

VARIANCE REQUEST

Iowa Department of Natural Resources

1. Date	: 7/24/91	13. Decision:	Denied
2. Review Engineer	: Billy Chen	Date:	7/29/91
3. Date Received	: 7/23/91		
4. Facility Name	: Bussey	14. Appeal:	
5. County Number	: 63	Date:	
6. Program Area	: CO2 CP		
7. Facility Type	: CO2		
8. Subject Area	: 367		
9. Rule Reference	: 64.2(9)C		
10. Design Std. Ref.	: 13.9		
11. Consulting Engr.	: McClure Engineering Company		
12. Variance Rule	: 64.2(9)C		

15. Description of Variance Request

To design a suction lift station, Our standards specified that under no condition shall the total dynamic suction lift and required net positive suction head exceed 22 feet, The engineer is requesting us to approve a 27 foot lift pump station.

16. Consulting Engineer's Justification

1. Pump manufacturer says this suction lift station will work.
2. The City is used to suction lift stations and like them.

16. Consulting Engineer's Justification (cont.)

3. By setting it above ground, it is easier to maintain and inspect.

17. Department's Justification

We will recommend that this Department to deny this Variance for reasons of

1. All design standards required some safety factors in design, this design has no safety factor in it. means, under normal condition, this station will work but under extreme conditions it will not.

2. Our standards said under No Conditions shall ~~we~~^{we} approve a total head of over 22 feet. No room for negotiation.

18. Precedents Used

NONE

7. Staff Reviewer	: Billy Chen	Date: 7/24/91
20. Supervisor	: [Signature]	Date: 7/24/91
21. Authorized by	: [Signature]	Date: 7/29/91



McCLURE ENGINEERING COMPANY

705 FIRST AVENUE NORTH
320 EIGHTH STREET S.E.

Since 1956
FORT DODGE, IOWA 50501
ALTOONA, IOWA 50009

515/576-7155 FAX 515/576-4235
515/967-6657 FAX 515/967-7151

July 2, 1991

Mr. Billy Chen
Iowa Dept. of Natural Resources
Wallace State Office Bldg.
900 East Grand
Des Moines, IA 50319

RE: Bussey, Iowa Sewer Improvements
MEC 87010

Dear Billy:

In accordance with our telephone conversation today, I am asking that the suction lift pump station be approved and that a variance from IDNR Standards be granted.

My calculations concerning NSPH are summarized below:

Atmospheric Pressure (1,000' MSL)	32.80'
Less Static Suction Lift	-20.22'
Less Friction Loss	- 1.50'
Less Vapor Pressure	- 1.00'
NSPH Available	10.08
NSPH Required by Pump	<u>4.20</u>
Excess NSPH Available	5.88

I am also enclosing a letter from Gorman Rupp Company (the specified pump) indicating their equipment will operate under those conditions.

Mr. Billy Chen

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July 2, 1991

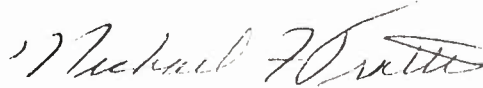
This type of pump station was selected for the following reasons:

1. The pumps are located at ground level, which eliminates the need to enter a below ground structure to inspect and service the pumps.
2. This design also eliminates the need to hoist the pumps from a wet well as required by a submersible pump.
3. The combination of these factors will result in a station which is easier to operate and more likely to receive the required maintenance. This translates into a better installation.

If you have any questions, please let me know.

Very truly yours,

McCLURE ENGINEERING COMPANY

A handwritten signature in cursive script, appearing to read "Michael F. Trotter".

Michael F. Trotter, P.E.

MFT:lg

THE GORMAN-RUPP COMPANY



305 BOWMAN STREET

P.O. BOX 1217

MANSFIELD, OHIO 44901-1217

419/755-1011

MANUFACTURERS OF PUMPS

July 19, 1991

Mr. Michael Trotter, P.E.
McClure Engineering
705 First Ave. No.
Ft. Dodge, Ia. 50501

Subject: Bussey, Ia. WWTP
6' x 6' Station

Dear Mr. Trotter:

Verne Gongol, D. J. Gongol Assoc., asked me to do the TESL calculations for the 6' x 6' packaged station for the subject project.

