Ravensview Wastewater Treatment Plant Upgrades Value Engineering

CSVA 2011 Conference
Toronto, Ontario

Nov 14 -16, 2011

Scot McClintock and Allen Lucas

What is Utilities Kingston?

Legal Name – 1425445 Ontario Ltd.

Shareholders – 1 City of Kingston

Assets – Own Fiber Optic Only

We are the “Operating Authority for water and wastewater

Mission Statement

We are a community-based corporation dedicated to the responsible management of safe, reliable, integrated services.

Vision

To be recognized as a company committed to innovation, prosperity and service excellence, valued by our customers and reinvesting in our community's future.

Values

We are a team recognized for being

Honest

Motivated

Respectful

and

Reliable.

Why We Used Value Engineering

7.0 Assignment Objectives and Divisions of Service

:

the consultant's work shall also include the following Divisions of Service, which are generally based on Professional Engineers of Ontario project guides.

:

Division 1–Consulting, Advisory, Investigative and Predesign Services

:

value engineering at various project stages;

utilities kingston
water sewer gas electricity networks
all your utility services under one roof

Request for Proposal
for
Consulting Services to Complete

Ravensview Water Pollution Control Plant
Secondary Treatment and Capacity Upgrades
Detailed Design, Construction Administration
&
Post Construction Services

requested by:

Utilities Kingston
211 Counter Street
P.O. Box 790
Kingston, Ontario
K7L 4X7

issued on:

May 7, 2004

RAVENSVIEW 2004

Ravensview WWTP

- Identified as requiring upgrades to increase hydraulic capacity and treatment process
- Subject to a Provincial Class Environmental Assessment Update and a Canadian Environmental Assessment Act Screening (funding was the trigger)
- The largest municipal capital project undertaken in Kingston’s history.

One VE Proposed

- The design engineering team, lead by J.L. Richards & Associates Ltd proposed:
  - a single Value Engineering exercise at completion of preliminary design;
  - an external facilitator, Scot McClintock.
- Participants included:
  - project design staff;
  - other engineering staff not assigned to the project; and
  - Utilities Kingston operators, engineers and management

Value Engineering Exercise

- Rationale: The Value Engineering exercise challenged many of the design assumptions made.
- Benefits:
  - Additional operation redundancy;
  - Additional operator safety; and
  - cost savings can be attributed to the measures identified.

Objectives of VE Study

- Refine design to better meet project objectives in context of overall Ravensview site and the community.
- Identify opportunities to reduce cost while preserving and/or improving functionality and key project objectives.
- Consider increased cost if value added to project (e.g. process flexibility, better site use, etc.) outweighs cost.
- Achieve lowest 25 year life cycle cost in broadest context of operations, maintenance, redundancy, reliability, process stability, sustainability, capital cost, etc.
- Obtain best value for monies spent in same broad context.
- Support the Utilities Kingston vision for the project.

Value Engineering Exercise

- Used Top Ten Project Cost Model, Project Risk Register, and Function Analysis Systems Technique (FAST) Diagram to select 7 Value Target Areas.
- Defined Value as:

$$\text{Value} = \frac{\text{Worth}}{\text{Cost}} = \frac{\text{Plant Performance, Operability, Reliability, etc.}}{\text{Life Cycle Cost}}$$

- Generated 136 creative ideas through brainstorming.
- Developed 39 VE Proposals.
- Made 14 design suggestions for Utilities Kingston and design team consideration as design went forward.

Value Engineering Exercise

HANSCOMB FAITHFUL & GOULD
SUMMARY OF VALUE ENGINEERING STUDY RESULTS

Project: **Ravensview Water Pollution Control Plant Upgrades**
Location **Kingston, Ontario**
Date: **January 31-February 4, 2005**
Client: **Utilities / Kingston**

Value Target Area: **Electrical, Instrumentation, Controls**
Functions: **Power facilities, Power equipment, Light space, Generate power, Control facilities & process, Monitor process**

Idea No.	Description	VE TEAM EFFORT				IMPLEMENTATION			Comments
		Eval. Score	VE Team Action	Initial Cost Savings	LCC Savings including 25 yr O&M	Reject	Accept	Further Study	
E - 1	Build bigger co-gen to burn digester and natural gas, use electricity on site	2	X						
E - 2	Provide substation and power feed redundancy	8	P	($200,000)	($200,000)		X		16 week delivery for replacement
E - 3	Service of 6000 amp switchboard	10	P	($50,000)	($65,622)		X		$150,000 / $165,622 without E-2
E - 4	Use co-gen technology to provide heat	10	P	($8,000,000)	($12,686,600)			X	
E - 5	On-site incineration of sludge for power	1	X						
E - 6	Rockwell SCADA system	1	X						
E - 7	Utilize as much existing equipment as possible	1	X						
E - 8	Provide operator interfaces in the field using laptops	7	P	($20,000)	($25,000)		X		Rely on multiple "tough" laptops
E - 9	Do vibration analysis	10	P	($138,000)	$306,446			X	Especially continuous & critical
E - 10	Use different conduit materials as appropriate	10	DS						
E - 11	Central bank of skid-mounted generators	1	X						
E - 12	Gas powered drives for pumps and blowers	1	X						
E - 13	Keep substation close to BAF	9	DS						
E - 14	Secondary effluent metering	9	P	($10,000)	($13,124)		X		
E - 15	Alternate on-site routing for electric feed	10	P	$25,500	$25,500		X		Less impact to Gates Road residents
E - 16	Devicenet communication	10	P	($851)	($78,961)		X		
E - 17	On / off controls	1	X						
E - 18	Optimize level of control and monitoring	8	P	($115,512)	($131,134)			X	Sludge density to optimize chem use
18			**11**	**($255,351)**	**($357,207)**		**6**		

