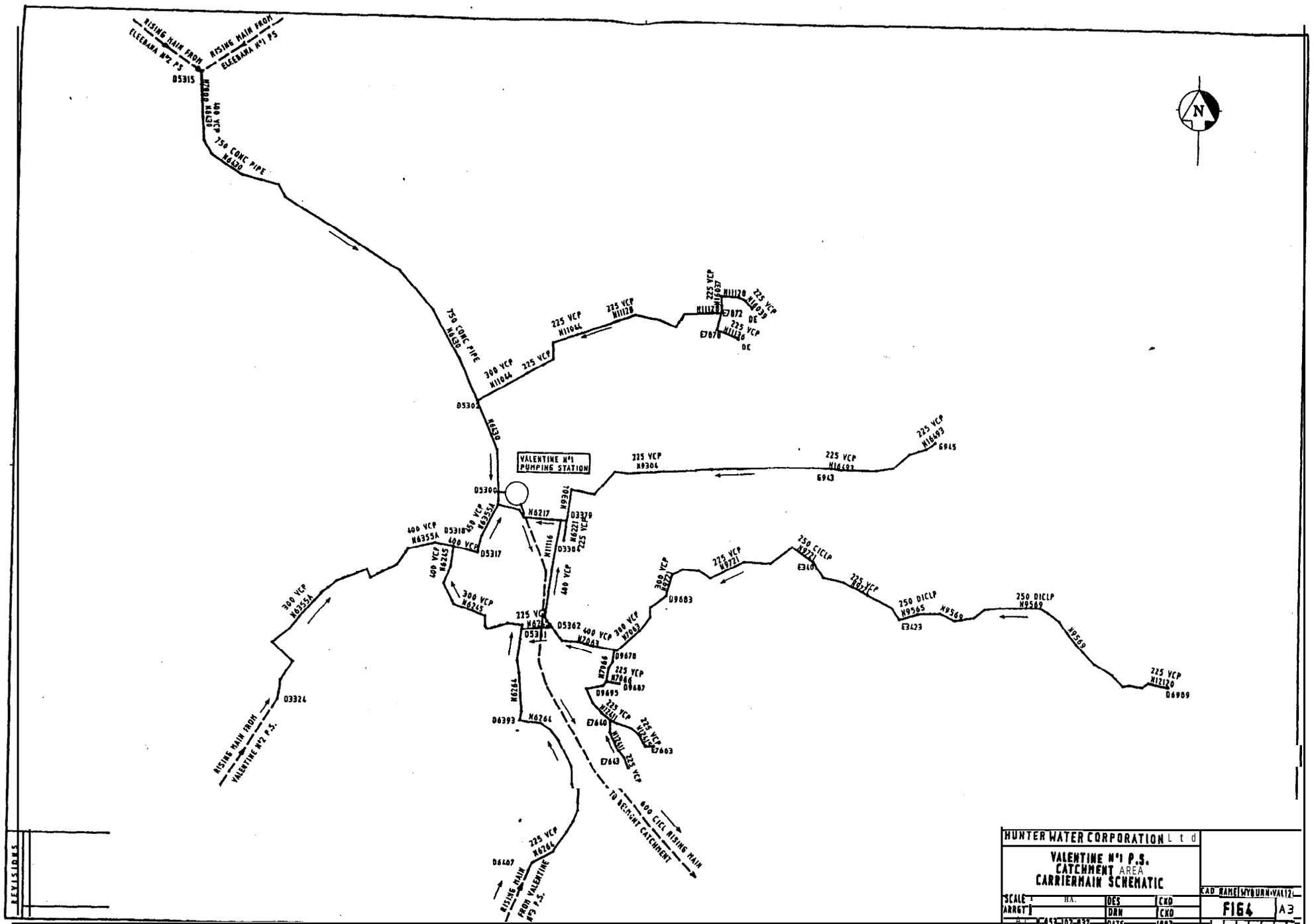
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RISING MAIN FROM ELEEBANA No1 PS
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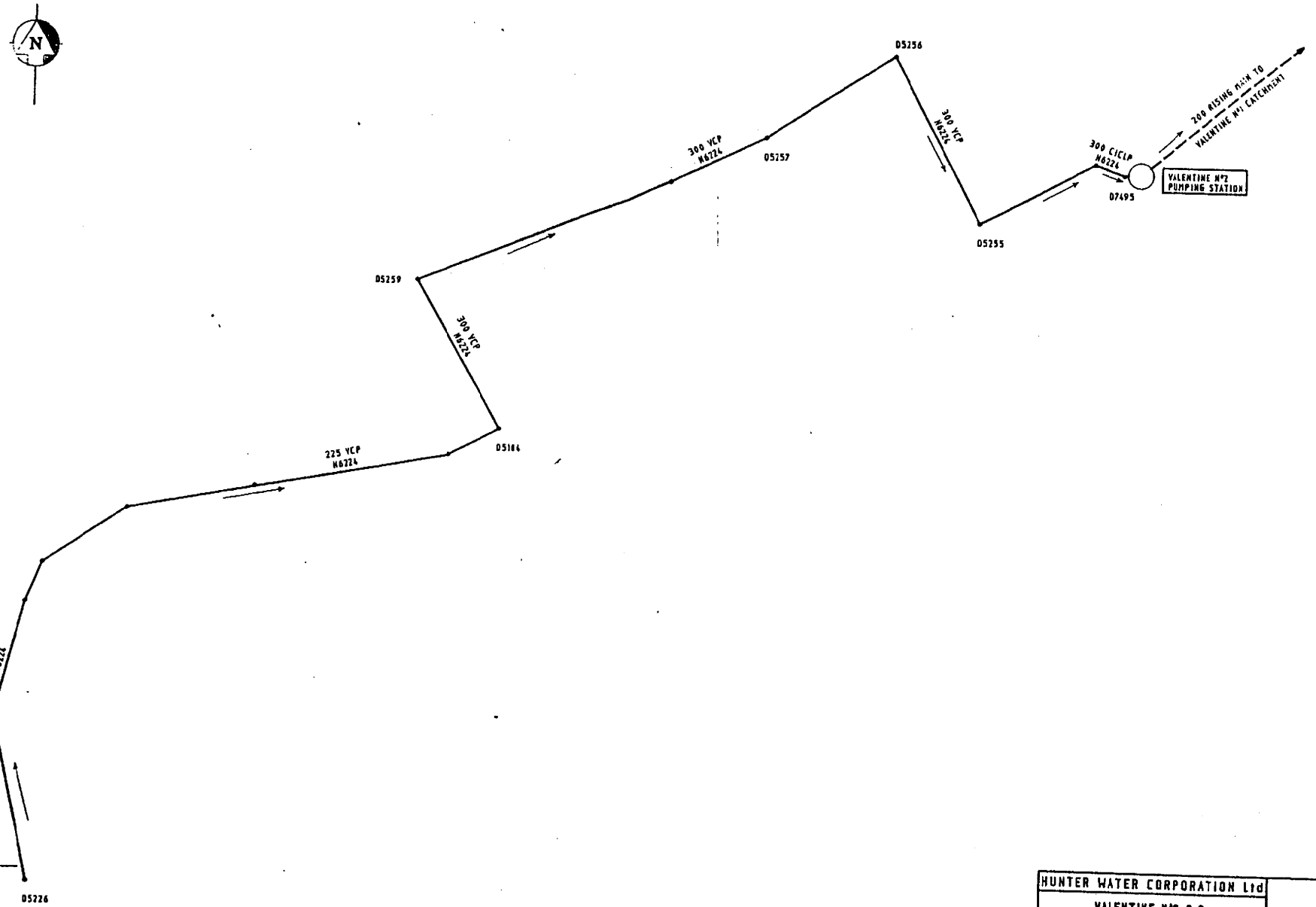
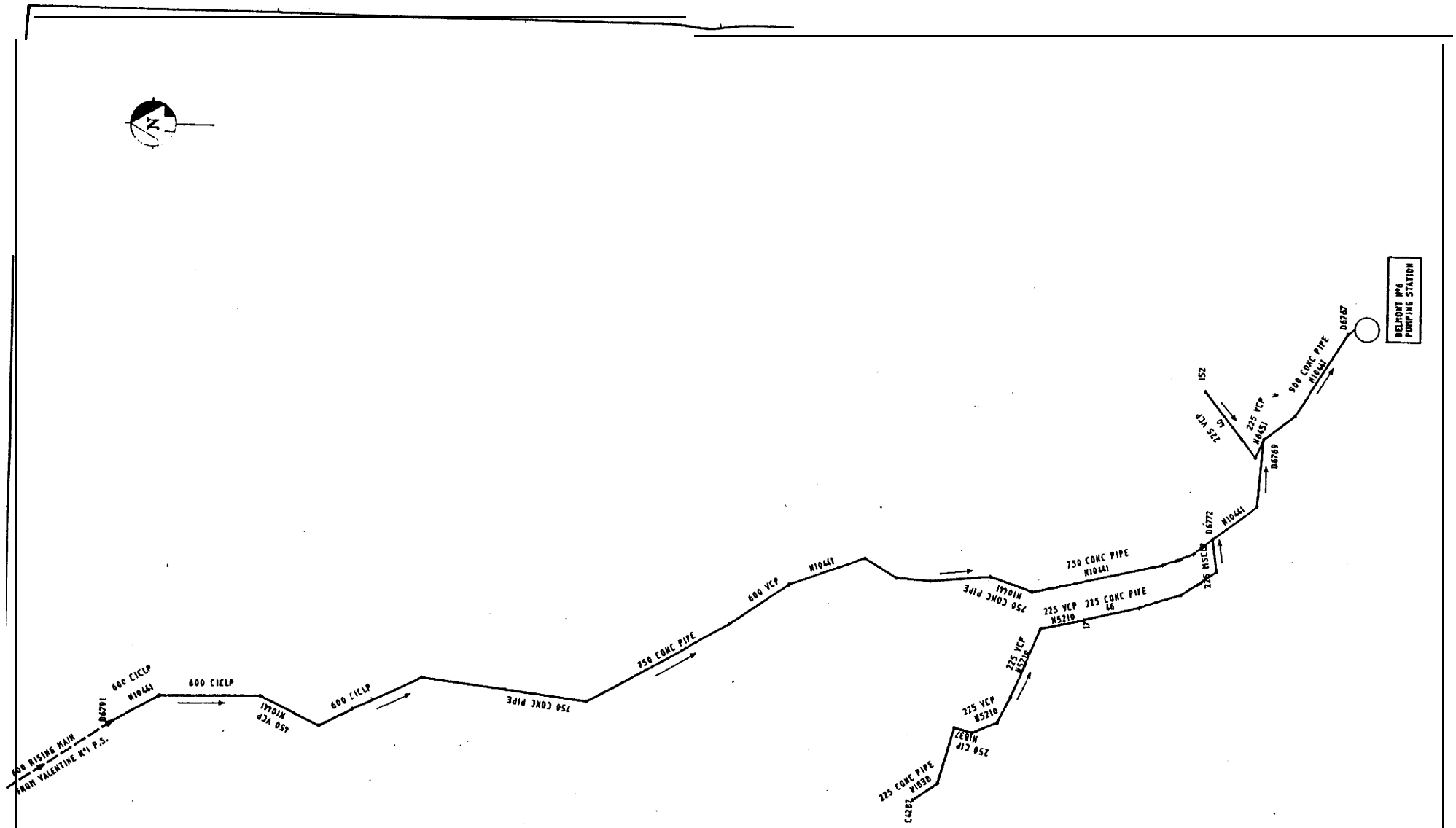
225 VCP N11128
225 VCP N11037
225 VCP N11128
225 VCP N16039
225 VCP N11136
E7072
E7070
DE
DE
300 VCP N11044
225 VCP
05302
N6439
VALENTINE No1 PUMPING STATION
