Portland Cement Plant Water Use

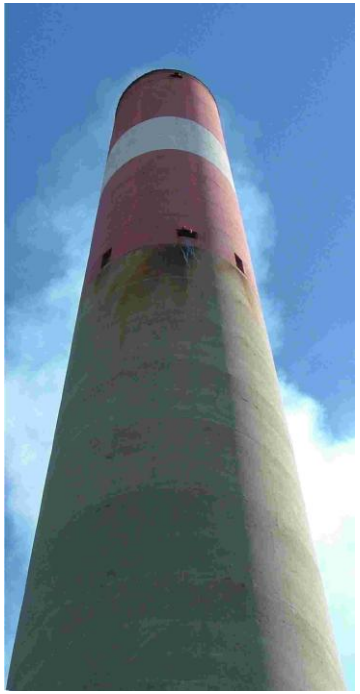
July 16, 2010

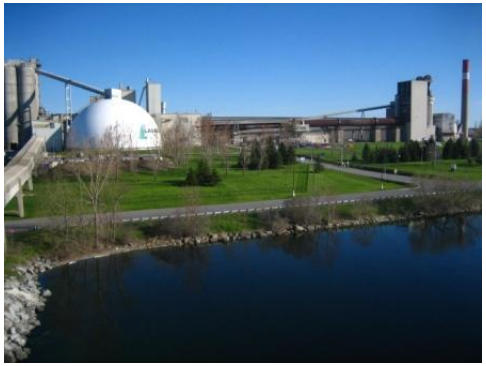
Water Considerations at a Cement Plant

- Cooling water consumption
- Quarry dewatering
- Process water use & discharge
- Community water use
- Airborne deposition
- Shipping product throughout the Great Lakes & Beyond

Cooling water consumption

- Cement requires the heating of limestone and other raw materials to a high temperature
- Combustion of fuels provides the energy for this heating
- Flue gases exit the process at a high temperature
  - For some plants must be cooled to ensure efficient filtration and to prolong equipment life
- Example Plant “A”
  - Lake water is sprayed into the flue gas to cool it down – evaporative cooling – and this consumes 1,535 m3/day of water
  - Evaporated water is considered lost from the watershed.





