

Deep River 330,000 Gallon Elevated Water Tank Video Inspection

INTRODUCTION:

A remotely operated vehicle (ROV) with attached submersible camera and lighting was used to perform an internal visual survey, while full of water and in service, of the Town of Deep River elevated potable water tank on May 19th, 2006. The ROV was disinfected using sodium hypochlorite and potable water prior to being lowered into the tank. The inspection was recorded on VHS (and DVD) and photos of the internal areas above the waterline, external areas and components of the tank and a photo of the roof hatch lid closed and locked after the video was completed are also included in the report.



330,000 Gallon Capacity, Six Legged Structure, Elevated Tank

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CONCLUSIONS:

- 1) Random pitting corrosion and small areas of rust deposits were seen on the walls and some welds. No large areas of coating failure or corrosion were seen except on the underside of the roof there is an area of rust beginning to show – see photo.
- 2) There is light, brown-coloured sediment on the lower and floor areas of the tank typically seen in most potable water storage facilities.
- 3) The fall-arrest system on the domed roof has missing fasteners and the main fall-arrest rail up the vertical access ladder is open-ended at the top.
- 4) Noted in 2000: several bracket angle welds inside and under where the riser pipe meets the tank bottom are cracked but are no worse now; the roof top vent is in good condition but there is a gap between the screening and the vent cap; bracket welds attaching the overflow pipe to the upper portion of the tank are cracked but are no worse now; external areas of rust and flaked off paint are visibly larger than they were six years earlier – see photos.
- 5) At the normal high-low water level, light orange-brown staining seen on the wall typical of that seen inside most potable water storage vessels – see photo.
- 6) After the video inspection was completed, the roof top manway lid was closed and secured using a replacement “Master Lock” padlock and the only copy of the key was given to OCWA personnel.

RECOMMENDATIONS:

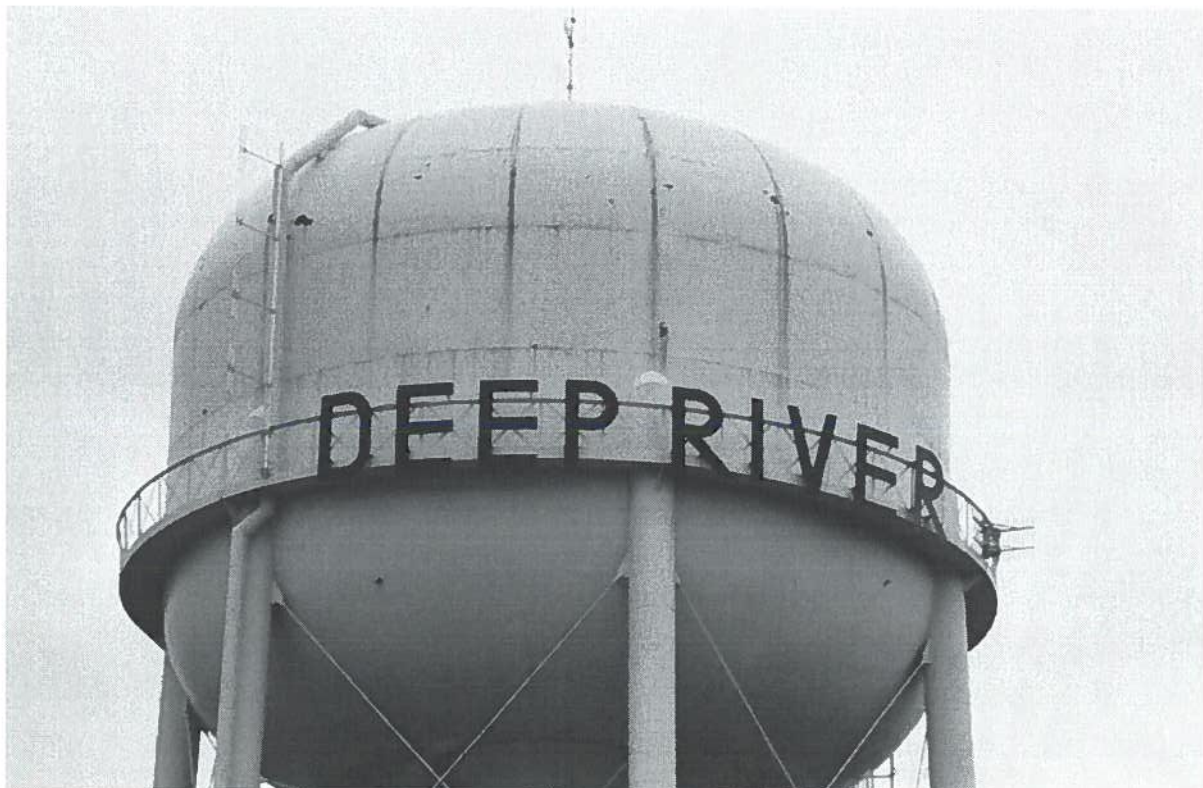
- 1) Town of Deep River public works staff to review the inspection video, photos and this written report as well as any previous inspection or repair history information.
- 2) If and when the tank is ever drained for cleaning or other reason, visually inspect the floor areas now covered by sediment to check for corrosion/wall loss. Ensure that a fall-arrest system is worn at all times when standing inside the tank.
- 3) If and when any external recoating of the tank is performed, ensure that internal touch-ups or weld repairs have been completed prior to going ahead with external painting. Ensure that inspection performed after sand-blasting and prior to recoating is performed by qualified personnel.
- 4) Install an approved “spring-loaded” stop at the top of the main fall-arrest rail to ensure that persons can safely move from the ladder to the catwalk. Install more fasteners as required on the lower portion of the fall-arrest rail on the domed roof.
- 5) Reinspect internally in two years to check on the progress of pitting and rust seen this time. Continue to monitor the tank externally until recoating is performed.
- 6) Replace the chain holding the circular grill to block any possible unauthorized access to the vertical access ladder. Install some form of “motion sensing” alarm to alert operating personnel in case of unauthorized climbing of the tank.

