Appendix 10

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Vision Statement Control System Upgrade
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Vision Statement
Control System Upgrade
Gladstone Area Water Board

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Definitions and Terms

The following acronyms are used within this document:

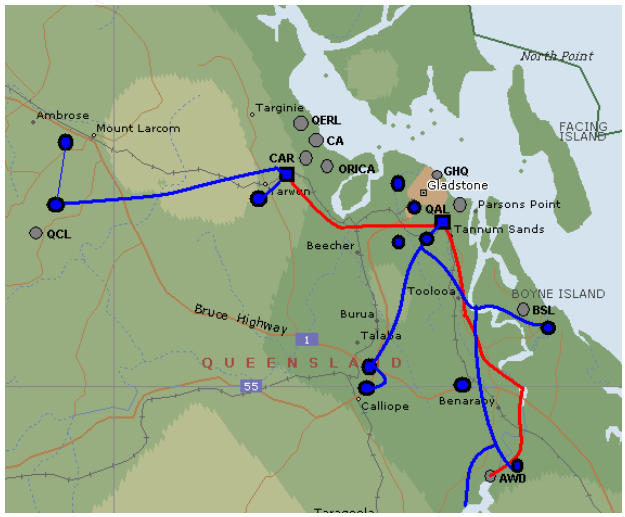
- AWD - Awoonga Dam
- CSC - Calliope Shire Council
- E&I - Electrical and Instrumentation
- FAT - Factory Acceptance Test
- FEP - Front End Processor (synonymous with Master Telemetry Unit).
- GAWB - Gladstone Area Water Board
- GCC - Gladstone City Council
- GHQ - GAWB Headquarters
- GWTP - Gladstone Water Treatment Plant
- HMI - Human Machine Interface
- IS - Information Systems
- IT - Information Technology
- MIS - Management Information Systems
- MTU - Master Radio Telemetry Unit (sometimes known as an FEP)
- PLC - Programmable Logic Controller
- PTP - Point to Point
- PTMP - Point to Multi-Point
- RTU - Radio Telemetry Unit
- SCADA - Supervisory Control and Data Acquisition
- SLMP - System Leakage Management Plan
- SOW - Scope of Work
- SQL - Structured Query Language
- VLAN - Virtual Local Area Network
- VPN - Virtual Private Network
- WBS - Work Breakdown Structure
- WNMS - Water Network Management System
- WTP - Water Treatment Plant
- YWTP - Yarwun Water Treatment Plant

The following terms are used within this document:

- Intellectual property - The ownership and control of knowledge within a system including, but not limited to, access, distribution and use
- Life-cycle cost - The total cost of an asset over the term of its useful life. This will encompass all tangible costs to the operation from installation through to decommissioning.
- Redundancy - The ability of a system to tolerate failure. There are many types of redundancy, which primarily express the time to recover from a failure.
- Scalability - The ability of a system to retain the original system performance characteristics while being expanded to accommodate new facilities. This can be expressed in terms of system scale and functionality.

Executive summary

Gladstone Area Water Board (GAWB) operates a water distribution network, supplying raw and treated water to industrial, commercial and domestic consumers located within the environs of Gladstone, Queensland.



This managed water resource is essential to the viability of the Gladstone region, both domestically and commercially.

Connell Wagner has been engaged to assess and scope the system requirements for GAWB monitoring, communication and control facilities.

This Vision Statement describes the high level plan to provide the replacement system, with provision for present and future operational needs as documented below.

The present Telemetry systems are predominantly owned by other parties, or consists of obsolete equipment. As such, a significant investment is required by GAWB to procure a replacement system.

Having reviewed the operational requirements with GAWB, it was determined that the basic functionality required is greater than currently provided.

To support current operational requirements, a greater data throughput is required, which exceeds the capacity provided by the present Telemetry systems.

Data analysis and reporting are required to provide strategic information to allow GAWB to manage their operation. This includes asset performance, leak detection (SLMP) and customer billing data. To achieve this, an open, integrated SCADA system is required to provide a fully auditable trail from sensor through to historical data storage. The present Telemetry systems do not provide a commercial off-the-shelf solution for this requirement.

The present Telemetry systems do not provide appropriate security measures to ensure critical infrastructure protection of the GAWB operation. To achieve an appropriate level of security, digital keyed cryptographic technologies are required to control the transmission of data.

The present SCADA and Telemetry systems are not able to operate as an integrated system. To achieve a single consistent management tool, GAWB require the SCADA and Telemetry systems to be integrated and able to expand to include future facilities, such as the Fitzroy pipeline project.

A comparison between a prior vendor proposed solution and the scope of works currently identified as part of Connell Wagner's investigation, has been included in this report. Refer to Appendix D.

The scope of this engagement as detailed in the GAWB Scope of Work document OP2008-007-SC001, sets out the following ultimate project objectives:

- Installation of (new) flow meters at all main customer connections and throughout the water distribution network to support the System Leakage Management Plan (SLMP)
- Installation of (new) radio telemetry to all electro-magnetic flow meters to report back to the central control room, including remote monitoring of treated water quality parameters and control of remote disinfection equipment, where required
- Replacement of existing remote Radio Telemetry Units (RTU) and Front End-Processors (FEP) with current model equipment

- Obtain a new operating frequency and licences to allow the separation of GAWB's radio-telemetry system including back-up telemetry system, from that of Gladstone City Council (GCC). Assist GCC plan relocation of radio telemetry from Gladstone Water Treatment Plant (GWTP).
- Extend telemetry and Citect Supervisory Control and Data Acquisition (SCADA) systems to GAWB's head office
- Provide remote access to the SCADA system at the GWTP to permit after hours fault diagnosis and control for selected staff and maintenance technicians
- Store historical and flow meter data in an industry standard Structured Query Language (SQL) database on an existing SQL server

Following discussion with GAWB operation, maintenance and information system stakeholders, additional ultimate project objectives were identified:

- Provision of a Total (ie Integrated) Solution
- GAWB ownership of assets and Intellectual Property
- Provision of finished operation and maintenance documentation
- System scalability to allow expansion to incorporate future projects

This review also considered the following fundamental objectives:

- Operational integrity
- Systems security
- Systems scalability
- Systems maintainability
- The ability to retain system intellectual property
- System life-cycle costs

Key objectives

In summary, the key GAWB objectives of this Vision are:

i) Operational Independence – Provision of systems necessary for GAWB to independently manage their Water Network.

ii) Operational Security – Identification of the (risk based) system requirements necessary to provide critical infrastructure integrity and security.

iii) SLMP – Provision of management facilities necessary for GAWB to implement their System Leakage Management Plan.

Recommendations

The following recommendations are described in terms of the key objective addressed in each case:

No.	Recommendation	Objectives Addressed
1	New radio telemetry system	Operational Independence – allows GAWB total control of key assets
2	New water Network Management System	Operational Independence – improved business management information flow
3	Risk analysis	Operational Security – provides detailed requirements for security in the form of actions tied to risks
4	Consolidate and unify critical systems	Operational Security – provides improved system reliability
5	Decentralise through remote access	Operational Security – provides redundancy and operational flexibility, reducing location dependence
6	New Management Information System	SLMP – provides connectivity to enable full and complete analysis of operational objectives Operational Independence – provide performance benchmarking
7	Implement "store and forward" functionality at local telemetry stations	SLMP – improve telemetry connectivity to allow for the required greater data capacity
8	Implement time synchronisation across the Wireless Network and Mobile System (WNMS)	SLMP – provide accurate time reference for coordinated data

Implementation phasing and budgetary cost

The estimated budgetary cost required to achieve Base System implementation is AUD$ via five completion phases, with cost breakdown as follows:

Phase		Description	Explanation	Budget
1	Analyse	Preliminary Analysis and Project Strategy	The current phase, which will establish the scope and a budgetary estimate to ± 30%	$130,000
2	Select	Conceptual Design and Execution Strategy	Initial conceptual design phase	$65,000
3	Approve	Preliminary Engineering and Project Final Approval	Engineering required to establish detailed estimates ± 15%	$36,000
4	Execute	Engineer, Construct and Commission	Project detailed engineering and implementation, including procurement, construction, installation and commissioning	$3,015,000
5	Operate	Handover and support	Finalisation and close-out of the project	$41,000
Total				$3,288,000

Budgetary costs include a + 30% contingency allowance, commensurate with this early project phase.

Critical risks

The following critical risks have been identified in conducting the project. These risks will require a management plan.

