

CE 331: Water Supply Engineering

Lecture 3 Surface Water Collection

Source: Water Supply Engineering by M. A. Aziz

Surface Water Situation

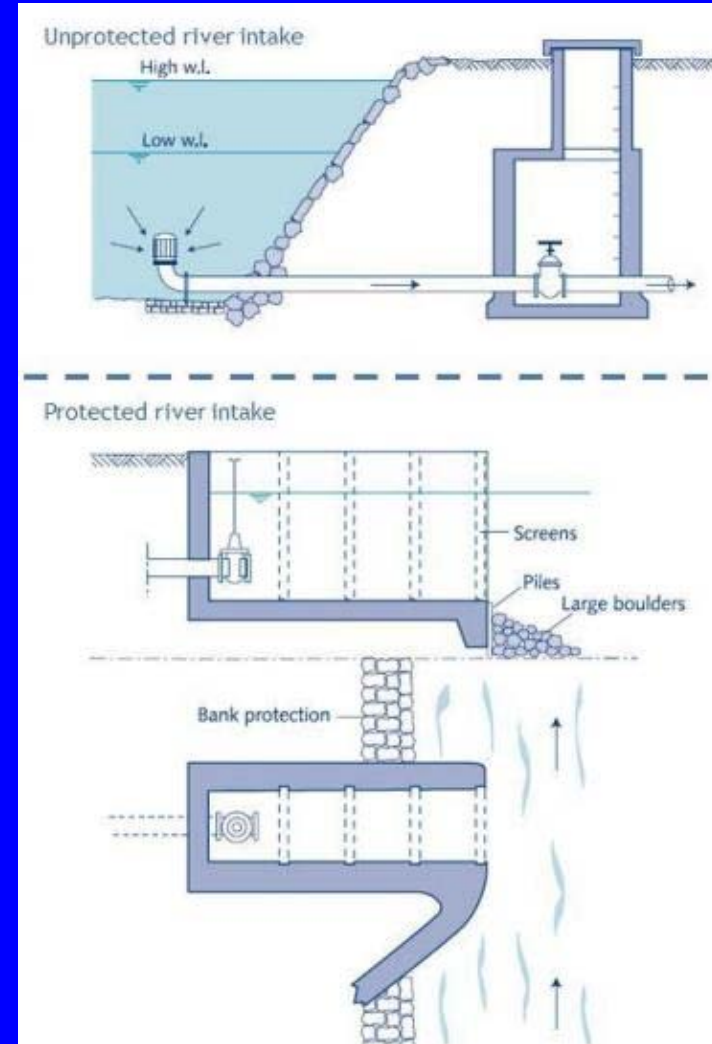
- Ground water and surface water are dependent on each other
- GW flows into the SW sources in the dry season
- SW enters into ground during the monsoon
- Two are interrelated and the use of one usually affects the availability of water from the other.
- Large-scale use of GW for irrigation purposes has caused a lowering of the GW level and drying up of SW sources.
- Surface waters are polluted by agricultural, industrial, domestic and municipal sources
- The use of SW for drinking purposes requires clarification and disinfection by elaborate and extensive treatment processes.

Surface Water Collection System

- A set of Engineering works designed to convey water from a source to a distribution system via treatment plant
- Includes intakes, suction pipes, delivery pipes and pumping stations

