

# OFFICE MEMORANDUM

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MICHIGAN  
STATE HIGHWAY DEPARTMENT

April 15, 1965

To: W. W. McLaughlin  
Testing & Research Engineer

From: E. A. Finney

**Subject:** Sampling and Analysis of Artesian Water in Caisson No. 4 on Fisher Expressway (I 75) Crossing Rouge River in Detroit (B01 of 82194G, C1). Research Project 62 G-112. Research Report No. R-509.

This is a brief report on Research Laboratory Division test results covering subject water samples obtained, a) from artesian test well outside of caisson, and b) from percolating leakage in caisson. This is in accordance with your memorandum to C. B. Laird dated March 12, 1965, approving his earlier request.

The sampling and analysis were conducted by Messrs. M. G. Brown, W. L. Frederick, and J. T. Ellis who report as follows:

On arrangement by D. Hines, four, 4-in. test wells were drilled two ft outside of caisson No. 4 and about six ft apart about March 12, 1965 (Fig. 1). This was in accordance with a decision reached at a meeting in the Office of Testing and Research on March 1, 1965, concerning the leakage of artesian water into the slag fill inside caisson No. 4. These test wells were drilled off the north, or upstream side of the caisson and extended down into the glacial till layer on top of bedrock some 80 ft below the top of the caisson. Only one of the test wells had a substantial flow amounting to about 15 gpm.

When the project was visited about one week later on March 19, the artesian water pressure had apparently been relieved enough by the test wells to allow the water level inside the caisson to drop 10 in. below the top (Fig. 2). However, on March 25 this level had not changed inside the caisson and exterior flow was still primarily confined to the one test well. The river level was about 5 ft below the interior water level at this time, or about 6 ft below the top of the caisson.

Three, one-quart samples were obtained from the interior of the caisson and also from the one test well which was flowing on March 19, 1965. These were obtained with the assistance of J. J. Sanchez, Project Engineer. Additional samples were obtained from the flowing test well on March 25 to substantiate the previous analysis of the hydrogen sulfide content. Analysis was performed at the project site on the March 25 visit to obtain greater accuracy.

W. W. McLaughlin

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Samples had also been obtained on March 8 and 12 and submitted for analysis to the Testing Laboratory Division. Results of our samples of March 19 and 25 are summarized with the earlier Testing Laboratory data in the attached Table 1.

A review of Table 1 would indicate that for the present, the hydrogen sulfide and sulfate content of the caisson artesian water is being removed by the open hearth slag fill. This, of course, would only be temporary should water resume its flow and deplete the neutralizing chemicals in the slag fill.

OFFICE OF TESTING AND RESEARCH

E. A. Finney, Director  
Research Laboratory Division

EAF:nl

Attachments

cc: P. A. Nordgren  
A. J. Sinelli  
D. J. Hines  
D. N. Hart  
S. J. Vracan  
C. J. Olsen

TABLE 1  
SUMMARY OF SULFIDE WATER CHEMICAL ANALYSIS  
(Outside and Inside Caisson No. 4)

Test Performed	Artesian Flow in Test Well(a)		Flow Inside Caisson No. 4(b)	
	65 CH-101	65 MR-18 & 19	65 CH-83	65 MR-17
Sample Number				
Testing Agency	TLD	RLD	TLD	RLD
Date Sampled	3-12-65	3-19 & 25-65	3-8-65	3-19-65
pH	7.2 (approx.)	6.8	10.5-11.0 (approx.)	12.1
Total Solids, percent	0.356	0.374	0.315	0.293
Organic Matter, percent	0.083	0.077	0.121	0.030
Chloride (Cl <sup>-</sup> ) Ion. Conc., ppm	250	428	108	132
Sulfate (SO <sub>4</sub> <sup>=</sup> ) Ion. Conc., ppm	1,655	1,720	9	None
Hydrogen Sulfide (H <sub>2</sub> S), ppm	--	105	--	1
Total Alkalinity (CaCO <sub>3</sub> ), ppm	--	--	--	2,590

(a) Artesian flow from glacial drift layer 80 feet below caisson top.

(b) Interior water after passage up through about 77 feet of open hearth slag fill.  
Sample 65 MR-17 had been stagnant in caisson for several days before sampling.



Figure 1. Three of four, 4 in., test wells on north side of caisson no. 4. Note artesian flow of about 15 gpm in left pipe.

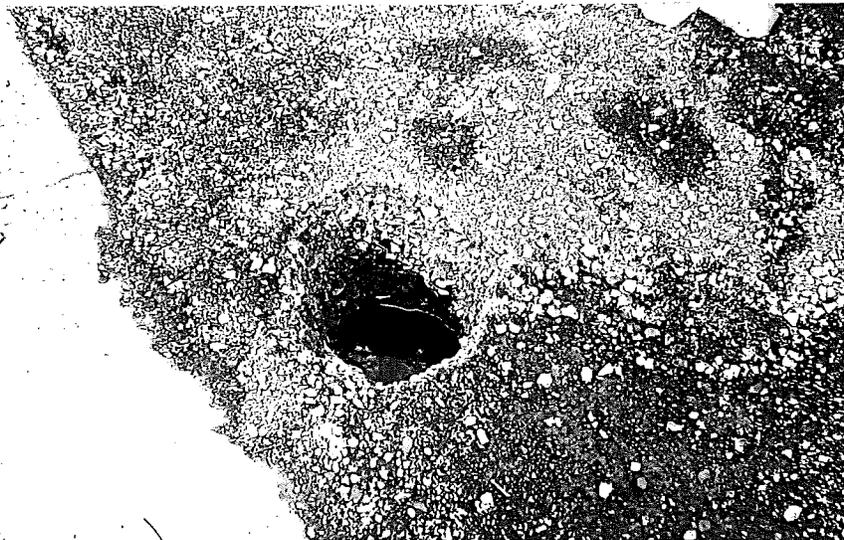


Figure 2. Level of water in slag fill inside of caisson no. 4 about one week after drilling test wells. Level 9-10 in. below top.