

Dawson City Wastewater

Ken Johnson
Planner and Engineer



Dawson City Wastewater

What is bad about sewage ?

Environment

Oxygen depletion

Eutrophication

Toxicity



Public Health

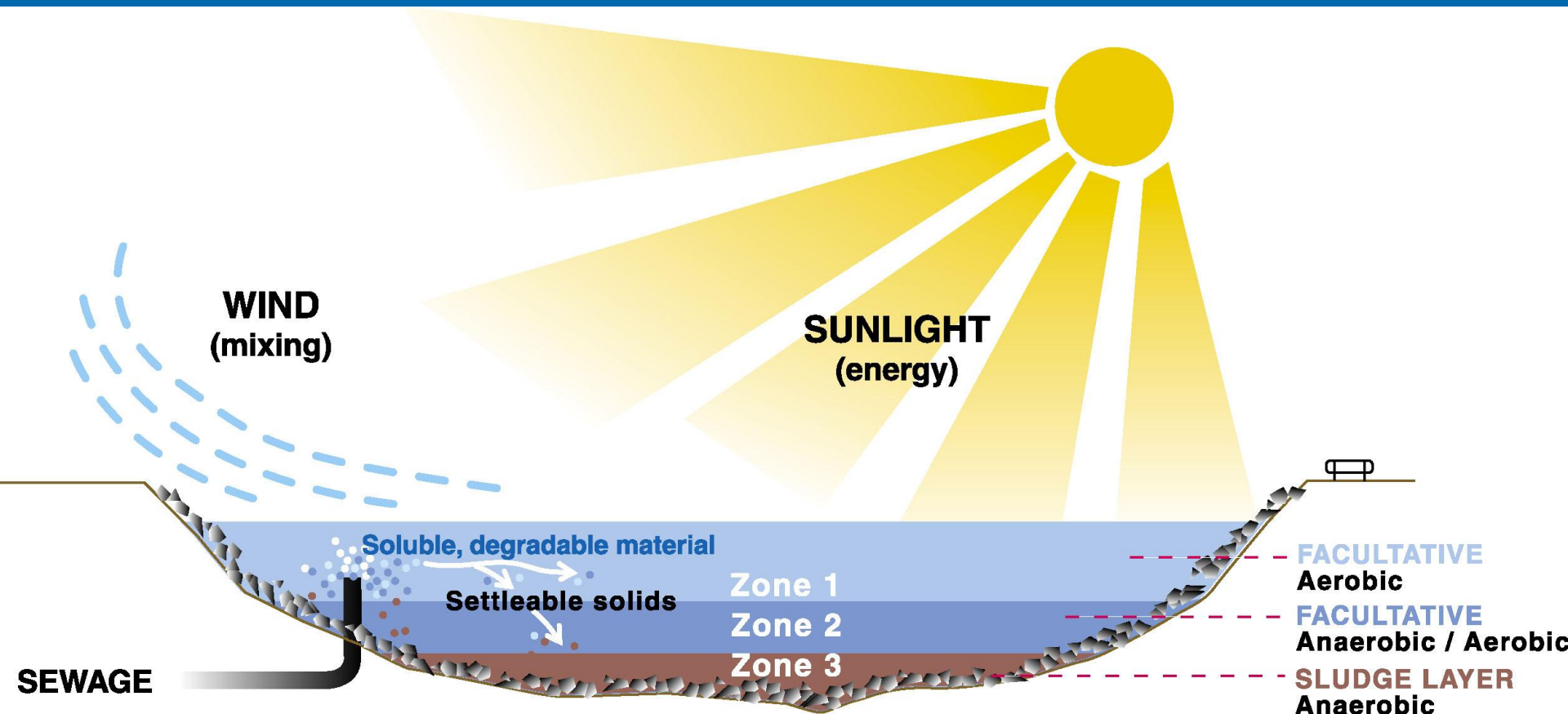
Water borne organisms which cause disease



Dawson City Wastewater

Lagoon system process basics.

Nature will provide complete sewage treatment



Dawson City Wastewater

Over a dozen community sewer outfalls emptied into the Yukon River before 1979.



Dawson City Wastewater

In 1980 a multimillion dollar capital program was initiated to modernize all of the community infrastructure.