- Accidental loss of control of Awoonga Pump Station
- Accidental loss of control of Treated Water Pump Stations
- Accidental loss of power at GWTP
- Accidental loss of power at YWTP
- Accidental loss of power at GAWB Headquarters (GHQ)

A risk management plan will be developed during Phase 2 of the project, which will assess and treat each of these operational risks.

1. Introduction

1.1 Document purpose

This Vision Statement defines the system requirements and context of a Control System Upgrade for GAWB. The intent of this statement is to present a common vision of the target system to align all interested parties, both internal and external, that will be involved with this project.

This document is aimed at application operational, engineering and commercial users to ensure that all business and operational needs are accurately captured.

Detail of the actual products and engineering solutions to these user requirements is not dealt with in this document.

1.2 References and applicable documents

This section contains all documentation that is either referenced or applicable to this Vision Statement.

No.	Identification	Description	Rev.	Publish Date	Publish Agency
1	OP2008-007-SC001	Control Systems Upgrade Scope of Work	B	Jul-07	GAWB
2	-	Generic SCADA Risk Management Framework	2	Dec-06	TISN

2. Background

Various control, monitoring and communications systems are currently in use throughout GAWB and some these systems are ageing and in need of replacement.

In November 2006, GAWB reviewed its current control, monitoring and communications systems, including flow metering installations. This review assessed GAWB's existing systems, as well as the requirements to implement an instantaneous flow metering system. It included a review of currently available technologies and industry best practice, to enable a strategy to be developed for the upgrade and replacement of these systems.

Additionally, GAWB and GCC share the same radio telemetry system, including radio frequencies and hardware. Separation of GAWB's radio telemetry from GCC's is considered a necessary strategic goal with anticipated benefits to both GAWB and GCC.

Refer also to Appendix A – Existing system architecture.

A Gap Analysis assessing the existing telemetry system with the requirements identified as part of this investigation, is included in Appendix C.

2.1 Existing systems

2.1.1 Management Information Systems (MIS)

Currently, management information is handled via manual data entry, with some discrete data gathering and analysis for operational and engineering benefit.

2.1.2 Control, alarm and monitoring systems

Two systems are used for control, alarm and monitoring.

Firstly, Programmable Logic Controllers connected with Human Machine Interface (HMI) systems. These systems are used at Awoonga Dam and the Gladstone Water Treatment Plant for control of local equipment, and to provide an operator interface. The HMI system records data and displays information and alarms to operators locally.

Secondly, a separate radio telemetry HMI system collects alarm and control data from remote sites via radio signals. Control functions at remote sites are provided by small Programmable Logic Controllers connected to radio telemetry units. The operator interface for this system is also located at the Gladstone Water Treatment Plant. This system similarly records data and displays information and alarms to operators at the treatment plant. In addition, control functions are performed by the telemetry HMI computer. Selected signals are monitored from remote telemetry sites. These signals trigger requests to be sent to other remote sites for control. Typically, water reservoir levels trigger supply pumps to start and stop. The telemetry computer is operating as a Master Telemetry Unit, this is also known as a Front End Processor in material supplied by the vendor.

The HMI system at the Gladstone Water Treatment Plant and the HMI at Awoonga Dam are owned by GAWB. The telemetry HMI is owned by others.

2.1.3 Communication and telemetry systems

A radio telemetry system is used to monitor reservoirs and pump stations throughout Gladstone and surrounding areas.

A separate (Cello) data logging system is used to monitor selected flow meters to gather data for engineering design purposes.

GAWB and GCC have a combined radio telemetry monitoring system. This system has 107 remote telemetry stations monitored at the Gladstone Water Treatment Plant. Of these stations, 27 sites are of key interest to GAWB existing operations. Twenty telemetry stations within the system are owned by GAWB, with the remaining sites owned by others. Of the stations owned by GAWB, five telemetry units are current technology vendor equipment. The remaining units are obsolete but still in service.

Functions performed by the telemetry system include:

- Transfer of reservoir level signals to start and stop water supply pumps remotely
- Reservoir level indication and alarming
- Pump station indication, control and alarming
- Other indications and alarming
- Flow detection

The telemetry system conveys data to and from remote field locations via radio signals back to a central monitoring facility located at the Gladstone Water Treatment Plant. All radio signals are sent via the Mt Biondello radio repeater. This system operates on the VHF radio band.

GAWB do not own the radio repeater equipment or facility at Mt Biondello.

Planned expansions of this system to accommodate flow metering sites will require approximately 20 additional sites to be monitored by GAWB. The number of telemetry sites required to implement the existing control scheme along with additional flow metering sites is estimated at more than 50 telemetry units.

Seven sites, owned by others, are of interest to GAWB operations. These seven sites will require GAWB owned telemetry units and interface development. These sites are Round Hill, Radar Hill, Ferris Hill, Fisher Street, and Mt Elizabeth Reservoirs as well as a monitoring unit at Mt Biondello.

2.1.4 Local control systems

- Separate PLC control systems at the Gladstone Water Treatment Plant and the Awoonga Dam Pump Station, each using stand-alone Citect SCADA systems

2.1.5 Operational systems

The existing GAWB operation is comprised of:

- Awoonga Dam and pump station
- Raw water distribution systems
- Raw water reservoirs and pump stations
- Gladstone Water Treatment Plant
- Yarwun Water Treatment Plant
- Treated water distribution systems
- Treated water reservoirs and pump stations

3. Change proposal

The aim of this project is to provide an operational facility that allows GAWB to independently manage its Water Distribution Network in a functional and secure environment, with a scalable system allowing for future operational sources, consumers and facilities.

3.1 Scope

The scope of the proposed change includes facilities to manage bulk water movements and system loss, billing, data historian and security, and the following:

- Management of bulk water movements
- Management of system loss
- Billing system access to metered data
- Reservoir - Pump control
- Remote Alarm Management
- Interfacing to PLC equipment
- Consolidation and unification of SCADA layer systems
- Secure communication systems
- Time Synchronisation
- Unpowered (solar) local sites

The scope of this proposal considers the following GAWB water sources:

- Awoonga Dam (AWD)
- Fitzroy River Project (future)
- Awoonga River height gauges

The scope of this proposal encompasses the following GAWB water distribution facilities:

- GAWB Headquarters (GHQ)
- Awoonga Pump Station
- Toolooa Reservoir
- Gladstone 50 ML
- Gladstone 16 ML
- Gladstone Water Treatment Plant (GWTP)
- Yarwun Water Treatment Plant (YWTP)
- Calliope Pump Station
- Benaraby Pump Station
- Boat Creek Pump Station
- GCC Reservoir
- Round Hill Reservoir
- Boyne Reservoir
- Mt Elizabeth Reservoir
- Wurdong Reservoir
- Goolegumma Reservoir
- Mt Miller Reservoir
- East End Reservoir

The scope of this proposal encompasses the following major water customers:

Raw Water

- Queensland Alumina 600 mm
- Queensland Alumina 375 mm
- Boyne Smelters Limited
- CS Energy (Awoonga PS bridge)
- Transpacific
- QER
- Cement Australia Fire Fighting
- Cement Australia Fishermans Landing
- Central Queensland Ports Authority (Serrant Road)
- Rio Tinto Australia, Yarwun Refinery 500 mm
- Rio Tinto Australia, Yarwun Refinery 200 mm
- Central Queensland Ports Authority Standpipe (Wiggins Island)
- Orica Ammonia Terminal (Serrant Road)
- Rio Tinto Australia, Yarwun 50 mm Wharf (Serrant Road)
- Rio Tinto Australia, Yarwun Transfer Tower No. 2
- Orica
- Central Queensland Ports Authority (Calliope River)

Treated Water:

- Gladstone City Council (Various)
- Calliope Shire Council - Benaraby Township
- Calliope Shire Council - Mt Larcom
- Calliope Shire Council - Boyne Island and Tannum Sands
- Queensland Alumina
- Boyne Smelters Limited
- Cement Australia Fishermans Landing
- Rio Tinto Australia, Yarwun Refinery
- Orica
- Rio Tinto Australia, Yarwun Residue Management Area
- Rio Tinto Australia, Yarwun
- Alinta
- QLD Rail

3.2 Key system requirements

3.2.1 Collection of requirements

Requirements were initially gathered through interview and discussion with GAWB operation, maintenance and engineering representatives as well as research with a wide variety of vendors and suppliers equipment to the water distribution networks.

3.2.2 Validation of requirements

Raw requirements were validated, however review and validation of these requirements within the GAWB operation is still required.