This station will have duplex T4A3-B pumps and, as I understand, the design condition is 230 gpm at 72.7' tdh.

From the information provided I have calculated excess NPSH will be a positive 2.83'. The station should work satisfactorily at these given numbers for center line and suction, as indicated on my work-up sheet.

If you have any questions please do not hesitate to contact this office.

Thank you.


David L. Mackey
Sales Application Engineer

DLM:cb
Attach.

cc - Verne Gongol

LOCATION: BUSSEY, I.A.
W.W.T.P.

235 G.P.M. @ 72.7' T.D.H.
17.86 PRIMING LIFT
H.P. REQ'D. (NON O/L)

1) TOTAL DYNAMIC SUCTION LIFT

A.) STATIC SUCTION LIFT

20.22 Ft.

- (1) TOTAL STRAIGHT LENGTH OF 4" PIPE 28.22 Ft.
(2) No. of 90° L.R. Elbows @ 6.8' Ft. = 6.80 Ft.
(3) No. of 90° S.R. Elbows @ 10.2' Ft. = 10.20 Ft.
(4) No. of 4x6 REDUCER Valves @ 3.0 Ft. = 3.0 Ft.

TOTAL EQUIV. STRAIGHT PIPE = 48.22 Ft.

235 G.P.M. = 5.98 FT. LOSS/100' x .482 x .71 (C=120) = 2.05 Ft.

TOTAL DYNAMIC SUCTION LIFT = 22.27 Ft.

2.) N.P.S.H. @ 235 G.P.M.

A.) TOTAL ATMOSPHERIC PRESSURE @ SEA LEVEL

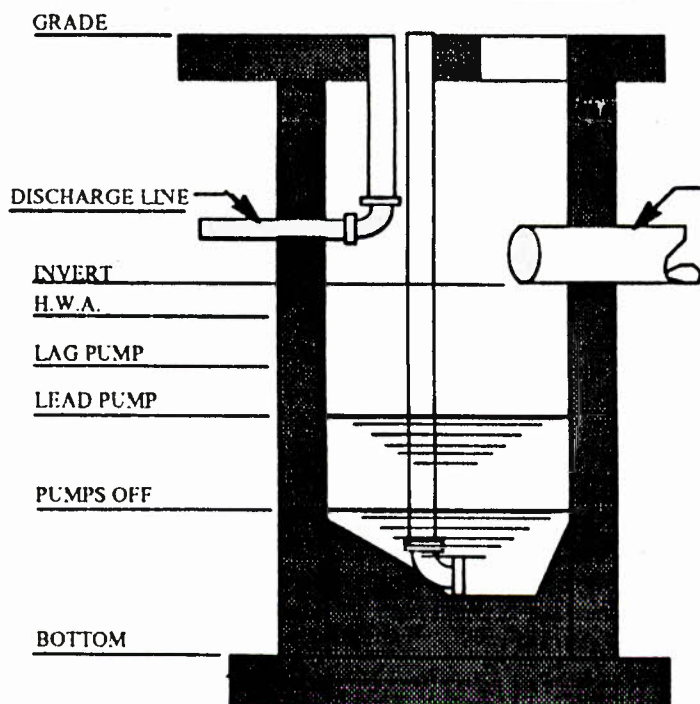
33.9 FT.

B.) DEDUCTIONS:

- (1) TOTAL DYNAMIC SUCTION LIFT 22.27 Ft.
(2) N.P.S.H. REQUIRED BY PUMP 5.0 Ft.
(3) ALTITUDE CORRECTION .8 Ft.
(4) SAFETY FACTOR 2.0 Ft.
(5) VAPOR PRESSURE 1.0 Ft.

N.P.S.H. REQUIRED = 31.07 Ft.

N.P.S.H. AVAILABLE @ 235 G.P.M. = 2.83 Ft.