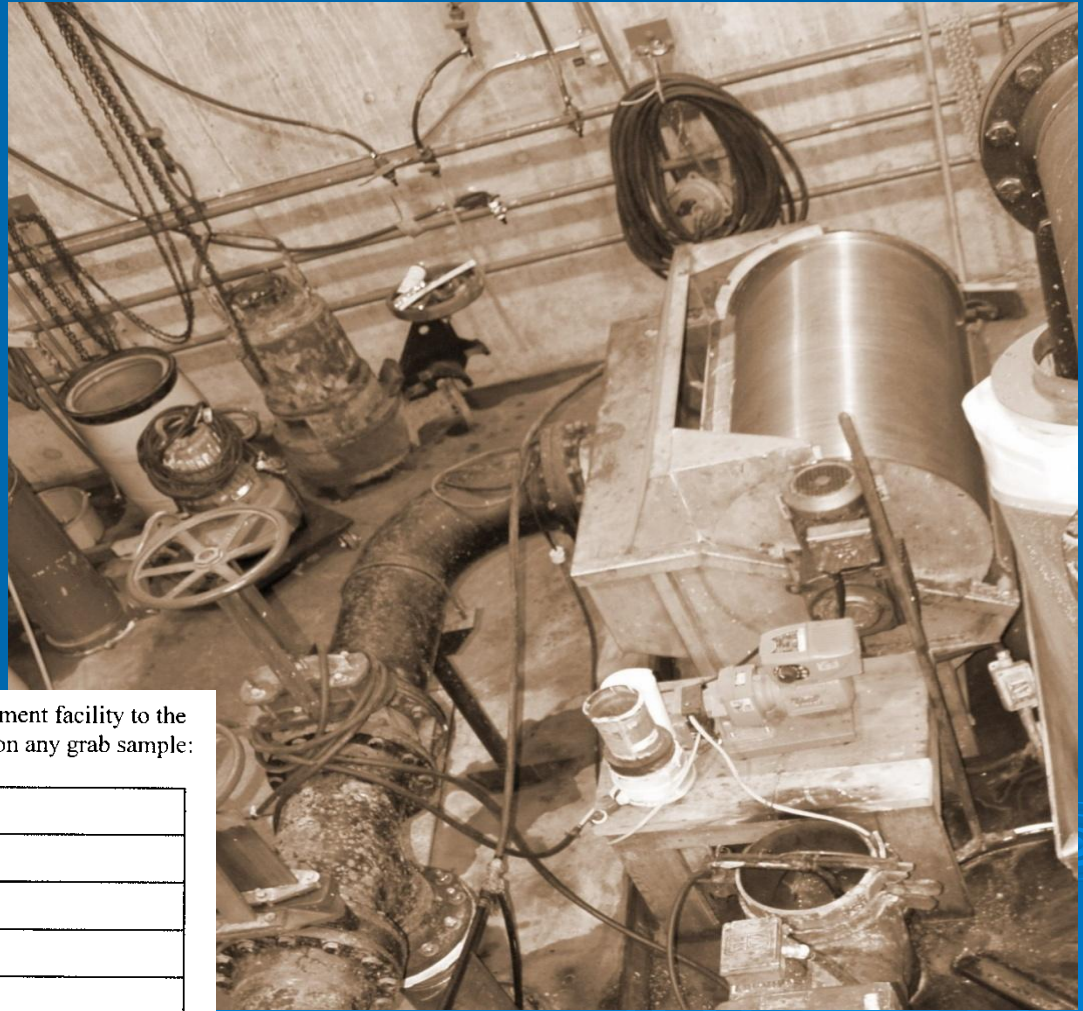
Community sewage collection



Community water distribution

Dawson City Wastewater

The 1980 improvements included a primary sewage treatment system and a submarine effluent discharge into the Yukon River.