Maximum Cost Savings (Sum of Items Marked +)

Legend:

P = Proposal (approximate value of suggestion is identified)

DS = Design Suggestion (value of suggestion is not quantifiable or requires definitive design effort)

Value Engineering Exercise

HANSCOMB FAITHFUL & GOULD
SUMMARY OF VALUE ENGINEERING STUDY RESULTS
OVERALL SUMMARY

Project: **Ravensview Water Pollution Control Plant Upgrades**
Location: **Kingston, Ontario**
Date: **January 31-February 4, 2005**
Client: **Utilities / Kingston**

No. of Ideas Identified	Value Target Area	No. of Ideas Carried Forward	Ideas Carried Forward to Total	Maximum Potential Capital Cost Savings (Rounded)	Max Potential Life Cycle Savings with 25 Year O&M (Rounded)
28	BAF Facility	13	1	600,000	600,000
18	Anaerobic Digestion	6	1	30,000	30,000
18	Electrical, Instrumentation, Controls	11	6	(255,351)	(357,207)
14	Existing System Upgrades	6	1	(200,000)	(200,000)
21	Site	6	1	1,362,124	1,362,124
8	Septage	3	1	1,741,675	1,741,675
29	Sludge Dewatering and Storage	8	4	2,423,000	1,871,023
136	Summary	53	15		
	Total Potential Savings/Cost Adjustment			$5,701,448	$5,047,615
	Adjustment For Overlap & Estimating Contingency		20%	($1,140,290)	($1,009,523)
	Grand Total Potential Savings/Cost Adjustment (Rounded)			**$4,600,000**	**$4,000,000**

Legend for Summary Sheets:
P = Proposal (approximate value of suggestion is identified)
DS = Design Suggestion (value of suggestion is not quantifiable or requires definitive design effort)
X = Dropped from consideration. (i.e. found to be not feasible, non cost-effective, etc.)

Value Engineering Implications

- An estimated $4,500,000.00 in savings have been estimated, value to be detailed. There will be additional functionality and operations safety as a result of the proposed changes. The design elevations and configurations are to be optimized which may result in further benefits and savings.

Value Engineering Significance

- Deferring septage receiving at this facility will impact the users and the design will still consider inclusion of the potential loading as the receiving may be relocated or included at a future date.
- Redundancy will result in long term life cycle cost savings.
- Overall budget impact is an increase in the available contingency, which may be adjusted.
- Schedule will not be affected.

Value Engineering Approval

Ravensview Water Pollution Control Plant Upgrades & Expansion
Design and Construction Administration

JLR No. 20052 / UK 03-01-02

Initiated by: Senior Management Team as discussed on February 17, 2005
Prepared by: Dan Lalande, P. Eng., J.L. Richards & Associates Limited
Date: February 17, 2005

CHANGE MANAGEMENT No. 8 – VALUE ENGINEERING CHANGES

Describe Change:

As result of the Value Engineering Workshop, the following significant scope changes are adopted:

- Implementation of a Septage Receiving Facility at this site is deferred and removed from this project except for the discharge piping which may be required at a later date.
- Additional space (2nd floor addition) for the Operation Centre (Admin. Bldg.) is no longer required; the existing 1st and 2nd levels will be renovated as part of the project.
- Sludge storage is to be provided on-site for the equivalent of 200 days of sludge generated at the ultimate average design flow of 95,000 m^3/day.
- A sludge storage silo is not required as part of the dewatering facility. Sludge will be loaded and hauled directly from the on-site storage facility.
- The electrical sub-station and main switchboard shall have redundancy.
- A permanent influent by-pass pipe or channel shall be provided around the screenings building and the grit removal process.
- The sludge dewatering and storage functions are to be provided via separate buildings.

In addition, various relatively minor changes or design suggestions are to be incorporated as summarized in the Value Engineering Study report.

Describe Impact To:

Overall Budget:	$102,842,000
Cost for this Change:	Savings of approximately $4,500,000.
Remaining Contingency:	$20,677,000+CM05
Consulting Budget:	Savings included above.
Schedule:	Nil
Other:	Nil

Individuals Endorsing Change

Roger Tedford — Date: March 10, 05
Jim Miller — Date: 10/3/05
Kevin Riley — Date: 10/3/05
Jim Keech — Date: Mar 9/05

Authorization to Proceed:

Dan Lalande, P. Eng — Date: March 12, 2005
J. L. Richards & Associates Limited

Allen Lucas, P. Eng. — Date: Mar 11/05
Utilities Kingston

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Lessons Learned

- Formal Value Engineering is important for the overall success of a project,
- Engage a broad range of stakeholders to participate in the process,
- Senior management need not participate in the entire exercise, but must be involved at key times,
- Value Engineering should not be considered solely to trim costs, and
- Commitment by all parties adds value to the process.

RAVENSVIEW 2010

Questions?

Thank You

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