05300
225 VCP N9304
225 VCP N16493
225 VCP N16493
6943
6945
N9304
H6217
D3379
H6221
225 VCP
D3380
N11116
400 VCP
400 VCP N6355A
D5318
450 VCP N6355A
400 VCP
D5317
400 VCP N6215
300 VCP N6215
225 VCP N6215
05362
D5311
400 VCP N7043
300 VCP N7043
D9683
300 VCP N6355A
D3324
225 VCP N9721
250 CICLP N9721
E3410
225 VCP N9721
250 DICLP N9565
E3423
250 DICLP N9569
N9569
N9569
225 VCP N12120
D6989
D9678
N7044
225 VCP N7044
D9687
D9695
N6264
D6393
H6264
225 VCP N12121
225 VCP N12120
E7640
E7603
E7643
225 VCP
RISING MAIN FROM VALENTINE No2 P.S.
TO HEIGHT CATCHMENT
600 CICL RISING MAIN
225 VCP N6264
D6407
RISING MAIN FROM VALENTINE No1 P.S.
N
REVISIONS
HUNTER WATER CORPORATION Ltd
VALENTINE No1 P.S.
CATCHMENT AREA
CARRIERMAIN SCHEMATIC
SCALE 1
ARRGT 1
HA.
A.I.F. No 853-102-037
DES
DRN
DATE
CKD
CKD
1993
CAD NAME WYBURN-VAL12
F164
A3