Intakes

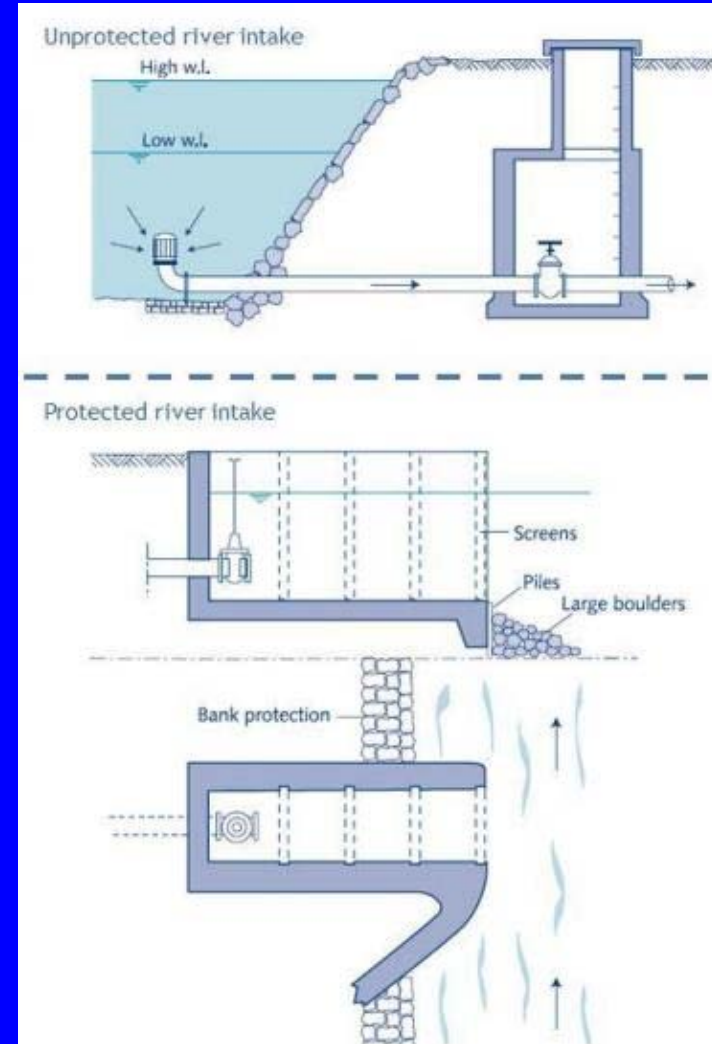
- A device placed in a surface water source to permit the withdrawal of water from the source and then discharge it into intake pipe through which it will flow into the water-works system



Intakes

Two types

- River intakes
- Lake and reservoir intakes

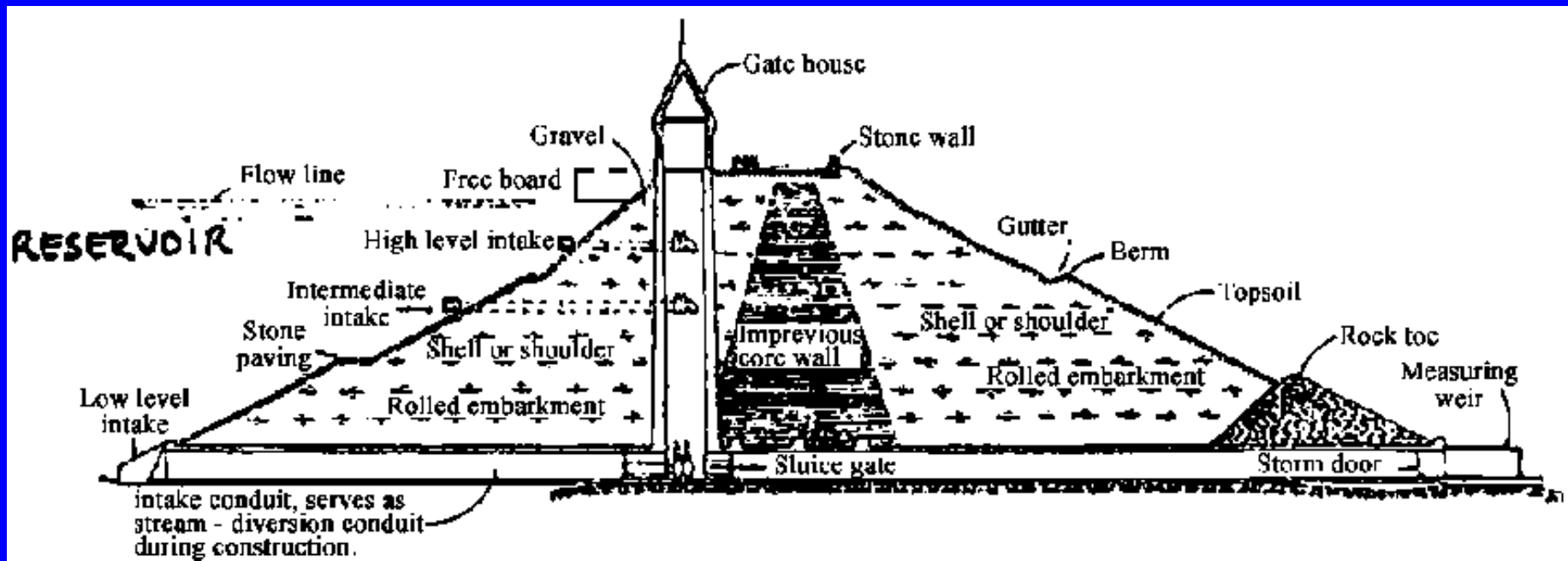


River Intakes

- Constructed well upstream from points of discharge of sewage and industrial waste.
- Preferable locations will have deep water, a stable bottom and favorable water quality
- Locations will have protection against floods, debris and river traffic.
- For fluctuating river beds, intake pumps are mounted on carriages to move.