MODEL T473-13 IMP. DIA. 9 3/4"

SUCTION CENTER LINE 838.50
GRADE 836.50
INVERT _____
HIGH WATER ALARM 823.00
LAG PUMP ON 822.00
LEAD PUMP ON 820.64
PUMPS OFF 818.28
BOTTOM WET WELL 814.28

Bussey Variance Review

Summary of suction pump station review

A. Martensdale - Approved 1990

Reviewed as a non-grant project first was transferred to grant project area later. Lift station design was questioned first but was approved without going through variance request process. Pump station started up about 8 months ago. FO #5 has not been there yet.

Incoming sewer is 5.5 feet above pump shut-off level. Pump station may or may not operate as designed. but has room for mistake.

Perry - Effluent pump station to river - 1988
meet design standards. design engineer said "sorry. the other one".

Perry - Flow Equalization Pond Return Flow Pump station. - 1988

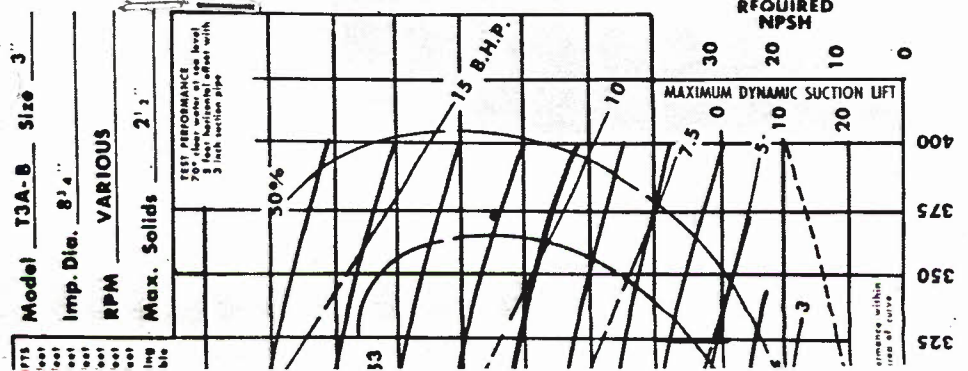
Being a return flow pump station it is rarely in operation and is controlled as part of STP operation rather than by water level at the flow equalization pond. Approved plans

does not have enough information to confirm that the station did not meet design standards.