REVISIONS

HUNTER WATER CORPORATION Ltd				
VALENTINE N°2 P.S. CATCHMENT AREA CARRIERMAIN SCHEMATIC				
SCALE	N.A.	DES	CKD	CAD NAME: MYBURN+VAL121
DRWGT		DRN	CKD	FIG.5 A3
A.C.N. 053 102 837		DATE	1993	



REVISIONS

HUNTER WATER CORPORATION Ltd

BELMONT N°6 P.S.
CATCHMENT AREA
CARRIERMAIN SCHEMATIC

CHIEF DESIGN ENGINEER

SCALE	N.A.	DES	CKD
ARRD		DRN	CKD
A C N 053 102 037		DATE	1993

CAD MARCELMYBURGH/FIG6

FIG.6 A3

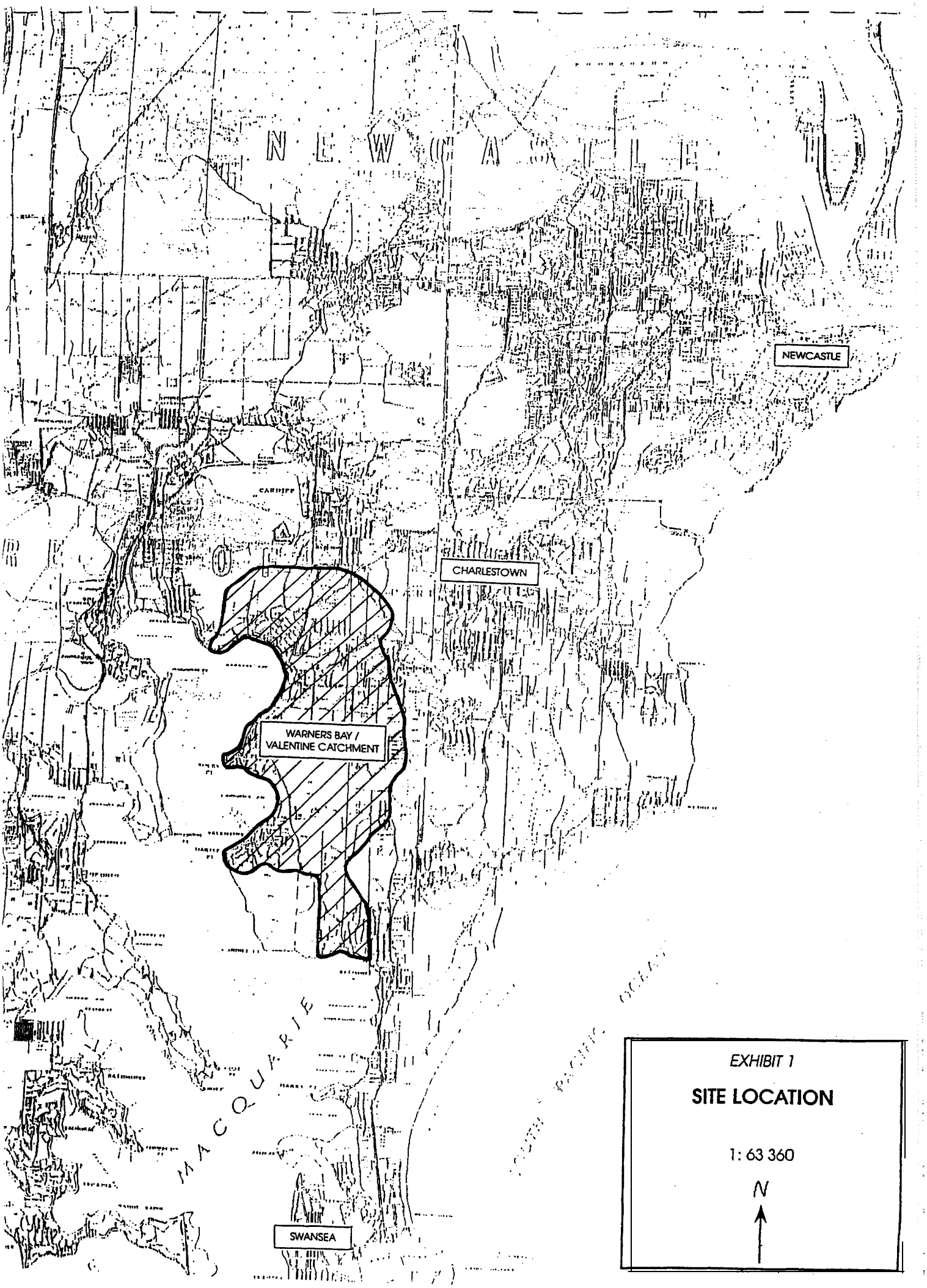
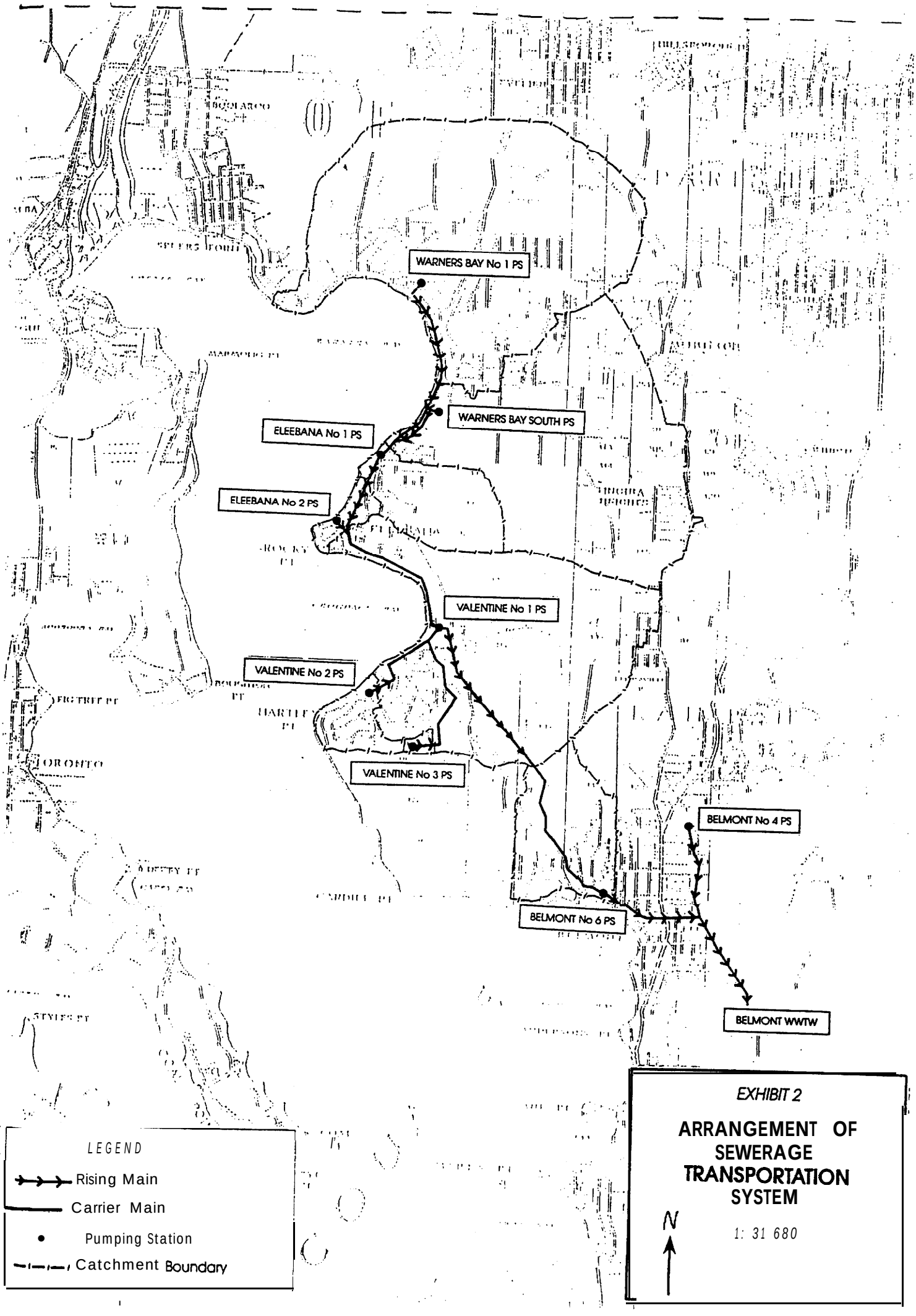