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INSPECTION/DISCUSSION:

As requested by Mr. Belo Csomor, Town Superintendent, a submarine video inspection was performed internally. Some external areas of interest were noted and photographs taken are incorporated into the report on subsequent pages.

A self-propelled submarine ROV equipped with a high resolution, colour tilt camera and attached lighting was brought up onto the tank roof, disinfected using a mixture of sodium hypochlorite with potable water supplied by OCWA – Ottawa Valley Hub, then lowered into the tank through the circular roof hatch opening next to the ladder. Using the attached thrust motors, the ROV was maneuvered up and down the inside and viewed the walls, welds, floor, riser pipe and areas above and at the water line. In the June 29th, 2000 video survey, the scans were mainly vertical up and down but in this 2006 survey the scans are also circumferential at different depths. The ROV position is not always known but enough views were recorded in all areas to provide a condition assessment.



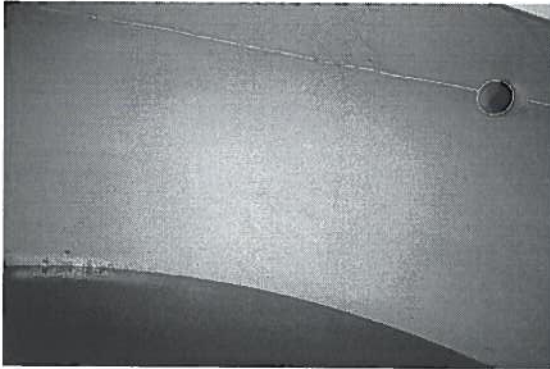
View of Tank Showing Some External Rust Deposits

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Below is an explanation of the inspection video with brief comments and approximate locations of the areas seen and times in hour: minutes: seconds.