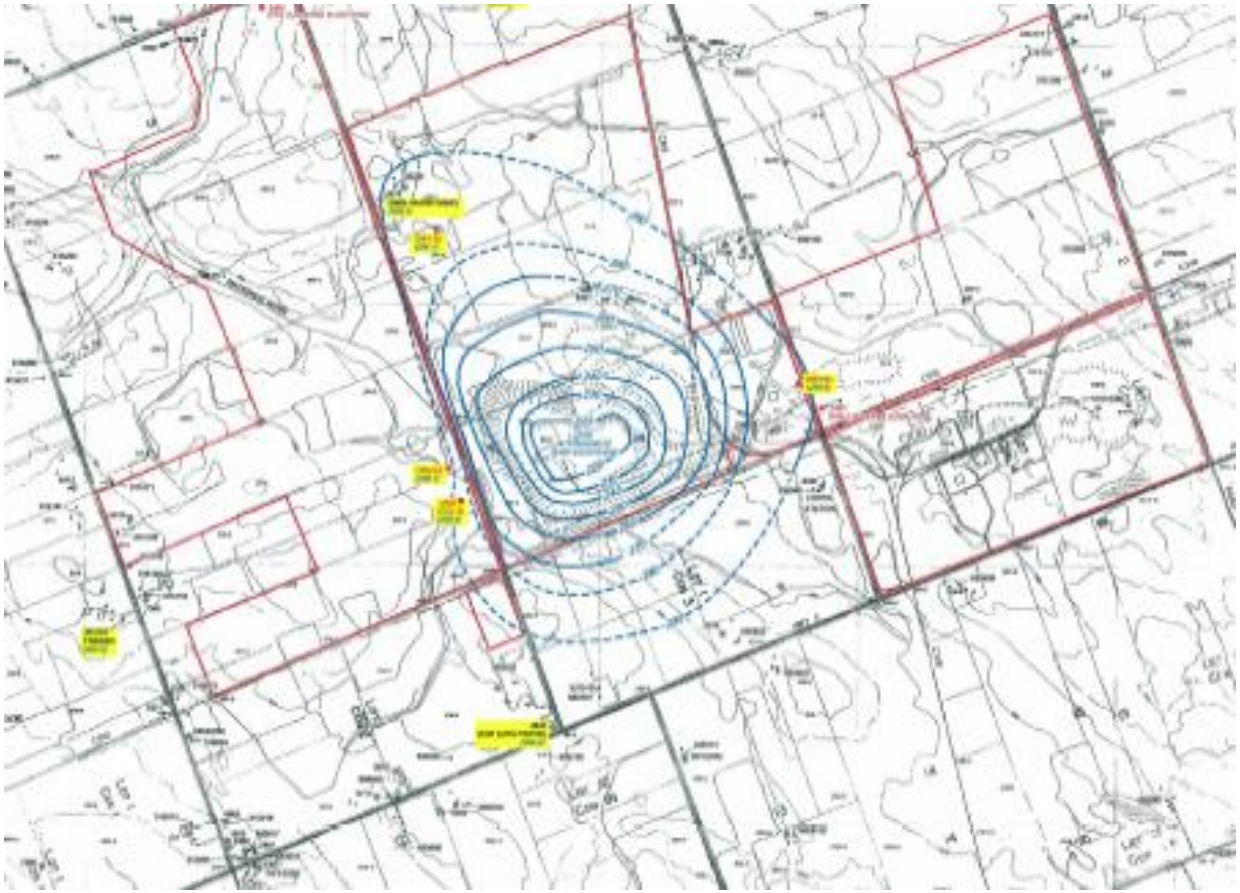
Quarry Dewatering

- Quarries used to obtain limestone for cement production must be kept dry
- Water sources include:
  - Rainfall
  - Groundwater in flow
  - Surface water flow
- Surface water flow can be controlled by berms
- The rest of the water removed from a quarry is a combination of storm water and ground water
- Example plant “A”
  - Pumped water is primarily storm water and the average flow of 469 m3/ day
  - This is primarily the <u>movement</u> of water

Ground water effects

- In quarries where groundwater infiltration into the quarry is significant, quarry dewatering can lower ground water levels around the quarry properties
- This is known as the drawdown cone
- Poorly sited or managed quarries can result in dry wells at neighboring properties
- In unusual cases, groundwater drawdown can have other negative effects on neighboring properties

Aquifer Water Levels (Typical)



Process Water Uses

Use	Consumptive?
Evaporative Cooling	Yes
Non-Contact cooling	No
Dust control	Yes
Washing	No
Domestic	No

Typical Plant Environmental Controls

- Discharge criteria and regulation
- Spill prevention and control plans
- Monitoring and Inspection
- Settling ponds and oil skimmers

Community Water Use

- Our shared ambition, public waterways that can be used for:
  - Swimming
  - Fishing
  - Drinking
  - Economic Activity
- We all need to do our part to ensure good water **quality** and **quantity**
- Businesses need to consider any unique water uses in their surrounding community
  - For example, for example plant “A” the local village takes its drinking water from the lake not too far from the plant

Airborne Deposition

- Concerns about the airborne deposition of toxic compounds is an emerging question for facilities on the Great Lakes
- Measures designed to minimize air emissions will also address their deposition into waterways
- Emissions include point sources (stacks) and fugitive dusting

Appendix
Plant “B” Example

Example Plant “B” Water Use Processes

- Steam generation from waste heat boilers to generate plant electricity
- Once through cooling water for grinding mills bearings
- Once through cooling water for air compressors
- Fire suppression systems
- Sanitary facilities
- Waste solidification
- Dust control
- Shipping plant cement product throughout the Great Lakes Basin and beyond

Example Plant “B” Water Balance

- 43 billion gallons withdrawn annually from lake and discharged back to the lake (118 MM gallons/day)
- 1 billion gallons annually discharged to lake from quarry dewatering (300 K gallons/day)
- 32 million gallons of city water used annually (90 K gallons/day)
- 42 million gallons discharged to city treatment works annually (115 K gallons/day)
- 30 K gallons per day lost to evaporation – dust control
- 400 K annually evaporation loss from raw materials to produce cement

Example Plant “B” Water Stewardship

- 45 million gallons annual withdrawal reduction by switching to air cooled compressors in plant
- 425 million gallons annual withdrawal reduction by switching finish mills to a glycol based closed loop cooling system
- 15 million gallons annual withdrawal reduction by replacing older and worn out equipment
- 5 billion gallon reduction (1%) in water usage in past 10 years