3.2.3 Prioritisation of requirements

Priority	Description
Must Have (Must)	• Critical to short term operational integrity • Immediate Requirement • Not meeting will have significant negative implications that can be quantified from an operational or business perspective • The system will be unacceptable unless provided • Must be justified
Need to Have (Need)	• Critical to long term success • Strategic long-term requirement • Not meeting will have significant negative implications that can be quantified from an operational or business perspective • The system will be sub-optimal unless provided in the long term • The system may be delivered without meeting this requirement in the short term • The system must be designed to allow incorporation of this requirement in future releases
Like to Have (Like)	• Will add usability and “bells and whistles” • The system may be delivered without meeting this requirement

3.2.4 System architecture

The system architecture for GAWB Water Network Management System consists of four layers. These layers are described as follows:

No.	Layer	Description
1	Instrumentation	Local sensing and actuation devices
2	SCADA	Local HMI, PLCs, radio telemetry and data concentration
3	Management Information System (MIS)	Long term data storage and analysis
4	Corporate	Corporate IT systems

Appendix B describes the proposed system architecture.

The proposed system architecture takes account of the key system requirements and provides a unified system model.

3.2.5 Key system design criteria

The GAWB Water Network Management System shall be designed to address the following key criteria:

Item	Requirement	Priority	Measure	Why Required?
1	Design Life	Must	20 years	Operational Integrity
2	Data Access	Must	Access to operational information will not be limited by location	Operational Integrity
3	Loss Metering	Must	Loss accounting through segmented (metered) accounting of the GAWB Water Network	Meet the requirements of the GAWB System Leakage Management Plan
4	Time Synchronisation	Must	Synchronisation of system time references to relate time sensitive information across all sites in a predictable manner	1. Periodic Loss Accounting 2. Periodic Billing 3. Audit ability
5	Store and Forward Interface	Must	Data buffering at the RTU	1. Communication failure tolerance 2. Data integrity
6	Communication Status	Must	Status indication of connectivity between central and remote sites	1. Operational Integrity 2. Maintainability
7	VPN Network	Must	Encrypted network technique, allowing secure network “tunnelling” through a public network (ie the internet)	1. Limits access to system connections 2. Limits remote user access to network
8	VLAN Network	Must	A network technique, allowing multiple unrelated networks to be partitioned on a single (physical) network (ie Telephone, CCTV, Corporate, SCADA, etc)	1. Segregation of different operational network layers (ie corporate, SCADA, etc) within the same physical network 2. Separation of network traffic to avoid loading on one network impacting other networks
9	Alerts and Notification	Must	Alert of critical conditions requiring immediate action	1. Loss Management 2. Supply Integrity
10	Analysis Package	Must	User tool to complete ad-hoc data analysis	1. Loss Management 2. Equipment Performance 3. Complex Alerting
11	External Interfaces	Must	Interfaces to a wide variety of equipment packages	1. Operational Scalability 2. Operational Flexibility
12	Billing Interface	Need	Transfer of measured periodic volumetric water delivery by water consumer	Transfer of measured periodic volumetric water delivery by water consumer

Item	Requirement	Priority	Measure	Why Required?
13	Master Time Service	Need	Interface to a single external time reference	Single time reference for time synchronisation
14	Data Concentration	Need	Concentration of data from remote telemetry sites	1. Reduces data congestion in slower radio communications 2. Maintains data visibility and reduces communication overhead within the faster communications systems
15	Interface Data Buffering	Need	Buffering of data and events at the SCADA System	1. Communication failure tolerance 2. Data integrity

3.2.6 Base system

The base system is described by the need to implement a backbone system. This system will provide the required functionality and performance, as well as allow an expansion platform to allow expansion of both scale and integrity to meet future operation needs.

The proposed base system comprises the following components:

Item	Function	Format	Layer	Location					Scope
				GHQ	AWD	GWTP	YWTP	Remote	
1	Remote Client	Internet Browser	4						Existing
2	Loss Management Client	Internet Browser	4						Existing
3	Billing System	-	4						Existing
4	VLAN Systems	Network	2/3/4						Project
5	VPN Systems	Network	3/4						Project
6	Master Time Service	External	3						Project
7	Billing Data Interface	TBA	3						Project
8	Web Server	MIS	3						Project
9	Historical Data Storage	MIS	3						Project
10	Analysis Package (Loss Management)	MIS	3						Project
10	Alarm and Email Alerts	MIS	3						Project
11	Audit Logs	MIS	3						Project
12	Field Data (Concentrator) Interface	MIS	2						Project
13	Field Data Buffering	MIS	2						Project
14	SCADA Server	SCADA	2						Project
15	Operational HMI	SCADA	2/3						Project
16	SCADA (Local Control) Interface	PLC	2						Project
17	Local Control	PLC/Relay	2						Existing
18	SCADA (Telemetry Control) Interface	Telemetry	2						Project
19	Telemetry Control	Telemetry	2						Project
20	SCADA (Metering Data) Interface	Telemetry	2						Project
21	Metering Data Store and Forward	Telemetry	1/2						Project
22	Communication Statistics	Telemetry	2						Project
23	Communication Status	Telemetry	2						Project
24	Communication Event Log	Telemetry	2						Project
25	SCADA Metering Parameter Change Log	Metering	1/2						Project
26	Metering Parameter Change Event	Metering	1/2						Project

3.2.7 Expanded system

The expanded system is described by the optional features that would provide the required functionality and performance for the expanded system, nominally an order of magnitude larger than the base system (ie x10).

The proposed expanded system comprises the following components:

Item	Function	Format	Layer	Location					Scope
				GHQ	AWD	GWTP	YWTP	Remote	
1	Billing Data Interface	MIS Redundancy	3	■					Project
2	Web Server	MIS Redundancy	3	■		■			Project
3	Report Service	MIS	3	■		■			Project
4	Historical Data Storage	MIS Redundancy	3	■		■			Project
5	Alarm and Email Alerts	MIS Redundancy	3	■		■			Project
6	Audit Logs	MIS Redundancy	3	■		■			Project
7	SMS Alerts	MIS	3	■		■			Project
8	SCADA Server	Redundancy	2	■		■			Project
9	Telemetry	Redundancy	2		■	■			Project
10	Interface to New Water Source Systems	SCADA	2		■	■	■	■	Project
11	New Water Sources	Telemetry	1/2					■	Project
12	Interface to New Consumers	SCADA	2		■	■	■	■	Project
13	New Water Consumers	Telemetry	1/2					■	Project

3.3 Key strategic drivers

The implementation of GAWB Control System Upgrade is required to meet a number of key drivers to achieve a sustainable, cost effective system.

3.3.1 GAWB control of core systems

To maintain effective command and control of the GAWB Water Network Management System, GAWB must occupy the system superintendent position. A strategy must be developed to manage the system during and after upgrade activities. The strategy must include a change control mechanism.

3.3.2 Promotion of competition

A healthy level of competition must be engendered to provide immunity to the fates of individual suppliers. To achieve this level of competition, the system must be able to incorporate a number of different (prequalified) products in similar (non-core) functional roles.

3.3.3 Ongoing support

The ability to provide ongoing external support to the operation, via a healthy relationship program that engenders timely and high quality delivery of service.

3.4 System objectives

When reviewing the system requirements, consideration was given to achieving a complete solution within the context of a number of key objectives.

It is important to note at this point that to achieve an appropriate life-cycle cost for any system the components must be off-the-shelf, be fully developed, have clear separation between the system and configuration layers and have the ability to easily integrate with other systems.

A Gap Analysis has been performed to evaluate the existing telemetry system equipment with the system objectives. Please also refer to Appendix C – Requirements Gap Analysis.

Selection of the end system components would be based on demonstration of the following key objectives.

3.4.1 Operational integrity

Operational integrity, in this context, relates to the ability of the operational systems to support operational needs and demands. This would include:

i) Avoidance of a single point of failure tolerance for critical (backbone) systems.
ii) Clear and timely remote annunciation of critical alarms (including an escalation process).
iii) Data integrity through to auditable systems.

3.4.2 System security

System security, in this context, relates to the recommendations for Critical Infrastructure Protection of the IT Security Expert Group (ITSEAG), relating to:

i) Denial of Service/Distributed Denial of Service.
ii) General SCADA Risk Management.
iii) Enterprise Security.