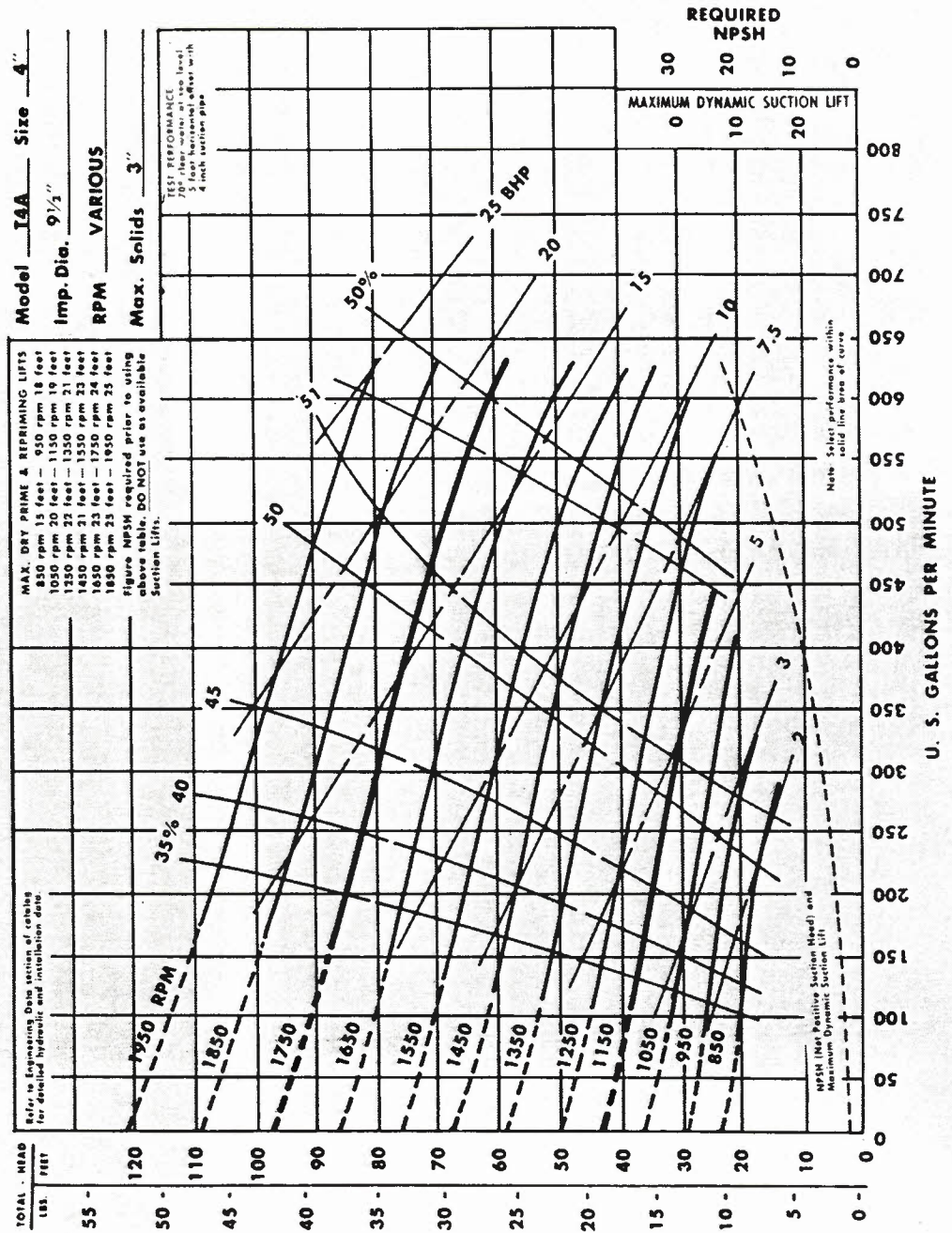
The approved plans show that the pump ~~sta~~ are installed one (1) foot above the high water level of the flow equalization pond. Because the flow equalization pond has an effective depth of 13 feet. At the low water level, the pump station may be at the maximum lift allowable by the standards. This pump station could not be used as a support case for Bussey.

The design engineer also mentions one pump station in Carlisle approved in 1988 did not meet design standards. He basically said that we should approve Bussey project because it will not cause problems (should ^{be} called basement flooding problems) as the station is located at STP and has 10' elevation for sewer ~~surge~~ surge before it causes problems.

at various RPM's.



4-inch—Model T4A3-B



Bussey, sewage



TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

October 1, 1991

City Clerk
City Hall
Fourth and Merrill
Bussey, IA 50044

ATTENTION: Honorable Mayor and Councilmen

SUBJECT: First Supplement to Construct Permit No. 91-200-S
Sewage Treatment Improvement
Bussey, Iowa

Gentlemen:

We have reviewed and approved revised plans for sewer lines leading to the lift station and the proposed lift station for the referenced project. Our review and approval is limited to the technical aspects of the submitted information only.

Construction Permit No. 91-200-S issued August 14, 1991, is hereby extended to include the changes for the sewer lines leading to the lift station and a 200 GPM pump station with two pumps and 1,811 feet of 6-inch force main.

The permit is extended subject to the conditions and requirements contained in the original permit.

Inasmuch as this letter refers to an extension of an official construction permit, it should be retained in your files.

Sincerely,

BILLY CHEN
SURFACE & GROUNDWATER PROTECTION BUREAU

bkp/S&GW274P04.01

Enclosure

cc: Region 5 - Des Moines, IA
McClure Engineering Co., Fort Dodge, IA



McCLURE ENGINEERING COMPANY

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Since 1956
FORT DODGE, IOWA 50501
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515/967-6657 FAX 515/967-7151

August 21, 1991

Mr. Billy Chen
Iowa Department of Natural Resources
Wallace State Office Building
900 East Grand
Des Moines, IA 50319

RE: Bussey, Iowa Sewer Improvements
MEC 87010-2

Dear Billy:

We have made revisions to the lift station design and are submitting the following items for your review. As I understand, we will need a variance for the proposed design. We are, by this letter, requesting a variance for this design.