Effective September 1, 2004, effluent discharged from the sewage treatment facility to the Yukon River shall meet the following effluent quality standards based on any grab sample:

Parameter	Maximum Concentration
Faecal Coliforms	20,000 MPN/100 mL
BOD ₅	45 mg/L
pH	6 - 9
Total Suspended Solids	60 mg/L
Oil and Grease	5 mg/L
96-hour Static LC ₅₀ Bioassay (100% concentration)	Non-toxic

Dawson City Wastewater

Screening Plant Performance

2010	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TSS	16	23	17	80	30	32	38	37	42	14	19	5
BOD	14	21	11	10	46	66	41	57	22	75	19	--
FC	0.52	0.25	0.14	0.08	1.1	4.9	--	0.2	0.2	0.2	0.2	0.02

1994 to 2010	Minimum	Maximum	Median	Average
TSS	3.0	137	21.0	27.0
BOD	7.3	146	31.0	39.8
FC	0.0016	54	0.5	1.5



Notes: TSS in mg/L; BOD in mg/L; FC (fecal coliforms) million MPN / 100 mL

Dawson City Wastewater

REASONS FOR SENTENCING

Introduction:

[1] The City of Dawson entered a guilty plea to a single count alleging that on August 16, 2000, it did deposit or permit to be deposited a deleterious substance, sewage, contrary to s. 36(3) of the *Fisheries Act* (R.S.C 1985, c.F-14), an offence contrary to s. 40(2) of that Act.



Dawson City Wastewater



Conclusion:

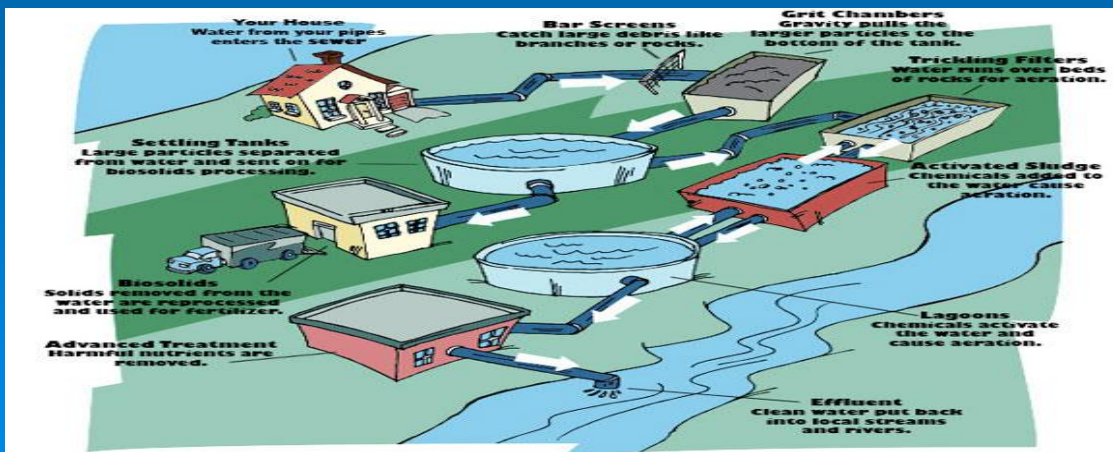
[58] In summary, the following facts are, in my view, relevant to the sentencing of the City of Dawson.

1. The charge before the court relates to one sewage sample taken on August 16, 2000 that failed the LC50 bioassay. Nevertheless, I am satisfied that the City of Dawson's discharge of sewage into the Yukon River during the spring and summer months since 1983 was frequently, if not continuously, in violation of the standards established by its water-use licenses.
2. Although knowingly in violation of both the water-use license and the *Fisheries Act*, the City of Dawson did almost nothing to reduce the toxicity of its sewage effluent until 1997.



Dawson City Wastewater

[59] Based on the unique circumstances of this case, I have concluded that the principles of sentencing and the public interest are best met by imposing a sentence that requires the City of Dawson to construct a sewage treatment plant that will remedy or avoid any harm to fish or fish habitat in the Yukon River. This will require a substantial additional expenditure of several millions of dollars. In addition, considering the history of delay leading up to the charge before the court, the sentence should impose monetary penalties if the City does not meet the timelines set out in their plan submitted to the Water Board as a result of lack of due diligence.



Dawson City Wastewater

Modern wastewater treatment offers a variety of process technologies that may produce very good effluent quality and reduce ammonia toxicity. Traditional wastewater treatment using lagoon systems also offers a similar effluent quality. Lagoons are, however, less stable than mechanical systems.