EXHIBIT 1

SITE LOCATION

1: 63 360

N


WARNERS BAY No 1 PS
WARNERS BAY SOUTH PS
ELEEBANA No 1 PS
ELEEBANA No 2 PS
VALENTINE No 1 PS
VALENTINE No 2 PS
VALENTINE No 3 PS
BELMONT No 4 PS
BELMONT No 6 PS
BELMONT WWTW
LEGEND
Rising Main
Carrier Main
Pumping Station
Catchment Boundary
EXHIBIT 2
ARRANGEMENT OF SEWERAGE TRANSPORTATION SYSTEM
N
1: 31 680

INDEPENDENT PRICING AND REGULATORY TRIBUNAL
OF NEW SOUTH WALES

DEVELOPER CHARGES FOR WATER, SEWERAGE AND DRAINAGE SERVICES

A Supplementary Note to the Guidelines for the Methodology to be used in Calculating Developer Charges

1. Purpose of this supplementary note

This supplementary note is prepared to clarify the guidelines previously issued by the Tribunal in the determinations for developer charges for Sydney Water Corporation, Hunter Water Corporation, Gosford City Council and Wyong Shire Council. This note outlines in detail the approach/procedures that should be adopted in the calculation of the net present value of future operating profits or losses - that is the second component of the developer charges formula.

2. Background

In 1995/96, the Tribunal made determinations for developer charges for the four urban water supply' agencies by setting a methodology in terms of section 13(A)(l)(b) of the PART Act. Details of the methodology are set out in the guidelines (the Guidelines) in a schedule to the following determination reports:

Sydney Water Corporation, Prices of Developer Charges for Water, Sewerage and Drainage Services, Determination No 9 1995

Hunter Water Corporation, Determination No 5 1996, Attachment 3

Gosford City Council, Determination No 3 1996, Attachment 3

Wyong Shire Council, Determination No 4 1996, Attachment 3

The net present value approach calculates the developer charges as:

- the cost of the assets used to service the development
- less the future net operating profits (or losses) expected to be derived from providing services to the development area.

Implementation of the net present value (NPV) methodology has resulted in water agencies using different approaches to calculate the future net

operating profits (or losses). After an independent review' by an external consultant and consultation with the Developer Charges Forum, the Tribunal has decided that it is necessary to clarify the Guidelines in respect of the calculation of the future operating profits (or losses). A detailed description of the calculation of the future operating offset is provided in this note.

3. Calculation of the net present value of future operating profits (or losses)

3.1 The developer charges formula

As specified in section 5 of the Guidelines, the developer charge (DC) per lot is calculated using the net present value (NW) approach in accordance with the following formula:

$$DC = K \cdot NPV_r(R_i - C_i) \text{ for } i = \text{years } 1, \ldots n; n \leq 30$$

The components of this calculation are as follows:

- K - the capital charge for the existing or future assets calculated on a NPV basis which will serve the development or release area
- R_i - the future periodic revenues expected to be received from customers in the development area in each year (i)
- C_i - the future expected annual operating, maintenance and administration costs of providing services to customers in the development area
- r - the discount rate to be used in the calculation of the net present value of future revenues and costs
- n - the forecast period for the assessment of future revenues and costs.

The Tribunal has determined the parameters (discount rate, period of analysis, efficiency factor and phase-in arrangement) of the NPV calculation for each of the four water agencies.

3.2 Future operating profits (losses) – the application issues

The calculation of the component $NPV_r(R_i - C_i)$ requires projections of:

- the take-up rate of lots in the development
- future annual revenues and costs per equivalent tenement (ET) or other appropriate charging criterion (e.g. hectare).