1. Plan Sheets 11/35 and 12/35 with revised sewer lines leading to the lift station.
2. Revised sheet 28/35 showing the proposed lift station design.
3. Calculations for the pumps, including:
 - ✓ Total Dynamic Suction Lift
 - Total Dynamic Discharge Head
 - Total Dynamic Head
 - ✓ Net Positive Suction Head - Recommend and Available

Mr. Billy Chen
Page 2
August 21, 1991

I believe this will meet IDNR requirements. If you have any questions, please call. As you know, this project is several months behind schedule. Please review at your earliest opportunity.

Very truly yours,

McCLURE ENGINEERING COMPANY

A handwritten signature in cursive script, appearing to read "Michael F. Trotter".

Michael F. Trotter, P.E.

MFT:lg

Enclosures

cc: City of Bussey
FmHA, Jim Carroll

**BUSSEY, IOWA
WASTEWATER SYSTEM IMPROVEMENTS
LIFT STATION REDESIGN
AUGUST 21, 1991**

Capacity, 180 gpm

Force Main 6", Velocity 2.04 Ft/Sec.

Pump Speed 1750 RPM, Impeller 8½"

☼ Pump Suction	838.83
Top of Wet Well	836.50
Bottom of Wet Well	817.80
Lead Pump On	823.14
Lead Pump Off	821.81
Lag Pump On	823.91
Lag Pump Off	822.58
Force Main Outlet	878.74

Static Suction Lift	$838.83 - 821.81 =$	17.02
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Friction Losses

4" Pipe	19'	
Fittings	<u>8'</u> Equivalent	
	$27' \times \frac{2.6 \text{ Ft.}}{100 \text{ Ft.}} =$	<u>0.70</u>

Total Dynamic Suction Lift	17.72
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Static Discharge Head	$878.74 - 838.83 =$	39.91
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Friction Losses

6" Pipe	1,811'	
Fittings	<u>68'</u> Equivalent	
	$1,879' \times \frac{0.36 \text{ Ft.}}{100 \text{ Ft.}} =$	<u>6.76</u>

Total Dynamic Discharge Head	46.67
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Total Dynamic Head	<u>64.4 Ft.</u>
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Bussey, Iowa Lift Station Redesign (Continued)

Net Positive Suction Head

Atmospheric Pressure at Sea Level	33.90 Ft.
Correction to 840 Ft. MSL	<u>- 0.93 Ft.</u>
Atmospheric Pressure at Job Site	32.97 Ft.
TDSL	-17.72
Vapor Pressure	- 1.00
Safety Factor	<u>- 6.00</u>
NSPH Available	8.25 Ft.
NSPH Required (from Pump Curve)	<u>- 3.0 Ft.</u>
Excess NSPH	5.25 Ft.
TDSL at Lead Pump Off =	17.72 Ft.
NSPH Required (from Pump Curve)	<u>3.0</u>
	20.72 Ft.

PERFORMANCE CHART NO. T4A-9

8-7-76

SECTION 55 PAGE 1159
REQUIRED NSPH

Model T4A-B Size 4" X 4"
Imp. Dia. 8 1/2"
RPM VARIOUS
Max. Solids 3"

REPRIMING LIFTS

650 rpm 2 feet — 750 rpm 4 feet
850 rpm 6 feet — 950 rpm 8 feet
1050 rpm 9 feet — 1150 rpm 12 feet
1250 rpm 11 feet — 1350 rpm 15 feet
1450 rpm 14 feet — 1550 rpm 18 feet
1650 rpm 17 feet — 1750 rpm 20 feet
1950 rpm 21 feet — 1950 rpm 21 feet

Figure NSPH required prior to using
above table. DO NOT use as available
Suction Lifts.

TEST PERFORMANCE

75°F clear water at sea level
4 foot horizontal offset with
4 inch suction pipe