Ammonia
Nitrites
Nitrates

MBR

SBR

RBC

Anaerobic

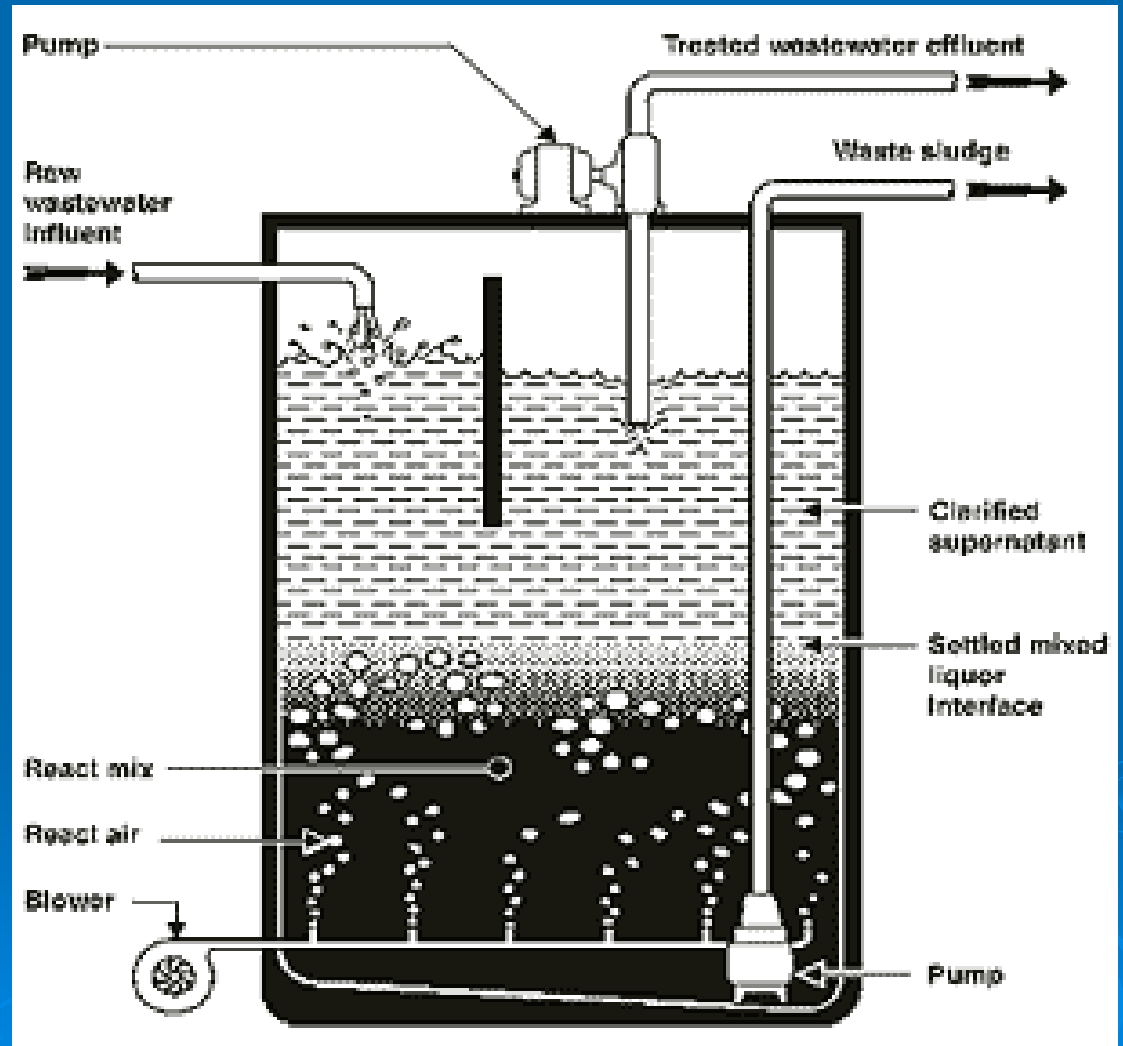
Aerobic

Facultative



Dawson City Wastewater

An SBR (sequencing batch reactor) solution was advanced to detailed design in 2003, and ready for tender. The estimated \$600,000 annual operating cost caused this solution to be deferred.



Dawson City Wastewater

An aerated sewage lagoon would be an appropriate sewage treatment solution for Dawson City. The process has been operating successfully in Alaska and northern British Columbia. A lagoon system, however, requires a considerable amount of land for construction.