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1 William M. Mercer was engaged by the Tribunal to advise on the implementation issues relating to the developer charges methodology.

Firstly, an assessment is made of operating profits (or losses) for the development area as a whole; and secondly the operating profits (or losses) are translated into a' per lot basis (or other charging criteria e.g. ET or hectare).

The basis for projecting costs and revenues are set out in sections 7 and 8 of the Guidelines. However, the Guidelines do not provide a detailed description of the approach to be adopted in expressing the operating profits (losses) on a per lot basis.

In the implementation process, all water agencies have followed the same approach in calculating the assessment of operating profits (or losses) for the development area as a whole. They calculate the net present value of the cumulative operating profits (or losses) attributable to a particular development area over a 30 year period. However, in translating the NPV of the cumulative operating offset (for the development area as a whole) into a per lot basis, different approaches have been adopted:

- some have divided the NPV simply by the *total number* of lots released within the development area
- others have divided the NPV by the *present value* of the lots to be released, taking account of the timing of lot releases.

Both approaches give a flat operating offset per lot over time. When (R-C) is positive, the second approach gives a higher operating profit offset, resulting in a lower developer charge. Alternatively, if (R-C) is negative, the second approach gives a higher operating loss adjustment resulting in a higher developer charge.

The Tribunal engaged an independent actuary to advise on the matter. The actuary's comments are encapsulated in the following section.

3.3 Analysis of alternative method

When a lot within a development area is released, the water agency will generate a profit (or a loss) in each of the future years. The determination restricts the years over which the water agency's profits can be taken into account to 30 years from the date of the first lot release for that development.

The consultant's analysis concluded that dividing the net present value of cumulative operating profits (losses) over the 30 years simply by the total number of lots within the development (ie no discounting of lots) gives a distorted result. However, dividing the net present value of cumulative operating profits (losses) by the total number of *discounted lots* results in the desired result of an operating offset amount that is consistent with the number of lots released in the specific year. Although "discounting of lots" is not an easily explained concept, it is an acceptable method and was confirmed by the consultant to be mathematically accurate.

The basic formula is therefore:

$$\text{Operating Offset Per Lot (Y)} = \frac{\text{Total NPV of cumulative profits (losses)}}{\text{Total PV of lots}}$$

The following illustration uses the simplifying assumption of a constant profit of (R-C) per annum per lot in real terms to show the derivation of the formula.

Let NPV = net present value at time 0 of operating profits (losses) in development area for all future years
(R-C) = operating profit (loss) per lot
x^i = number of lots released in year i
x^{ic} = cumulative lot production up to and including year i
r = discount rate
and Y = a constant amount to be offset for each lot which, when discounted, equals NPV as defined above

Then

$$NPV = \frac{x^{1c}(R-C)}{(1+r)} + \frac{x^{2c}(R-C)}{(1+r)^2} + \ldots\ldots\ldots\ldots + \frac{(R-C)}{(1+r)^{30}} \quad \ldots\ldots(1)$$

As well, the value of Y times the lots released each year, discounted to present value, must also equal NPV.

ie
$$NPV = \frac{x^1 Y}{1+r} + \frac{x^2 Y}{(1+r)^2} + \ldots\ldots\ldots\ldots + \frac{x^{30} Y}{(1+r)^{30}}$$

$$= Y\left[\frac{x^1}{(1+r)} + \frac{x^2}{(1+r)^2} + \ldots\ldots\ldots\ldots + \frac{x^{30}}{(1+r)^{30}}\right] \quad \ldots\ldots(2)$$

Rearranging (2):

$$Y = \frac{NPV}{\frac{x^1}{(1+r)} + \frac{x^2}{(1+r)^2} + \ldots\ldots\ldots\ldots + \frac{x^{30}}{(1+r)^{30}}} \quad \ldots\ldots(3)$$

Substituting (1) in (3):

$$Y = \frac{\frac{x^{1c}(R-C)}{(1+r)} + \frac{x^{2c}(R-C)}{(1+r)^2} + \ldots\ldots\ldots\ldots + \frac{(R-C)}{(1+r)^{30}}}{\frac{x^1}{(1+r)} + \frac{x^2}{(1+r)^2} + \ldots\ldots\ldots\ldots + \frac{x^{30}}{(1+r)^{30}}}$$

ie
$$\text{Operating Offset Per Lot (Y)} = \frac{\text{Total of NPV of cumulative profits (losses)}}{\text{Total of PV of lots}}$$