0:00 to 5:00 – orientation and testing of the ROV while floating on the water surface.
5:00 – begin moving down a section of wall. 6:00 – view several small rust spots on circumferential weld, continue moving down. 6:30 – moving down the curved lower portion of the tank, dark loose sediment seen. 7:00 – turn ROV towards the bottom centre of the tank, view bottom sediment. 7:30 – view of riser pipe opening, raised “mud” ring around the opening prevents sediment or other debris entering and going down into the riser pipe. 8:00 to 10:00 – enter riser pipe opening, view looking up at the small welded stiffener plates around the riser circumference, some cracked welds (noted in 2000).
10:00 to 29:30 – moving down the riser pipe. @ 10:30 – view small random rust spots and spots on a circ weld. @ 15:45 – small linear line of rust on circ weld. @ 27:00 – bottom of riser, view looking down at the round baffle cover plate on inlet/outlet pipe.
29:30 to 39:15 – moving up the riser pipe out and up into the tank. 42:30 – view looking up at the tank roof of a discoloured area beginning to rust. 43:30 – down a section of wall at random, some coating loss near water surface. 45:30 – close up view of four small rust spots on circ weld, beginning moving right (clockwise) around tank viewing mid level of the tank and circ weld. 47:30 – view random pitting spots below circ weld, continue moving clockwise around. 49:00 – view further random pitting. 49:30 – view rust spots on lower circ weld. 50:00 – view lower portion of tank. 52:00 to 55:30 – moving around the entire troughed area of the tank where it would be expected that the most sediment and debris would collect. @ 52:30 – view on spot of pitting deposit on weld, weld profile can be seen through the sediment indicating the thickness of the sediment is not great. @ 53:00 – section of floor sediment with a different texture from the surrounding sediment, continue moving clockwise around floor. 55:30 – begin moving back up wall, some random pitting seen. 57:00 to 58:30 – rust spots on circ weld. 59:00 – old fillet weld indications on wall, small areas of rust. 59:30 to 1:02:30 – view above the water line moving right. 1:02:30 to 1:05:00 – view the walls below the water line moving left (counter clockwise). 1:05:30 to 1:09:00 – move down in the tank centre and around looking down to view wide areas of the floor, move up to view circumferential section of wall. @ 1:06:30 – view a small area blown clear of sediment by the ROV thrust motors. 1:09:30 – move right around lower section of the tank wall. 1:11:30 to 1:12:30 – view roof. 1:14:00 – view overflow pipe, down tank centre again. 1:15:00 to 1:17:00 – move around outer curved edge of tank floor. 1:17:00 – moving left viewing mid section of tank wall. 1:20:00 – move to view riser pipe to tank interface area (pause to 1:28:00). 1:31:00 to 1:34:00 – view riser pipe to tank interface area again. 1:34:00 – random rust spots. 1:35:00 – water surface, small bits of coating loss on circ weld. 1:35:30 – view looking up at roof and overflow pipe. 1:36:22 (end).

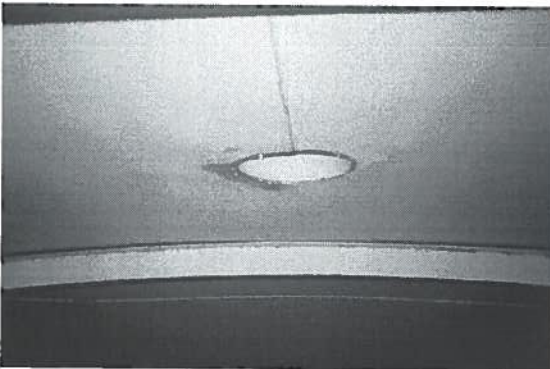
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Wall, Overflow Pipe (see view in 2000)