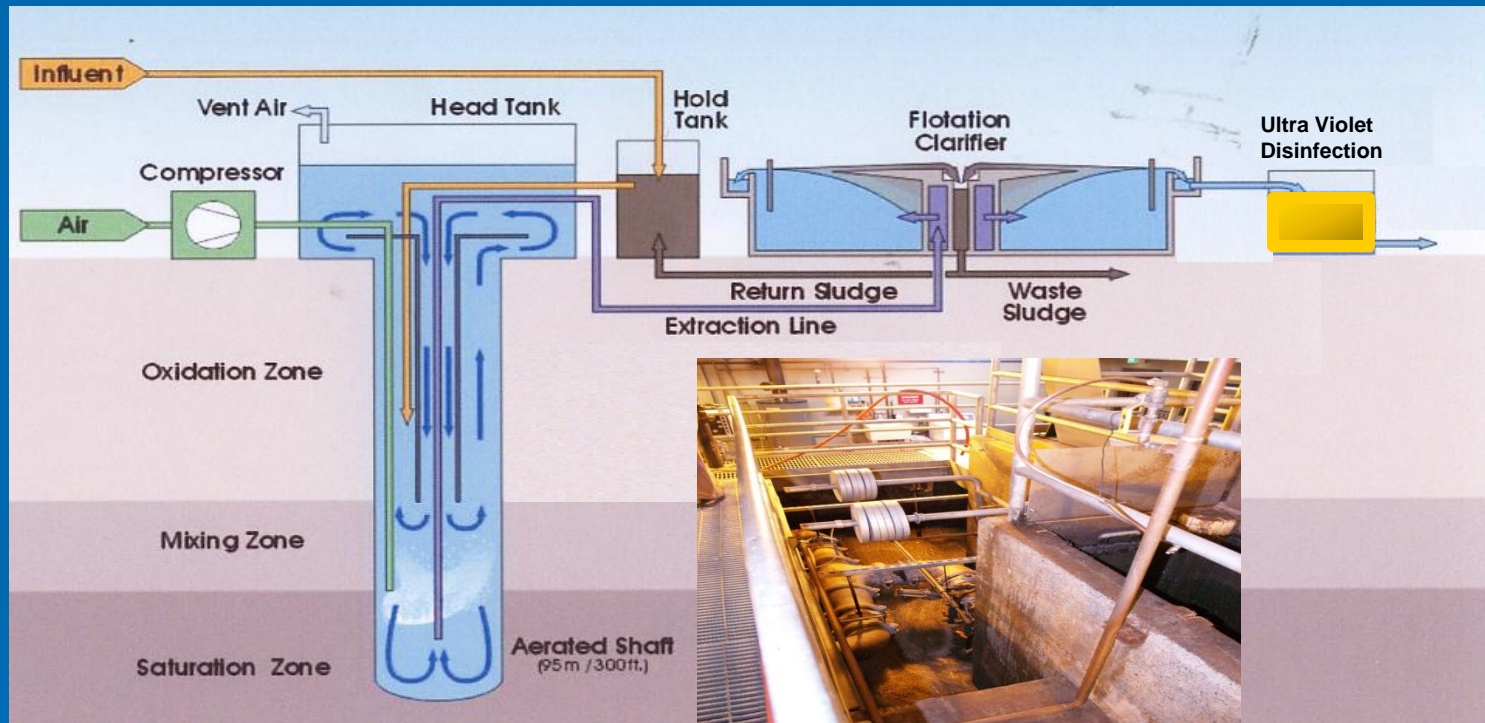
Dawson City Wastewater

A aerated lagoon sewage treatment solution was advanced to preliminary engineering before a land use referendum stopped any further development of the site. The estimated capital cost was \$15.7 M and the estimated annual operating cost was \$223,000.



The New Klondike Gold

Current Wastewater Process Under Construction



The deep shaft process is unique; a similar process has been operating successfully in Homer, Alaska for the past 18 years. The capital cost for the deep shaft technology will be approximately \$25 million, with an estimated annual operation and maintenance cost of less than \$300,000. The effluent quality is expected to meet the 25/25 mg/L (CBOD/SS) of the CCME guidelines.