3.4.3 System scalability

System scalability, in this context, relates to the ability of operational equipment to physically and functionally expand and be able to adapt to incorporate future operational demands. This may include consideration for:

i) Expansion of existing operational equipment.
ii) Increase in statutory/reporting requirements.
iii) Opportunistic improvements.
iv) Municipal mergers.
v) Interfacing to new package systems.
vi) Interfacing to third parties.

3.4.4 System maintainability

System maintainability, in this context, relates to the ability of GAWB maintenance personnel to:

i) Access equipment, remotely and locally.
ii) Manage planned system change.
iii) Repair and rectify system faults in a timely manner.
iv) Access system support in the local region.

3.4.5 Intellectual property

Intellectual property, in this context, relates to the ability of GAWB to retain and control access to information that is operationally and/or commercially sensitive. This may include:

i) Equipment location and structure.
ii) Protocols, codes and passwords.
iii) Billing and loss data.

iv) Operational events.

3.4.6 System life-cycle costs

Life-cycle cost, in this context, long term cost of ownership associated with a system, which may be influenced by the following factors:

i) Capital cost associated with initial implementation.
ii) The number of discrete systems.
iii) Configuration complexity.
iv) Configuration structure (ie use of configuration and coding standards).
v) Ongoing support costs.
vi) Online and expansion capacity.
vii) Escalation of license costs though system expansion.

3.5 System location

System locations within the GAWB Water Network Management System are described as follows:

Layer		Equipment Physical Location
1	Instrumentation	Various remote and town locations, including: • Reservoir monitoring • Water quality monitoring • Pump control and monitoring • Flow metering equipment monitoring • Power monitoring • System equipment and communication monitoring
2	SCADA	Awoonga Pump Station Gladstone WTP Yarwun WTP
3	MIS	GAWB Head Office (Expanded) Gladstone WTP
4	Corporate	GAWB Head Office Gladstone WTP

3.6 Proposed manning

This section outlines the proposed personnel allocation for GAWB facilities.

The primary location for the GAWB operation is the Gladstone Water Treatment Plant. This facility is manned on a 24 hour basis and will be the central coordination facility, providing:

- Voice (radio) communication
- Visibility of all operational sites
- The primary control desk
- Secure system power facilities
- Secure corporate and control network facilities
- Emergency response facilities

The secondary location for the GAWB operation is the GAWB Corporate headquarters. This facility is manned on an office hour's basis and will accommodate:

- Operational backup facilities
- Visibility of all operational sites
- An alternate control desk location

While the centralised control model is in place, the nature of the GAWB Water Network requires that the operation be mobile and that operational information be accessible from any location. The control model shall also include distributed access for supervisory operation, maintenance and management.

This is particularly apparent as the water network expands into remote areas, where monitoring of operational vehicle location and status may form part of the operational safety case when travelling to remote locations.

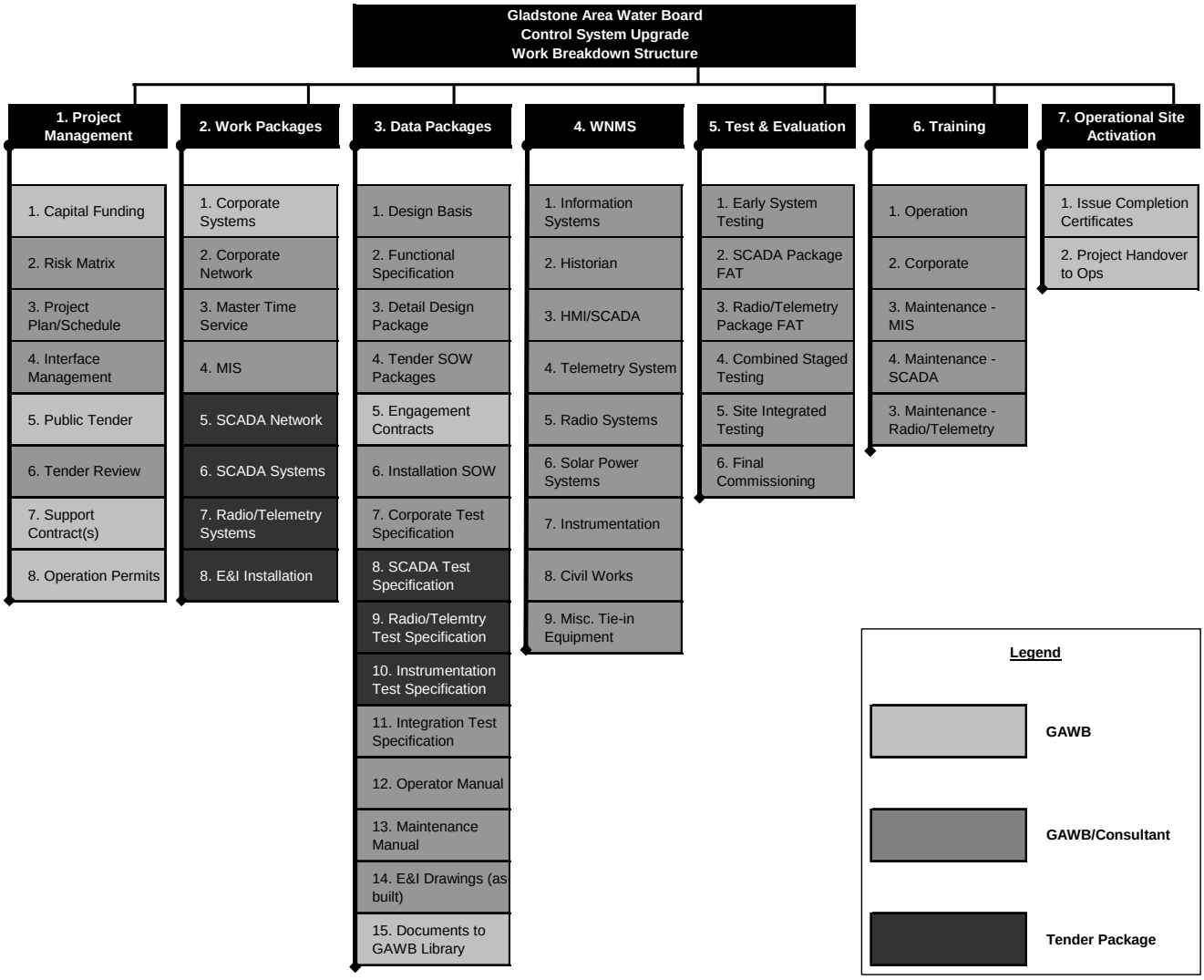
4. Implementation plan

The implementation of change with GAWB and its critical systems requires the coordination of engineering design and execution across many parties.

At this early stage, a rudimentary Implementation Plan has been formulated in very broad terms. It is anticipated that this would form the basis for a detailed implementation plan during the detail design phase.

4.1 Work breakdown structure

A work breakdown structure has been formulated to indicate work activities and the parties tasked with leading that activity. As such, due consideration is required in the subsequent project phases to these activities. The following WBS describes the GAWB Control System Upgrade:



4.2 Budgetary cost

The estimated budgetary cost required to achieve Base System implementation is AUD via five completion phases, with cost breakdown as follows:

Description	Budget
Phase 1 – Preliminary Analysis and Project Strategy (Current Phase)	$130,000
Phase 2 – Conceptual Design and Execution Strategy	$65,000
Phase 3 – Preliminary Engineering and Project Final Approval	$36,000
Phase 4 – Detail Engineering, Construction and Commissioning	$3,015,000
Phase 5 – Handover and Support	$41,000
Total	$3,288,000

Budgetary costs include direct internal GAWB costs, external costs and a + 30% contingency allowance.

4.3 Timing

The stages of implementation for this project are yet to be defined. However, GAWB has indicated that the implementation of sufficient works to achieve functionality of the SLMP is to follow the milestones below:

- Capital Approval — Fourth quarter 2007
- Practical Completion — Second quarter 2008
- Project Completion — Second quarter 2008

Although there is a risk of accidental shutdown of water supply to GAWB, all planned shutdowns to complete these modifications will be indicated in the project schedule.

4.4 Key project measures

The key measures for project success, in order, are:

- Zero lost time injuries
- Implementation practically complete by second quarter 2008
- Capital cost being under or on planned cost
- Demonstrable achievement of functional requirements

5. Justification

Currently GAWB owns the local control facilities at the Gladstone Water Treatment Plant, however the radio telemetry part of the HMI facilities are owned by others.