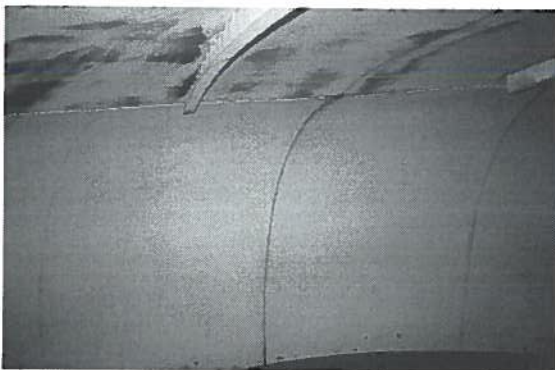
Roof Plate, Support Beam, Overflow Pipe



Underside of Roof Centre, Vent Opening



Roof to Wall Overlapping Steel Plating

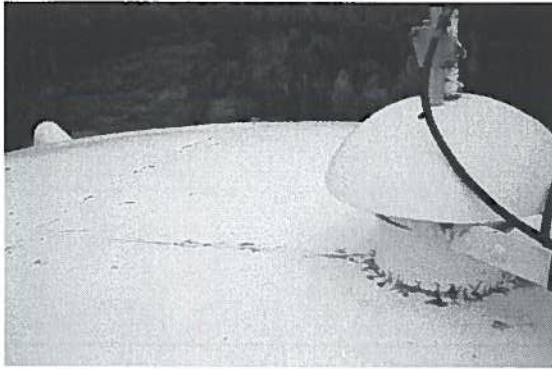


Underside of Roof Looking Approx. South
Area Beginning to Rust is Seen on Video

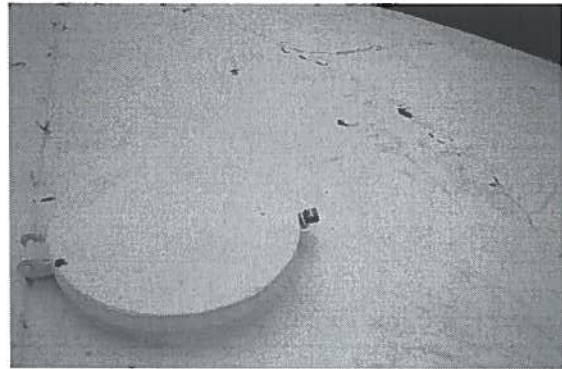


Underside of Roof Above Photo at Left
All Internal Photos Taken from Hatchway

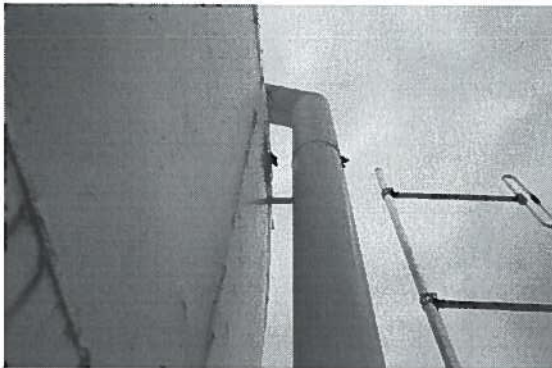
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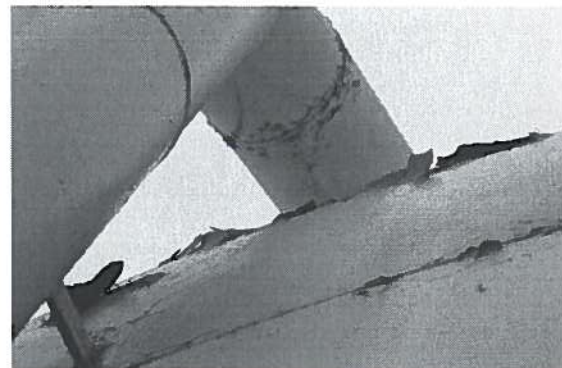
Roof Vent Cap (see view in 2000)



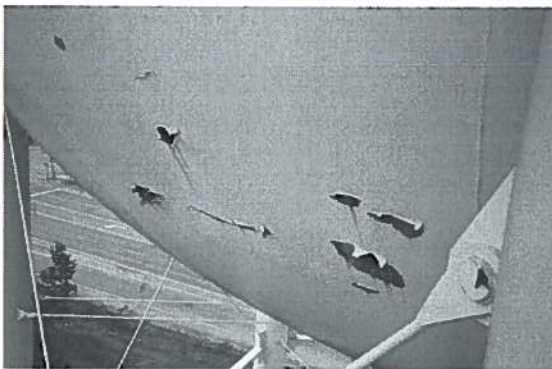
Hatch Secured and Locked after Inspection



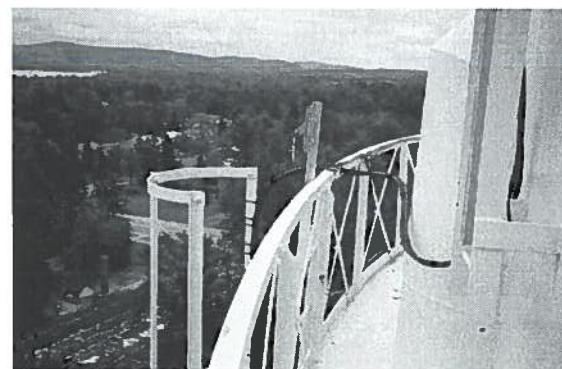
Overflow, Cracked Support Weld (see 2000)



External Paint Flaking Off near Overflow



Lower West of Tank Areas of Coating Off,
Three Spots of Coating Off Here in 2000



Top of Long Fall-Arrest Rail Centre of Photo
& Loose Fall-Arrest Rail on Right at Tank

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Town Of Deep River

Water Treatment Plant

Nov. 09 / 2006

A dive crew was mobilized to the treatment plant to investigate water loss from the clear well. Divers set up and disinfected surface supplied dive gear for entry. After lock outs were in place a diver conducted an inspection of the entire well. (Milk in a squirt bottle was utilized to detect and confirm a leak.) The inspection areas focused on were the interface of the walls and the floor slab and the interface between the support columns and the floor slab. The diver accessed the clear well through the access hatch located on the south wall at east corner.

