C.1 Operational Information Requirements

- ***A simple flow diagram of each unit operation, along with a brief description detailing its purpose.***

Flow diagram has been included as per Drawing 14, and treatment plant layout is shown in Drawing 2 in Attachment B.2.

- ***A description of the process control system indicating the control equipment including storm water overflows, retention tanks etc.***

There are 11 no. storm overflow points which run into 7 no. discharge points throughout the town of Ballina. These storm overflows limit the volume of effluent that can reach Cathedral Road and Bachelors Walk pumping stations, thereby limiting the flow that can reach the treatment works in wet weather. In general, these overflow points are constructed of double high sided weirs. They were originally designed under Stage 1 of the Main Drainage Scheme in the late 70's, for an overflow of no less than 10DWF. Although foul flows have increased due to development in the town since the design of the overflows, the surface water portion in the combined system has been reduced by the provision of separate surface water sewers in most areas, which takes the surface water runoff from roads and roofs directly to the river.

The collection network is naturally split into an Eastern and Western network by the River Moy. All effluent from the town centre eastern network discharges to a large pumping station known as Cathedral Road pumping station. From here the effluent is pumped to the Western network. The main pumping station for the entire town centre is located at Bachelors Walk and the majority of effluent from the agglomeration is pumped to the wastewater treatment plant from here. The remainder of the agglomeration is served by smaller localised pumping stations. On completion of Stage 2 of the Main Drainage Scheme, three pumping stations in total will discharge

directly to the treatment plant; namely Bachelors Walk pumping station, Crocketstown pumping station and Belleek Road pumping station.

Emergency overflows are provided at both the Cathedral Road pumping station and Bachelors Walk pumping station. These overflows are provided in the case of pump failure or maintenance requirements. It is noted that there is currently no remote monitoring or control of the pumping stations, but on completion of Stage 2 of the Main Drainage Scheme, all pumping stations within the catchment will be linked to the treatment plant SCADA system by telemetry. A call out system will be in place for pump failure etc. Neither of these emergency overflows are currently screened. However, works are currently underway to provide a mechanical screen to the overflow at Bachelors Walk.

A storm tank is not required at the wastewater treatment plant as all the flow is pumped, thus limiting the volume of effluent entering the head of the works. There is only the one discharge point from the wastewater treatment works, SW1.

- ***Information on all aspects of the waste water works that can results in discharges to the aqueous environment, including emergency overflows and storm overflows, during normal operation and also in the event of a malfunction or interruption of services, e.g. power loss.***

Wastewater Treatment Plant

The municipal treatment works is based on an activated sludge process and designed to treat sewage from a population equivalent of 21,459 and an average flow of 4,828m^3/day. As a result of extensions to the collection network currently being carried out under Ballina Main Drainage Scheme, Stage 2, this PE is expected to increase to 25,000 over the coming years.

This is being accommodated by the provision of a new primary settlement tank.

At the head of the works there is a flow splitter which was designed to permit future enlargement of the works. A standing wave flume is used for measurement of the inflow. Influent sampling (IS) also takes place here.
Screening is carried out using a Jones & Attwood high flow screen in the main channel downstream of the recording flume. The screenings are washed and compacted in a Jones & Attwood washpactor and conveyor. In the event of power failure or breakdown a manual standby screen is provided in a parallel channel. Immediately, downstream of the screening area, grit removal is carried out using a 3 metre diameter Pista grit trap. Screenings and grit are then taken off site for disposal.
The next stage of treatment is primary settlement. There are currently two primary settlement tanks in operation, both 15.5 metres in diameter, with a retention time of 2.18 hours and rated at 1.53 metres per hour. A third primary settlement tank is under construction at present. This tank is 24m diameter and will prevent "wash out" of the plant which has happened on occasion previously during intense rainfall events. It will also provide the additional capacity required for the expected increase in loading over the coming years. Sludge is removed from the hoppers of these tanks and pumped to the sludge thickening tank.
From here, the influent is fed into one of two diffused aeration tanks, each with a volume of 930m^3 and a side depth ratio of 3.6. The retention time in these tanks is 9.85 hours at DWF. Each aeration system is fed by its own air blower. A standby blower is also available to either tank. Activated sludge is also returned into these tanks from the secondary clarifier in order to feed the biological process. The effluent passes from here to the secondary settlement stage. There are two secondary settlement tanks in the municipal plant, each 20 metres in diameter. This stage is to remove any remaining particulate matter and surface scum. It is also the stage at which ferric sulphate will be dosed into the effluent in order to precipitate out dissolved

phosphorous. It is expected that the ferric dosing system will be up and running by early 2008. The final effluent overflows the circular vee notch weir and discharges to the final effluent sampling chamber. Here it is mixed with the final effluent from the industrial effluent stream prior to discharge to the River Moy via a diffused outfall on the river bed. This is the primary discharge point (SW1(P)). The flow is measured using an electromagnetic flow meter and an automatic sampler takes samples over a 24 hour period.