As such, to achieve the stated objective of operational independence, GAWB must provide as a minimum:

- A new radio system
- A new telemetry system
- Migration of HMI facilities

To achieve operational independence into the future, security, scalability and performance are required to support the GAWB operation.

With the further stated objective of securing critical infrastructure, this further drives the requirements away from the technologies currently in use.

The requirement to implement the GAWB System Leakage Management Plan requires that a new management system be provided to allow the operation to meet near term and long term objectives. This will be a new system that extends from the instrumentation layer through to the corporate layer.

Due to the resulting increase in information flow through all system layers, the operation must select systems that support the integrity of the WNMS. This requires greater degree of pre-processing and buffering at local sites, a higher data throughput across communication systems and an increased data storage requirement.

As such, to achieve the stated objective of implementing the SLMP, GAWB must provide as a minimum:

- A new Management Information System to provide storage and analysis facilities
- A radio/telemetry system that will support the level of data throughput
- Upgrade of network systems to support the level of data throughput
- Local data facilities that allow data to be buffered

5.1 Return on investment

One of the key areas of justification of this upgrade is return on investment, which deals with tangible and intangible returns on investment in this upgrade. While this report has sought to qualify the benefits in terms of return on investment, a quantitative analysis has not been completed to assess the actual improvement that could be gained.

Tangible return on investment is achieved through the following means:

- Productivity gains, through long term loss analysis
- Increased revenue, through enhanced billing facilities
- Increased revenue and cost savings, through improved response time to significant losses
- Productivity gains, through operational independence
- Reduced business risk exposure through operational independence

Intangible return on investment is achieved through the following means:

- Support critical business objectives, through system security, integrity and accountability
- Support of reputation, through system security, integrity and accountability
- Enables the business to shift to strategic planning culture

5.2 Whole of life costs

By implementing new systems, there is an opportunity to engage newer technologies and to select products that have a longer useful life span and are mature in their development cycle. This means the technologies will need less maintenance and support in the near term and will have an extended useful operation life prior to obsolescence (ie requiring further upgrade/replacement).

Appendix A

Existing system architecture

	GAWB HQ	Gladstone WTP (Primary Master)	Awoonga Dam (Secondary Master)	Yarwun WTP	Gladstone Repeater	GAWB Telemetry Sites	GAWB/GCC Telemetry Sites
Layer 4 - Corporate	Corporate Billing Systems	Corporate User PC	Corporate User PC				
Layer 3 - MIS							
Layer 2 - SCADA		Client, FEP (MTU), HMI, Control NW, PLC1, PLC2, PLC3	HMI, Control NW, PLC1, PLC2, PLC3, RTU	RTU		RTU: Awoonga Dam (001), Toolooa Booster (002), Fitzsimmons Res. (003), Glad. LL Pump Stn. (004), Glad. HL Pump Stn. (005), GWTP (007), Toolooa Res. (008), Sth. Gald. Res. (013), Boyne Island Res. (017), Goolegumma Res. (018), QAL Flowmeters (019), Wurdong Res. (021), East End Res. (022), Glen Eden Boost Pump Stn. (025), Benaraby Boost Pump Stn. (026), Calliope Boost Pump Stn. (027), Boat Creek Pump Stn. (028), Yarwun WTP (029), Mt. Miller Res. (031), Glad. Hatchery (044), Mt Elizabeth Res. (052), Awoonga Dam STP (104)	RTU: Round Hill Res. (010), Radar Hill Res. (011), Ferris Hill Res. (012), Fisher Hill Res. (015), Repeater Base Mt. Boindello (039); RTU
Layer 1 - Instrumentation							

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REVISIONS							
					DRAWN		18/09/07
					CHECKED		
					DESIGNED		
A	PGB	18/9/07	Internal Review		APPROVED		
No.	ORIG.	DATE	DESCRIPTION		CLIENT		

FILENAME: PRINTED: ORIG. SIZE: A3

Gladstone Area Water Board
Control System Upgrade
Existing Logical SCADA Model

Rev A

Doc. Number
D1458SK02

Appendix B

Proposed system architecture

	GAWB HQ	Gladstone WTP (Primary Master)	Awoonga Dam (Secondary Master)	Yarwun WTP	Gladstone Repeater Site	GAWB Remote Sites x 11	Currently Untelemetered Remote Flow Meter Sites x 7
Layer 4 - Corporate	Corporate Billing Systems	Corporate User PC Internet Browser	Corporate LAN / VLAN				
Layer 3 - MIS	Historian A Web Portal	Historian B Web Portal	SCADA VPN / VLAN				
Layer 2 - SCADA		HMI, Client, Primary, Control Network, MTU, PLC1, PLC2, PLC3	HMI, Backup, Control Network, MTU, PLC1, PLC2, PLC3	HMI, Control Network, RTU	Primary Communication, Backup Communication (Key Sites Only)	RTU, RTU, RTU, RTU	RTU
Layer 1 - Instrumentation		Treatment Plant, Pump Control, Quality Sensors	Dam Levels, Pump Control, Quality Sensors	Treatment Plant, Pump Control, Quality Sensors		Tank Levels, Pump Control, Quality Sensors	Flow Metering

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REVISIONS

No.	ORIG.	DATE	DESCRIPTION
B	PGB	26/9/07	Client Review
A	PGB	12/9/07	Internal Review

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APPROVED		
CLIENT		

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Gladstone Area Water Board
Control System Upgrade
Proposed Logical SCADA Model

Rev B

Doc. Number
D1458SK01

Appendix C

Requirement gap analysis

Component	Requirement	Evaluation 1 Unacceptable/ <---	2	3	4 --> Acceptable	5	Comments
							Evaluation Notes: 1 = Not present, 2 = There but not implemented, 3 = Adequate, 4 = Has extended functionality, 5 = Fully implimented and appropriate for task.
1. Radio Communications Equipment	1 Operational Integrity	1	**2**	3	4	5	Single point of failure with one Repeater. Backup voice system subject to interference. Radio system subject to reduced integrity by concurrent use of incompatible equipment. Radio operating frequencies not owned by GAWB.
	2 System Security	**1**	2	3	4	5	Data transmission not secured, encryption measures by Vendor unknown/ not verified, Keys not held by GAWB. Other parties control passwords and access
	3 System Scalability	**1**	2	3	4	5	System not capable of providing additional throughput required in present configuration
	4 System Maintainability	1	**2**	3	4	5	Local support base available.
	5 Intellectual Property	**1**	2	3	4	5	No remote diagnostics on radios. Problem only noted by loss of station or annual maintenance System designs, limitations and future planning schemes not held by GAWB.
	6 System Life Cycle Costs	**1**	2	3	4	5	Ownership of the field equipment by GAWB is estimated at less than 10% of sites. The remainder of sites are owned by others or obsolete. Radio repeater is a key component to the system and this is owned by others.
2. RTU / PLC Field Device	1 Operational Integrity	1	**2**	3	4	5	
	2 System Security	1	**2**	3	4	5	
	3 System Scalability	1	**2**	3	4	5	
	4 System Maintainability	1	2	**3**	4	5	
	5 Intellectual Property	**1**	2	3	4	5	
	6 System Life Cycle Costs	1	**2**	3	4	5	
3. Telemetry SCADA System	1 Operational Integrity	1	**2**	3	4	5	*Some logging and file history provided, Manual backup, Lacking audit trail of data for integrity.*
	2 System Security	1	**2**	3	4	5	Some security provided with user levels, full audit trail of system changes not provided
	3 System Scalability	1	**2**	3	4	5	According to vendor, system can be expanded for quantity of stations. Capabilities of flow metering data collection not demonstrated
	4 System Maintainability	1	2	**3**	4	5	Support provided by Vendor only.
	5 Intellectual Property	**1**	2	3	4	5	Some inhouse knowledge, all significant IP held by Vendor
	6 System Life Cycle Costs	**1**	2	3	4	5	Installation at WTP owned by others
4. MIS Interface (Management Information Systems).	1 Operational Integrity	**1**	2	3	4	5	
	2 System Security	**1**	2	3	4	5	Interface to other business systems not provided
	3 System Scalability	**1**	2	3	4	5	Security measures not developed or published to other systems.
	4 System Maintainability	**1**	2	3	4	5	Requires custom development of interfaces
	5 Intellectual Property	**1**	2	3	4	5	Custom development and maintenance required
	6 System Life Cycle Costs	**1**	2	3	4	5	IP not owned by GAWB GAWB do not own.