Dawson City Wastewater

Current Wastewater Process Under Construction

The construction of the deep shaft wastewater facility began in spring 2010, and is scheduled for completion by December, 2011.



2010/09/06



2010/08/15

Shaft drilling



Two bioreactors extending 100 metres into the ground

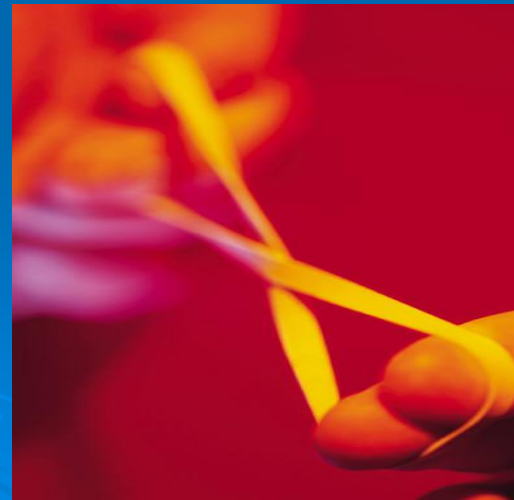
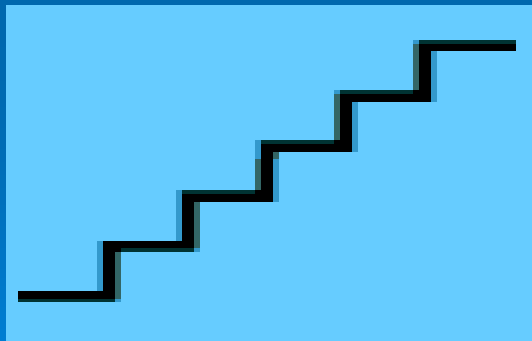


Finished building

Dawson City Wastewater

CCME MWWE Principles and apparent practices that are “rolling” out

- Be driven by the need to ensure **continuous improvement** in environmental protection
- Allow for **flexible implementation reflecting** cross Canada variability in ecosystems, local, regional provincial and territorial conditions



Dawson City Wastewater

CCME MWWWE Principles and apparent practices that are “rolling” out

- Use the water quality guidelines and other guidance developed through the CCME for **site specific considerations**

Environment Canada is undertaking 5 years of studies on wastewater treatment facilities in the far north to obtain performance related parameters for sewage lagoons in cold climates. However, a particular problem associated with this effort is delivering wastewater samples to testing laboratories in a timely manner.



Dawson City Wastewater

CCME MWWE Principles and apparent practices that are “rolling” out

- Be based on an **environmental risk management** model that will provide for a level playing field across the country

Biologists have suggested that the turbidity in the Yukon River is more deleterious to fish than the sewage discharge from Dawson City



Dawson City Wastewater

CCME MWWE Principles and apparent practices that are “rolling” out

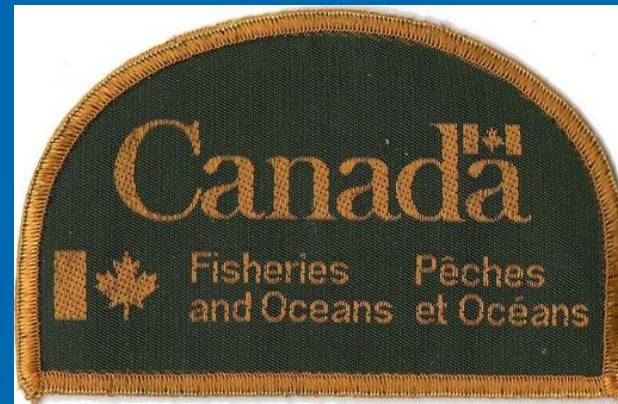
- Be **fiscally responsible and sustainable** by identifying costs and taking into account other environmental issues

The capital budget for the Dawson City wastewater facility is \$25 million – this is in addition to approximately \$8 million previously spent on “work” that was never implemented. The operation and maintenance budget is estimate to be \$300,000 per year.



Dawson City Wastewater

As much as regulations define the framework for environmental enforcement, the enforcement officers have a great deal of influence on the outcome of the enforcement.