Both the secondary sludge and phosphorous sludge are collected in the secondary settlement tank hoppers and discharge to the return/waste activated sludge pumping station. From here a portion (approximately 1 DWF) of the sludge is recirculated to the aeration tank as mentioned above and the remaining sludge is pumped to the sludge thickening tanks where is it is combined with the primary sludge and thickened to approximately 4% dry solids using a picket fence thickener. A new sludge dewatering building is currently nearing completion. Once commissioned, the sludge will be pumped from the sludge thickening tanks to a new sludge dewatering press. Prior to dewatering, the sludge will be dosed with a conditioning polyelectrolyte. The dewatered sludge will be at approximately 18% dry solids and will be taken away for further treatment at the Derrinumera Sludge Hub centre, once completed. The supernatant from the sludge thickening tanks and the sludge dewatering press is returned to the inlet works for treatment via a new supernatant return pumping station.

Under the current capital works, a comprehensive Supervisory Control and Data Acquisition (SCADA) system is being installed at the plant. The proposed system is Intouch. Signals from all equipment at the treatment works and from the pumping stations will be returned to the system located in a new Control House enabling much more effective control and earlier detection of any problems arising.

In 1999 a separate treatment works (on the same site) was built to process industrial effluent originating from Ballina Beverages, the facility which produces coca-cola concentrate. This treatment is different to the municipal plant in that it incorporates biological phosphorous removal. The effluent from the industrial treatment is mixed with that of the municipal plant and is discharged into the River Moy at a common outfall, as discussed above.

The inlet works of the industrial plant is made up of a pressure break manhole followed by a submerged flow metering arrangement with an outlet manhole draining to the anaerobic tank. It also includes composite sampling and flow control via an actuating valve and can convey the peak hydraulic load of 1,900m^3/day to the anaerobic and anoxic tanks. No primary settling was provided due to the low anticipated level of settleable solids in licensed effluent from Ballina Beverages.

The anaerobic tank has a volume of 64.23m^3 and at the peak hydraulic load of 1,900m^3/day has a retention time of 49 minutes. This is not sufficient for complete biological phosphorous removal, but ferric sulphate dosing, which is done at the secondary settlement stage, removes the remaining phosphorous. This tank is also dosed with acetic acid to provide volatile fatty acid supplementation for the biological portion of the phosphorous removal.

The anoxic tank has a volume of 123m^3 and at peak hydraulic loading has a retention time of 1.55 hours. This is shorter than the optimal retention time but the chemical dosing is being used to complete the process of phosphorous removal.

There are two aeration tanks which operate in parallel with their own dedicated internal recycle lines and pump arrangement. One of these tanks has a volume of 770m^3 (Tank no 1) while the second tank has a volume of 548m^3 (Tank no 2). The aeration of tank no 1 is achieved by using duty/standby air blowers to pumping diffused air. The Hick Hargreaves Series 4000 blower is fitted with 55 kW motors and can deliver 1,379m^3/hour. Operating at 24 hours per day this translates into the removal of 1350 – 1450 kg/BOD/day. Tank 2 is aerated using 22 kW motors with a delivery rate

of 736m^3/hour and a removal rate of 675 – 750 kg/BOD/day operating for 24 hours.

The three settling tanks perform the same purpose of those in the municipal plant, with the activated sludge returned from these tanks to the aeration tanks to create the environment required for the biological processes.

A supernatant balancing tank with a volume of 180m^3 is also provided. This supernatant is sent to the head of the works at time of low loading to ensure smooth operation of the system.

A SCADA system is in place and is used to monitor, control and optimise the performance of the plant.

Flow diagrams for both the municipal and industrial plant are being submitted as part of attachment C.1, on drawing number 14.

Secondary Discharge Points

The two secondary discharges (SW2 & SW3) are the outfalls points for emergency overflows at pumping stations. These emergency overflows were constructed to prevent back-up of sewage in the event of power failure at the pumping stations.

SW2 is related to Bachelors Walk pumping station which has an emergency overflow manhole on the incoming pipeline. It is of a similar design to the emergency overflow at Cathedral Road, with a high-level 450mm diameter overflow pipe from the manhole to the river. It is thought that there is a flap valve fitted to the pipe end, but this outfall is not visible even at low water. Within the pumping station itself, there are twin wet wells and a stormwater sump. Each of the wet wells contains two submersible pumps with a combined capacity of 156 litres/second, equivalent to 3 times DWF for 20,000 PE. These pumps operate on a duty/standby basis. An overflow weir has been provided from the wet wells to the stormwater sump in the event that the pump capacity is exceeded by the inflow. The stormwater sump contains 2 No. pumps (duty/standby) with a capacity of 297 litres/second.