Appendix D

Cost estimate

Table 1

GAWB Control System Upgrade

WBS Estimate

CTR	Task	Leadership	Tech. Support	Phase	Time ($ '000)	Material ($ '000)	Estimate ($ '000)	Basis
1.00	**Project Management**				**$ 31**	**$ -**	**$ 31**	
1.01	1. Capital Funding	GAWB	GAWB	3	$ -	$ -	$ -	% Time
1.02	2. Risk Matrix	Consultant	GAWB	2	$ 7	$ -	$ 7	% Time
1.03	3. Project Plan/Schedule	Consultant	GAWB	2	$ 7	$ -	$ 7	% Time
1.04	4. Interface Management	Consultant		3		$ -	$ -	% Time
1.05	5. Public Tender	GAWB	Consultant	4	$ 7	$ -	$ 7	% Time
1.06	6. Tender Review	Consultant	GAWB	4	$ 5	$ -	$ 5	% Time
1.07	7. Support Contract(s)	GAWB	Consultant	5	$ 5	$ -	$ 5	% Time
1.08	8. Operation Permits	GAWB	GAWB	4		$ -	$ -	% Time
2.00	**Work Packages**				**$ 146**	**$ -**	**$ 146**	
2.01	1. Corporate Systems	GAWB	Consultant	4	$ 7	$ -	$ 7	% Time
2.02	2. Corporate Network	GAWB	Consultant	4	$ 7	$ -	$ 7	% Time
2.03	3. Master Time Service	Consultant	-	4		$ -	$ -	% Time
2.04	4. MIS (Management Information Systems)	Consultant	-	4		$ -	$ -	% Time
2.05	5. SCADA Network	GAWB	Vendor	4	$ 14	$ -	$ 14	% Time
2.06	6. SCADA Systems	GAWB	Vendor	4	$ 14	$ -	$ 14	% Time
2.07	7. Radio/Telemetry Systems	GAWB	Vendor	4	$ 70	$ -	$ 70	% Time
2.08	8. E&I Installation	GAWB	Vendor	4	$ 34	$ -	$ 34	% Time
3.00	**Data Packages**				**$ 427**	**$ -**	**$ 427**	
3.01	1. Design Basis	Consultant	GAWB	1	$ 100	$ -	$ 100	% Time
3.02	2. Functional Specification	Consultant	GAWB	2	$ 14	$ -	$ 14	% Time
3.03	3. Detail Design Package	Consultant	GAWB	4	$ 159	$ -	$ 159	% Time
3.04	4. Tender SOW Packages	Consultant	GAWB	3	$ 28	$ -	$ 28	% Time
3.05	5. Engagement Contracts	GAWB	Consultant	4	$ 4	$ -	$ 4	% Time
3.06	6. Installation SOW	Consultant	GAWB	4	$ 14	$ -	$ 14	% Time
3.07	7. Corporate Test Specification	Consultant	GAWB	4	$ 14	$ -	$ 14	% Time
3.08	8. SCADA Test Specification	GAWB	Vendor	4	$ 14	$ -	$ 14	% Time
3.09	9. Radio/Telemtry Test Specification	GAWB	Vendor	4	$ 14	$ -	$ 14	% Time
3.10	10. Instrumentation Test Specification	GAWB	Vendor	4	$ 14	$ -	$ 14	% Time
3.11	11. Integration Test Specification	Consultant	GAWB	4	$ 14	$ -	$ 14	% Time
3.12	12. Operator Manual	Consultant	GAWB	4	$ 14	$ -	$ 14	% Time
3.13	13. Maintenance Manual	Consultant	GAWB	4	$ 14	$ -	$ 14	% Time
3.14	14. E&I Drawings (as-built)	Consultant	GAWB	4	$ 7	$ -	$ 7	% Time
3.15	15. Documents to GAWB Library	GAWB	Consultant	5	$ 4	$ -	$ 4	% Time
4.00	**WNMS (Water Network Management System)**				**$ 95**	**$ 1,608**	**$ 1,703**	
4.01	1. Information Systems	GAWB	Consultant	4	$ 15	$ 24	$ 39	Time & Material
4.02	2. Historian	GAWB	Consultant	4	$ 40	$ 70	$ 110	Time & Material
4.03	3. HMI/SCADA	GAWB	Consultant	4	$ 40	$ 66	$ 106	Time & Material
4.04	4. Telemetry System	GAWB	Consultant	4	$ -	$ 350	$ 350	Time & Material
4.05	5. Radio Systems	GAWB	Consultant	4	$ -	$ 346	$ 346	Time & Material
4.06	6. Solar Power Systems	GAWB	Consultant	4	$ -	$ 266	$ 266	Time & Material
4.07	7. Instrumentation	GAWB	Consultant	4	$ -	$ 81	$ 81	Time & Material
4.08	8. Civil Works	GAWB	Consultant	4	$ -	$ 375	$ 375	Time & Material
4.09	9. Misc. Tie-in Equipment	GAWB	Consultant	4	$ -	$ 30	$ 30	Time & Material
5.00	**Test & Evaluation**				**$ 159**	**$ 40**	**$ 199**	
5.01	1. Early System Testing	Consultant	-	2	$ 22	$ -	$ 22	% Time
5.02	2. SCADA Package FAT (Factory Acceptance Test)	Consultant	Vendor	4	$ 44	$ 10	$ 54	% Time
5.03	3. Radio/Telemetry Package FAT	Consultant	Vendor	4	$ 44	$ 10	$ 54	% Time
5.04	4. Combined Staged Testing	Consultant	-	4	$ 22	$ 10	$ 32	% Time
5.05	5. Site Integrated Testing	Consultant	GAWB	4	$ 17	$ 10	$ 27	% Time
5.06	6. Final Commissioning	Consultant	GAWB	4	$ 10	$ -	$ 10	% Time
6.00	**Training**				**$ 21**	**$ -**	**$ 21**	
6.01	1. Operation	Consultant	GAWB	5	$ 7	$ -	$ 7	% Time
6.02	2. Corporate	GAWB	GAWB	5		$ -	$ -	% Time
6.03	3. Maintenance - MIS	Consultant	GAWB	5	$ 4	$ -	$ 4	% Time
6.04	4. Maintenance - SCADA	Consultant	Vendor	5	$ 5	$ -	$ 5	% Time
6.05	3. Maintenance - Radio/Telemetry	Consultant	Vendor	5	$ 5	$ -	$ 5	% Time
7.00	**Operational Site Activation**				**$ 3**	**$ -**	**$ 3**	
7.01	1. Issue Completion Certificates	Consultant	GAWB	5	$ 1	$ -	$ 1	% Time
7.02	2. Project Handover to Ops	Consultant	GAWB	5	$ 1	$ -	$ 1	% Time

		Time ($ '000)	Material ($ '000)	Estimate ($ '000)
Raw Total		$ 881	$ 1,648	**$ 2,529**
Contingency	**30%**	$ 264	$ 494	**$ 759**
Grand Total		$ 1,146	$ 2,142	**$ 3,288**

GAWB Control System Upgrade
Preliminary Cost Estimate of Hardware

Group	Item	Qty	Unit Cost	Total Cost
1. Information Systems	VLAN Switches (20 way)	4 ea	$2,000	$8,000
	VPN Router	4 ea	$2,000	$8,000
	Frame-Relay / DSL etc. Comms (Note 1)	0 ea	$0	$0
	NTP (Time) Server	1 ea	$8,000	$8,000
	Subtotal			**$24,000**
2. Historian	Computer Hardware	1 lot	$10,000	$10,000
	Network Equipment	1 lot	$10,000	$10,000
	Software	1 lot	$50,000	$50,000
	Subtotal			**$70,000**
3. HMI/SCADA	Computer Hardware	2 ea	$3,000	$6,000
	New Licenses	2 ea	$15,000	$30,000
	License Upgrades	6 ea	$5,000	$30,000
	Subtotal			**$66,000**
4. Telemetry System	MTU	2 ea	$5,000	$10,000
	RTU (Hi Power)	30 ea	$4,000	$120,000
	RTU (Lo Power)	26 ea	$4,000	$104,000
	Enclosures	58 ea	$2,000	$116,000
	Subtotal			**$350,000**
5. Radio Systems	RTU Antennas	67 ea	$300	$20,100
	RTU Mountings	61 ea	$100	$6,100
	Option 2: New Repeater Site (Note 4)	2 ea	$50,000	$100,000
	Repeater Licenses	2 ea	$1,600	$3,200
	Radios - Digital Licenced	50 ea	$4,000	$200,000
	Radios - Digital Unlicenced	11 ea	$1,500	$16,500
	Subtotal			**$345,900**
6. Power Systems	Solar + Batteries	14 ea	$17,000	$238,000
	UPS Systems (Note 2)	0 ea	$20,000	$0
	Distribution - Cabling only	14 ea	$2,000	$28,000
	Subtotal			**$266,000**
7. Instrumentation	Pressure Sensors and PRV Controllers	3 ea	$12,000	$36,000
	Reservoir Level Sensors	9 ea	$3,000	$27,000
	Rainfall Sensor for Gauging Stations	3 ea	$500	$1,500
	Temperature Sensor	1 ea	$500	$500
	Conductivity Sensor	1 ea	$4,000	$4,000
	Piezometer Automation Equipment / Cabling	1 lot	$12,000	$12,000
	Subtotal			**$81,000**
8. Metering	Civil Works - Metering & Piping 07/08 Only.	1 lot	$375,000	$375,000
	Subtotal			**$375,000**
9. Misc. Tie-in Equipment	Retrofit Radio/RTU equipment at Existing Sites	30 ea	$1,000	$30,000
	Subtotal			**$30,000**