4. Guidelines on the Procedures Used in calculating $NPV_r(R_i-C_i)$

The procedures using the "discounting of lots" for purposes of calculating the net present value of operating profit (or losses) are set out below:

1. Set out the lot release schedule for a particular development
2. Discount these lot numbers to the start of the development project and add the discounted figures to obtain a total (present value of lots)
3. Calculate the operating profits (or losses) on the lots for 30 years from the start of the project ie the cumulative number of lots x Profit (or loss) per lot for the year
4. Discount to the start of the development period the total profit (or loss) on the cumulative number of lots developed in each of the 30 years. The sum of these amounts is the' net present value of operating profit for a particular development over 30 years.
5. Divide the total amount obtained in (4) by the present value of the number of lots as calculated in (2).
6. The offset to apply against the capital component (K) is the figure obtained in 5.

A numerical example is shown below.

Assumptions: Development: 500 lots in the first five years
Operating profits: $100 per lot per annum
Discount rate: 9% (real)

Period	Discount factor	Lot release *(Step 1)*	Discounted lot release *(Step 2)*	Cumulative lot release	Cumulative operating profit (loss) *(Step 3)*	Present value of operating profit. (loss) *(Step 4)*
1	0.917431	150	137.61	150	15,000	13,761
2	0.841680	100	84.17	250	25,000	21,042
3	0.772183	100	77.22	350	35,000	27,026
4	0.708425	100	70.84	450	45,000	31,879
5	0.649931	50	32.50	500	50,000	32,497
6	OS96267	0	.	500	50,000	29,013
7	0.547034	0		500	50,000	27,352
a	0.501866	0		500	50,000	25,093
9	0.460428	0	.	500	50,000	23,021
10	0.422411	0		500	50,000	21,121
11	0.387533	0	.	500	50,000	19,377
12	0.355535	0		500	50,000	17,777
13	0.326179	0		500	50,000	16,309
14	0.299246	0	.	500	50,000	14,962
15	0.274538	0	.	500	50,000	13,727
16	0.251870	0	.	500	50,000	12,593
17	0.231073	0	.	500	50,000	11,554
I a	0.211994	0		500	50,000	10,600
19	0.194490	0	.	500	50,000	97.24
20	0.178431	0	.	500	50,000	89.22
21	0.163698	0	.	500	50,000	81,85
22	0.150182	0	.	500	50,000	7,509
23	0.137781	0		500	50,000	6,889
24	0.126405	0		500	50,000	6,320
25	0.115968	0	.	500	50,000	5,798
26	0.106393	0		500	50,000	5,320
27	0.097608	0		500	50,000	4,880
28	0.089548	0	.	500	50,000	4,477
29	0.082155	0		500	50,000	4,108
30	0.075371	0		500	50,000	3,769
Total	**10.27365**	500	402.34		**1,420,000**	445,406

(Step 5)

Calculation of operating profit (loss) per lot (Y)

$$Y = \frac{\text{NPV of operating profits (losses) for development}}{\text{Total discounted lot release}}$$

$$= \frac{445{,}406}{402.34}$$

$$= \$1107.04$$

Check Ensure that the value for Y gives the correct present value of the operating profit (loss) for the development:

Period	tot release	Operating profit (loss) per lot (Y)	Operating profit (loss) per period	Discount factor	PV of operating profit (loss)
1	150	1107.04	166,056	0.97 7431	152,345
2	too	1107.04	110,704	0.841680	93,177
3	100	1107.04	110,704	0.772183	85,484'
4	100	1107.04	110,704	0.708425	78,425
5	50	1 t 07.04	55,352	0.649931	35,975
Total					445,406

5. Pricing implications

Where a water agency has adopted a calculation method that varies from the approach or the procedures set out in section 4, it will be necessary to re-calculate the developer charges. Appropriate actions. will be required to rectify this application issue. This may involve amendment of developer charges currently provided in the approved and/or draft development servicing plans.

6. Further information and inquires

For further information and inquiries on this supplementary note, please contact Con Read on (02) 9290 8436 or Elsie Choy (02) 9290 8488.

Thomas G Parry
Chairman
15 July 1997