Environment
Canada

Environnement
Canada



Indian and Northern
Affairs Canada

Affaires indiennes
et du Nord Canada

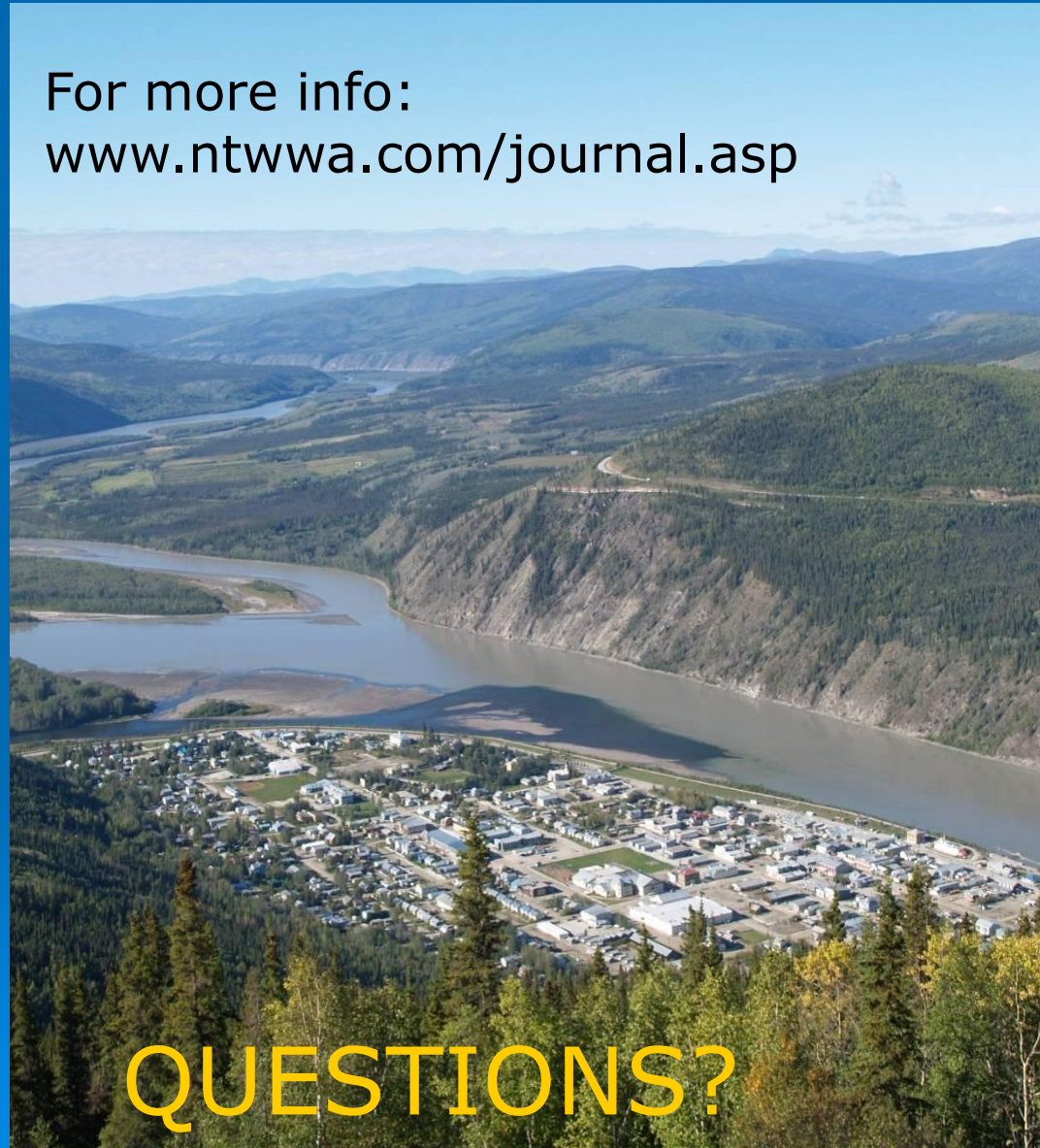
Dawson City Wastewater

Construction in Dawson has the opportunity for some unique surprises - the deep shaft construction uncovered an unmarked Gold Rush era grave that contained the bodies of Dawson first hangings in 1899.



Dawson City Wastewater

For more info:
www.ntwwa.com/journal.asp



QUESTIONS?



COOL IDEAS for management - technology - media