Diver Observations:

South Wall / floor Slab Interface

- There is separation of the masonry sealing strip and failure of the Vandex waterproofing along the south wall starting at the sump and continuing approximately 40 feet to the west.
- The gap is a 1/4 inch to 3/8 of an inch wide and was probed up to inches with a putty knife.
- The cold joint is leaking for approximately 20 feet in the middle of this area.

West, North & East Walls / Slab Interface

- No issues were found at these locations.
- Condition of concrete appears to be good.
- Masonry sealing material appears to be in good condition.
- Vandex waterproofing appears to be in fair condition with signs that it's deteriorating.

Support Columns / Slab Interface

- No issues were found at these locations.
- Condition of concrete appears to be in very good.
- Masonry sealing material appears to be in good condition.
- Vandex waterproofing appears to be in fair condition with signs that it's deteriorating.

Condition of floor slab

- Floor slab could not be observed in most areas due to sediment build up of approx. 1 to 12 inches and sand build up exceeding 18 inches.
- In areas where slab was evident it appears to be in good condition.

Ceiling

- Overall the ceiling appears to be in good condition. Concrete slab has some hair line cracks with no evidence of infiltration of outside water.

Conclusion

General condition of clear well appears to be in good condition. The Vandex seal is fair condition with signs that is deteriorating with some delimitation. A future replacement or inspection should be considered. There is silt and sand sediment build up on almost the entire floor of the wetwell. Depths of sediment vary from 1 inch to 12 inches with some sand build up exceeding 18 inches. The only evidence of water loss appears to be isolated to the south wall.

Reconditions as per requested by Belo Csomor:

1. **Option 1**-Immediate sealing of damaged area utilizing a closed cell foam backer rod. (Note this repair could prove to be adequate if monitoring water loss is possible. If it is decided a more permanent repair is required see Options 2 & 3.)

Method

- Diver to prep crack between wall and masonry seal.
- Pack foam into crack to stop or slow down leak. The effectiveness of this method should be evident as backer rod is applied or very shortly after.)

2. **Option 2**- repair utilizing un-oiled Oakum and THOR ROC hydraulic cement (NSF approved).

Method

- Divers to remove old masonry seal
- Pack cold joint with un-oiled Oakum
- Apply hydraulic cement seal into void

3. **Option 3**- repair utilizing ADEKA water stop (NSF approved) and THOR ROC hydraulic cement.

Method

- Divers to remove old masonry seal
- Prep cold joint
- Pack crack with ADEKA water stop
- Apply hydraulic cement seal into void

Note this water stop expands and could cause failure of hydraulic cement.

If you have any questions or concerns please contact us any time.

Regards,
Ken Rule
Operations Manager

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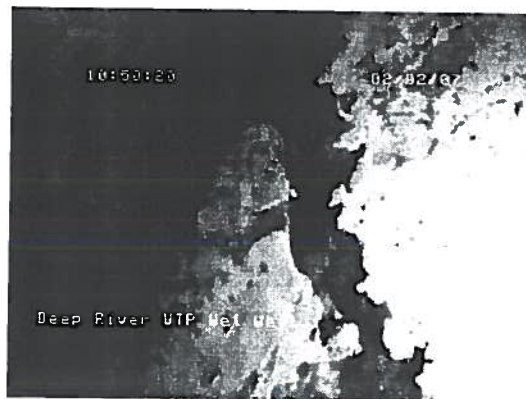
Town of Deep River **Water Treatment Plant**

Feb. 5th 2007

A dive crew was mobilized Feb. 2nd / 2007 to monitor, inspect and add additional sealing material to the south wall of the clear well if required. The inspection included underwater video documentation of the temporary repair in the clear well. All diving equipment, tools and sealing material were disinfected with chlorine supplied by the OCWA prior to entry. The diving operations were conducted in compliance with CSA Z275.4-02 standards and Ontario Diving Reg. 629/94.

Diver Observations:

- The crack on the south wall to floor slab interface appears to have decreased in width since the last inspection.
- During the inspection the diver located 3 areas along the south wall to add additional sealing material.
- 2 of the 3 areas were completely sealed; the leak in the sump area was reduced.
- The crack in sump is 2m to 3mm in width and is too narrow to except the sealing material.



Crack in Sump Well

Conclusions:

- It appears that back filling the outside of the clear well has helped stabilize the south wall.
- Leakage has been completely stopped except for one location in the sump.
- The leakage in the sump area has been reduced to a minor amount.

If you have any questions or concerns please contact me at any time.

Regards,
Ken Rule
Operations Manager