Lake and Reservoir Intakes

- Sited with due reference to sources of pollution, prevailing winds and surface currents.
- Reservoir intakes lie closer to bank in the deepest part of the reservoir ; often incorporated in to the impounding structure itself.



Intake Velocities and Depths

- Entrance should lie 10 to 15 ft below water surface but 4 to 6 ft above the river, lake or reservoir floor
- Velocities at or below 3 or 4 inch per sec
- Gratings or screens of 2 to 8 mesh to an inch are provided at entrance

Intake Pipe and Pumping Station

- Intakes are connected by pipe lines or by tunnels
- Intake pipes are designed to operate at self cleansing velocities, 3 to 4 fps at gravitational flow or suction flow
- Pump wells are often quite deep depending on the elevation of water level in times of drought

Intake Design Considerations

- Selection of a particular type for the given source
- The magnitude of the external forces to be resisted by the intake
- Consideration of the total lift from the source to the treatment plant and selection of a suitable pumping unit
- Determination of the total length of suction and delivery mains, head losses due to friction and small bends, enlargement and reduction

Intake Design Considerations

- Selection of suitable screen to provide around the intake pipe not to permit entry of large and small objects, such as logs, stones, aquatic lives and vegetation
- Installation of intake valves or port holes at 2 or 3 different levels to get the best available quality of water, eliminating seasonal fluctuation of water levels
- Determination of cost-benefit ratio
- Assurance of the safety of the intake structure, provision for future extension and installation of standby units of pumps

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Bar screens on the outside

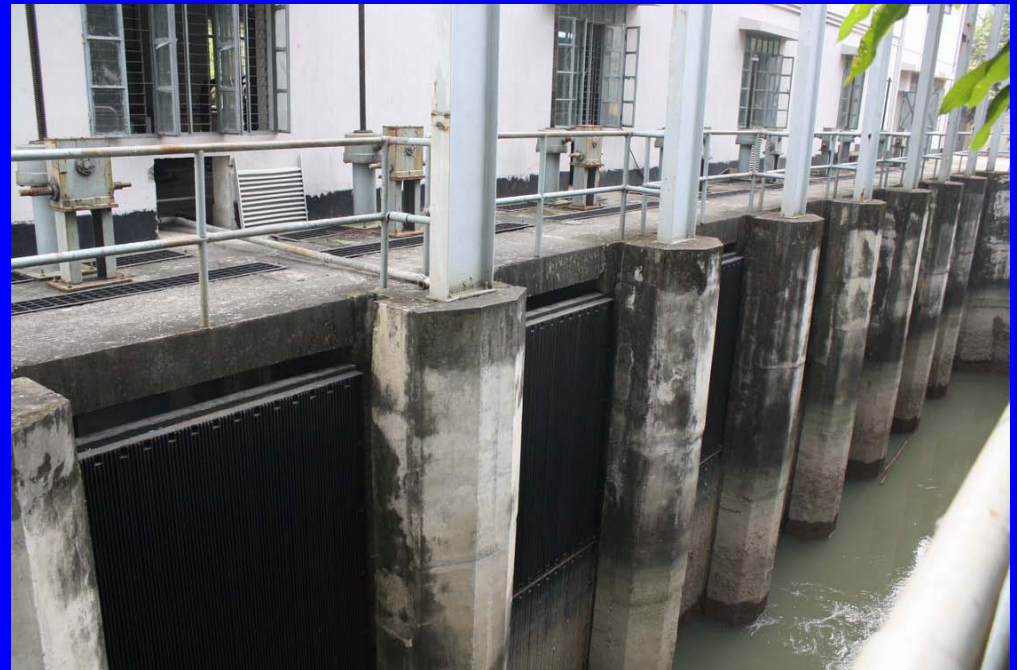
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River Training Works to protect the banks beside the intake

Additional screens before pumping



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Sluice Gates to Control the flow



Inside the pump house



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Water is pumped and discharged to WASA Conveyance Canal



WASA Conveyance Canal