The stormwater is pumped up to a second storm chamber from where it discharges by gravity to the river at SW2. The capacity of the storm pumps is being reduced to 150 litres/second under Stage 2 of the Main Drainage Scheme, due to surface water separation taking place upstream of the pumping station. Under the same scheme, a rotating bar interceptor is being installed upstream of the pumps. This should prevent pump blockages such as those that have been known to occur on a fairly regular basis in the past. As mentioned above, a mechanical screen is also being installed on the storm overflow.

The second emergency discharge point (SW3) originates from the pumping station on the Cathedral Road. This station is designed to handle flow rate of 6DWF and pumps sewage collected from the eastern network to the western network. There is a foul sump with an overhead control house. The sump is divided into two cells, with two foul pumps in each cell. The four deliveries are connected to a manifold which joins a 350mm rising main which carries sewage to the western network at a rate of 190 litres/second. The emergency overflow is located on the last manhole before the incoming sewer turns into the pumping station grounds. This is a 450mm pipe located 1.5m above the main pipeline. There is no evidence that this overflow has operated in recent times. It is thought that the end of the pipe is fitted with a flap valve.

Storm Overflows

There are 11 no. storm overflow manholes on the system that are set to discharge to 7 no. storm overflow discharge points at flows over 10 DWF. The majority of the overflows are screened with bar screens. From a WALLRUS model prepared in 1991, based on predicted future flows and a storm with a 2 year return period, the largest outflow from a storm overflow manhole is 0.449m^3/sec at the Bunree Road/ Sligo Road junctions (SO4).

- ***Information on the location within the waste water works of the overflows and the final discharge location from such overflows.***

Shown on the drawings included with this attachment.

- ***Brief details of the activities carried on in laboratory facilities associated with the activity. Details to include the monitoring carried out, the analytical methods used and any accreditation obtained by the laboratory.***

  There is a basic laboratory located in a portacabin at the wastewater treatment works in Ballina. Here, the plant manager tests the influent and final effluent for the following parameters;

  - Chemical Oxygen Demand
  - Suspended Solids
  - pH
  - Ammonia
  - Phosphates
  - Nitrates
  - Sulphates

  The analytical procedures used are as per the Standard Methods Book.

  The laboratory is not accredited.

  A new control building is currently being constructed which will house laboratory facilities.

C.2 Outfall Design and Construction

- ***A technical description of the design criteria and construction detail of the discharge outfall.***

Wastewater Treatment Works Outfall (SW1)

The outfall from the wastewater treatment works comprises a 560mm diameter PE100 (high density polyethylene pipe). This pipe extends approx 132m into the River Moy and is buried in the bed of the river. The effluent is discharged through 4 No. diffuser ports which are each fitted with non-return valves to prevent backflow of the river water. The diameter of the outfall decreases along the diffused section in order that equal discharge is achieved through each port. This outfall was constructed in 2000 in conjunction with the construction of the industrial effluent plant on site. Prior to this, the municipal effluent was discharged through an open ended pipe on the bank of the river. A high level overflow remains at the final effluent chamber, so that in the event of a blockage on the diffused outfall, the final effluent can discharge through the old pipe.

Secondary Discharge Points (SW2 & SW3)

The secondary discharge points are the emergency overflows from the two largest pumping stations. Both are manholes with a high level pipe cast approximately 1.5m above the level of the main inflow pipe. In the event of power failure, the effluent backs up through the pipe from the pumping station, eventually discharging through the high level pipe. This pipe extends some metres along the river bed and both overflows are thought to be fitted with a flap valve, although neither is visible in the water, even at low water level. Both overflow pipes are 450mm diameter.

Storm Overflows (SW4 to SW10)

The storm overflows were designed to relieve the combined collection network of any flows in excess of 10 times DWF. This is achieved in general by a high sided weir in the storm overflow manhole. Most of the overflows are screened with manual bar screens. The exception to this is SO6.1, SO6.4 and SO6.5. Overflow from these manholes takes place through a high level pipeline. There are no screens in these manholes.

The 7 No. discharge points construction details are as follows;

SW4 discharges through a 525mm diameter pipeline at the bank of the river. The end of the pipe if fitted with a flap valve.

SW5, SW8, SW9 and SW10 overflow pipelines runs along the river bed for several metres into the river. The ends of the pipes are thought to be fitted with flap valves. The diameters of the overflow pipes are 600mm, 525mm, 675mm and 375mm respectively.

SW6 and SW7 are open discharges. SW6 discharges through the end of a 2120 x 1820 (arch culvert) which takes a stream to the river by culvert. SW7 is an open discharge through a headwall. The outfall pipe is 525mm diameter.