Notes:

1. Assumes Backbone connectivity between GHQ - AWD - GWTP - YWTP is existing Also satellite connect at AWDPS.
2. Assumes UPS systems exist at GHQ and GWTP
3. Assumes that power is available locally at mains powered sites.
4. Assumes that this equipment can be installed at the existing Mt Biondello repeater site
6. Assumes Guaging Sites (Milton, Marlua, Nagoorin) have adequate power systems available.
8. Price includes 07/08 budgetted flow meter installation- excludes proposed 08/09 flow meters.

Project:	Control System Upgrade	Project No.:	29603 002
Client:	Gladstone Area Water Board	By:	KAW

Provision and exclusions

This opinion of cost has been prepared by Connell Wagner Pty Ltd at the request of Gladstone Area Water Board and solely for use in connection with the Control System Upgrade.

Connell Wagner does not accept any legal liability or responsibility in respect of the use of the cost estimate for any purpose other than the purpose defined above.

Connell Wagner has exercised due skill, care and attention in preparing the opinion of cost.

Since Connell Wagner has no control over the cost of labour, materials, equipment or services furnished by others, or cover contractors' methods of determining prices, or over competitive bidding or market conditions, any estimate of costs is made on the basis of Connell Wagner's experience and qualifications and represents its best judgement as an experienced and qualified professional engineer, familiar with the construction industry; but Connell Wagner cannot and does not guarantee that proposals, bids or actual construction cost will not vary from Connell Wagner's opinion of cost.

Basis of information

- Preliminary investigation and consultation

Limitations

- No detailed testing or investigation of existing equipment
- No detailed design has been performed
- Opinions of cost are preliminary and for budget purposes only
- A contingency allowance of 30% to the construction cost estimate is included for budgetary purposes

Appendix E

Scope comparison and justification matters

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Scope Comparison and Justification Matrix
Control System Upgrade
Gladstone Area Water Board

8 November 2007
Reference 29603 002
Revision 0

Connell Wagner

Document Control

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Rev No	Date	Revision Details	Typist	Author	Verifier	Approver
0	8 November 2007	Issue for Use	MB	KAW	PGB	

Disclaimer

Connell Wagner ABN 54 005 139 873 has prepared this report (the "**Report**") for the exclusive use of ***Gladstone Area Water Board*** (the "**Client**") for the purpose of ***scope comparison and justification***.

The Report must be read in light of:

- the limited readership and purposes for which it was intended;
- its reliance upon information provided to Connell Wagner by the Client and others which has not been verified by Connell Wagner and over which Connell Wagner has no control;
- the limitations and assumptions referred to throughout the Report;
- the cost and other constraints imposed on the Report; and
- other relevant issues which are not within the scope of the Report.

Subject to the limitations referred to above, Connell Wagner has exercised all due care in the preparation of the Report and believes that the information, conclusions, interpretations and recommendations of the Report are both reasonable and reliable.

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This disclaimer must accompany every copy of the Report, which is an integral document and must be read in its entirety.

Item	Criteria	Vendor Scheme	Vision Statement Option	Initial GAWB Budget	Comment
1.	**Enables SLMP Implementation**				
1.1	Installation of (new) flow meters at all main customer connections and throughout the water distribution network to support the System Leakage Management Plan (SLMP)	Not part of Vendor Scope	Included in scheme	Included	
1.2	Installation of (new) radio telemetry to all electro-magnetic flow meters to report back to the central control room, including remote monitoring of treated water quality parameters and control of remote disinfection equipment, where required	It is understood that this is included	Included in scheme	Included	See comments below regarding system scalability
1.3	Replacement of existing remote Radio Telemetry Units (RTU) and Front End-Processors (FEP) with current model equipment	It is understood that this is included	Included in scheme	Included	See comments below regarding system scalability
1.4	Data Capacity	Higher bandwidth radio and data storage systems with larger capacity than present not included	Higher bandwidth radio and data storage systems with larger capacity than present included in scheme	Not included	• Significant additional data volumes are expected to be necessary to meet the proposed System Leakage Management Plan (SLMP) requirements • This drives a need to use higher bandwidth radio and data storage systems with larger capacity than present. This requires a significant investment in design, outlay for equipment and installation for the radio and database systems.

Item	Criteria	Vendor Scheme	Vision Statement Option	Initial GAWB Budget	Comment
1.5	Data Analysis Toolset	This is not provided by the Vendor system. • The existing package provides simple SCADA alarm points which are not sufficient to do the data analysis	Included in estimate	Not included	• The SLMP requires the ability to automatically sense and alarm a catastrophic water loss event within a day period • This will require a data analysis tool set to correlate data and perform a flow balance calculation for each sector of the network
1.6	Secure Data Storage and Analysis	• The Vendor supplied SCADA product is not an open system, and not suitable to meet the billing strategy • No off the shelf auditability • Not suitable for use with customer billing systems	The total cost for data storage and analysis for metering is included in the Vision Statement option	Not included	The SLMP flow metering and customer billing strategy require the development of data storage and analysis functions. An open, integrated SCADA system is required to provide a full auditable trail for flow metering data from RTU, to SCADA to Database to meet the requirements of the SLMP.
1.7	Store historical and flow meter data in an industry standard Structured Query Language (SQL) database on an existing SQL server	• Does not appear to provide detailed analysis and storage functions with compression algorithms • It does not provide an open interface such as an OPC Server to allow other systems to interrogate or analyse the data collected in the Vendor system • The initial proposal is only an offer to develop database connections	Included and described as Management Information Systems	Not included	• The SLMP requires the ability to do analysis of operational data and subsequently, it is expected that significantly higher quantities of data storage are required • GAWB budget presumed the existing database had sufficient function and capacity

Item	Criteria	Vendor Scheme	Vision Statement Option	Initial GAWB Budget	Comment
		• The Vendor is not offering a fully featured product that can be evaluated or compared at this stage. The full cost of development over time of the Vendor's custom solution would be significant. • The Vendor has to date not supplied, or is not willing to supply, any printed literature or reference material detailing the technical specifications of their proposal. (This was requested at site meetings at the Gladstone Water Treatment Plant and Awoonga Dam in August with the Vendor. It can only be assumed that their system does not have these features and or they have not yet developed them).			

Item	Criteria	Vendor Scheme	Vision Statement Option	Initial GAWB Budget	Comment
2.	**Enables Separation of GAWB system from GCC system**				
2.1	Obtain a new operating frequency and licences to allow the separation of GAWB's radio-telemetry system including back-up telemetry system, from that of Gladstone City Council (GCC). Assist GCC plan relocation of radio telemetry from Gladstone Water Treatment Plant (GWTP).	It is understood that the current installation is to be replicated. This is expected to be insufficient for flow metering requirements.	Included	Included	Presumed included in Vendor quote but has been subsequently found to be insufficient
2.2	Extend telemetry and Citect Supervisory Control and Data Acquisition (SCADA) systems to GAWB's head office	Offer includes only expansion of existing Vendor telemetry system. Does not include full integration to Citect SCADA system.	Replacement of obsolete equipment and provision of the expected systems required to furnish a possible 15 to 20 year life-span is included	Included	
2.3	Provide remote access to the SCADA system at the GWTP to permit after hours fault diagnosis and control for selected staff and maintenance technicians	It is understood that only a limited connection to the existing Vendor Telemetry SCADA is provided	Included full integrated solution	Included ?	

Item	Criteria	Vendor Scheme	Vision Statement Option	Initial GAWB Budget	Comment
3.	**Key Characteristics**				
3.1	GAWB ownership of assets and Intellectual Property	Intellectual property not included. Identification of GAWB assets not included.	Included major components from field devices for up to 50 stations, radio equipment, SCADA servers and data systems	Not included	The present SCADA system is predominantly owned by others. A significant investment is required by GAWB to procure a full system that they currently do not own and do not have clearly documented.
3.2	Operational integrity i) Avoidance of a single point of failure tolerance for critical (backbone) systems. ii) Clear and timely remote annunciation of critical alarms (including an escalation process). iii) Data integrity through to auditable systems.	Offer only includes replication of existing systems design. Does not include provision of auditable systems.	Included, design for data integrity, extended backbone systems and alarming	Not included	
3.3	System scalability to allow expansion to incorporate future projects i) Expansion of existing operational equipment. ii) Increase in statutory/reporting requirements. iii) Opportunistic improvements.	The Vendor product does not provide an open interface to allow competitive expansion	Included	Not included	GAWB require the integration of SCADA systems for alarming, control and remote access. This requires the amalgamation of all the SCADA systems. GAWB already has a current investment in the separate Water Treatment Plant SCADA (Citect) package. This industry recognised, and open standard package can be used to provide the telemetry SCADA functions. This package is widely supported by a variety of system integration houses locally, nationally and internationally. The use of this package will allow GAWB to achieve competitive pricing for supply of equipment, services, maintenance, support and compatibility for future expansion with

Item	Criteria	Vendor Scheme	Vision Statement Option	Initial GAWB Budget	Comment
	iv) Municipal mergers. v) Interfacing to new package systems. vi) Interfacing to third parties.				Fitzroy pipeline, etc.
3.4	Operational Security - Critical infrastructure integrity and security. Relates to the recommendations for Critical Infrastructure Protection of the IT Security Expert Group (ITSEAG): i) Denial of Service/Distributed Denial of Service. ii) General SCADA Risk Management. iii) Enterprise Security.	Remote access to plant SCADA systems not included	Included	Not included	It is anticipated that keyed cryptography methods are required to secure and allow GAWB control of the transmission of data. This aligns with Queensland Government and ITSEAG requirements on information security to use cryptography on all data transmission. There is expected to be a significant investment required for this level of transmission system.
3.5	Systems maintainability Relates to the ability of GAWB maintenance personnel to: i) Access equipment, remotely and locally. ii) Manage planned system change. iii) Repair and rectify system faults in a timely manner.	• Remote access to plant SCADA systems not included • Telemetry system maintenance included though GAWB held to single source of supply from existing Vendor	Included. Vision also includes ability to competitively source maintenance and support.	Not included	

Item	Criteria	Vendor Scheme	Vision Statement Option	Initial GAWB Budget	Comment
	iv) Access system support in the local region.				
3.6	Ability to retain system intellectual property To retain and control access to information that is operationally and/or commercially sensitive. This may include: i) Equipment location and structure. ii) Protocols, codes and passwords. iii) Billing and loss data. iv) Operational events.	Currently all significant intellectual property of telemetry systems controlled by Vendor. Transfer of intellectual property to GAWB not included.	Included	Not included	
3.7	System life-cycle costs May be influenced by the following factors: i) Capital cost associated with initial implementation. ii) The number of discrete systems. iii) Configuration complexity. iv) Configuration structure (ie use of configuration and coding standards).	• Does not include hidden costs for telemetry system expansion and maintenance • Does not provide documentation to detail operation	• Scheme estimate does include the design, procurement and installation of flow metering equipment which are a significant portion of the overall works • Includes planned to implement open systems to allow competitive costs for provision of	Included Not included	Estimate does not cover the design, procurement and installation of flow metering equipment which is a significant portion of the overall works

Item	Criteria	Vendor Scheme	Vision Statement Option	Initial GAWB Budget	Comment
	v) Ongoing support costs. vi) Online and expansion capacity. vii) Escalation of license costs though system expansion.		services and equipment from other vendors and integrators • Includes capital cost of system design and operation documentation	Not included	
3.8	Promotion of competition to provide immunity to the fates of individual suppliers. Able to incorporate a number of different (prequalified) products in similar (non-core) functional roles.	The Vendor system in its current configuration, is not an open system, not compatible with other RTU manufacturers on the same radio network, is not open to competitive supply of equipment for expansion, is not open to competitive pricing for ongoing maintenance	Included	Not included	
3.9	Ongoing support via a healthy relationship program that engenders timely and high quality delivery of service	Forced single point of supply	Includes promotion and opportunity for competitive supply	Not included	
3.10	Tangible return on investment • Productivity gains, through long term loss analysis • Increased revenue, through enhanced billing facilities	Not included	Included	Not included	Refer to Data Analysis Tool

Item	Criteria	Vendor Scheme	Vision Statement Option	Initial GAWB Budget	Comment
	• Increased revenue and cost savings, through improved response time to significant losses • Productivity gains, through operational independence • Reduced business risk exposure through operational independence				
3.11	Intangible return on investment • Support critical business objectives, through system security, integrity and accountability • Support of reputation, through system security, integrity and accountability • Enables the business to shift to strategic planning culture	Not included	Included in strategy	Not included	Refer to Data Analysis Tool

Item	Criteria	Vendor Scheme	Vision Statement Option	Initial GAWB Budget	Comment
4.	**Features**				
4.1	Design Life	Future life cycle not addressed	15-20 year plan	Not included	Vendor scheme offered current technology only
4.2	Data Access to the user	Access limited	Included	Not included	The ability of data to be presented to the user in a timely manner
4.3	Loss Metering	Not included	Included	Not included	Requires development to implement
4.4	Time Synchronisation	Included	Included	Included	
4.5	Store and Forward Interface	Limited capability	Included, actual need for this depending on detail design stages		• Has capability at RTU level • Requires additional development over and above the Vendor offer
4.6	Communication Status	Basic functionality	Included	Not included	
4.7	VPN Network	Not part of scope	Included	Included	
4.8	VLAN Network	Not part of scope	Included	Included	
4.9	Alerts and Notification	Basic functionality	Included	Included	Vendor scheme does not include Data Analysis package
4.10	Analysis Package	Not part of scope	Included	Not included	
4.11	External Interfaces	Not part of scope	Included	Not included	O/C server not provided in Vendor package, therefore development required
4.12	Billing Interface	Not part of scope	Included	Not included	Vendor scheme requires development to implement
4.13	Master Time Service	Not part of scope	Included	Not included	

Item	Criteria	Vendor Scheme	Vision Statement Option	Initial GAWB Budget	Comment
4.14	Data Concentration	Not part of scope	Included	Not included	• The ability of data to be segregated within the telemetry systems to limit the consequences of communication failure • Additional repeater allowed for in Vision scheme to achieve this
4.15	Interface Data Buffering	Not part of scope	Included	Not included	• Data collection tolerance to communication failure • Vendor scheme would require engineering cost to develop functionality

5. Cost Estimate for Vision Statement Option

A revised cost estimate is attached for the Vision Statement Option. The cost for GAWB resources have been removed as discussed. The costs of the Civil works for flow metering have been refined as the civil team have progressed their works from a preliminary to a conceptual design stage. Following discussion with James Stewart, the costs of the radio repeater infrastructure have also been reduced on the assumption that suitable facility or facilities will be available to house the repeater/s equipment.

The report provided only a budgetary estimate to assist GAWB in identifying the possible magnitude of works required to implement a full system based on the information available in the preliminary stage. Refinement would require further progression to conceptual and detailed design stages.

6. Objectives and Time-frame

It is unlikely that a full system implementation with all key functional elements can be achieved by February 2008. It is estimated that an additional 12 - 16 weeks would be required post February to allow time to completely construct all facets of the intended system.

It is considered that the critical path works for this project are:

1. IT. Security Risk Assessment then,
2. Completion of Preliminary approvals and detailed design then,
3. Procurement of equipment for construction.

Some steps can be taken now with a Temporary system to achieve a replication of present functionality. This would achieve a measure of operational independence, but not achieve flow metering and the other key requirements. It is expected that this temporary option would cost less then $100,000. Some of the investment in this temporary equipment and services could be retained for use as part of a backup telemetry path, or on-sold to GCC to maintain their existing equipment.