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MCAS EL TORO
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CLEAN II TRANSMITTAL/DELIVERABLE RECEIPT

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TO: Commanding Officer
Naval Facilities Engineering Command
Southwest Division
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DATE: April 23, 1996
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FROM: [Signature]
Program/Project Manager Operations Manager

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April 23, 1996

Commanding Officer
Naval Facilities Engineering Command
Southwest Division
Mr. Paul Kennedy, Code 0233.PK
Building 128
1220 Pacific Highway
San Diego, CA 92132-5187

Subject: Pump Inspection Report, Marine Corps Air Station El Toro, California

Dear Mr. Kennedy:

It is our pleasure to submit this copy of the Pump Inspection Report for the Marine Corps Air Station (MCAS) El Toro, California, prepared under Contract Task Order (CTO) 0076 and Contract No. N68711-92-D-4670.

The attached letter report summarizes the activities and findings of an inspection of dedicated pumps installed in monitoring wells at MCAS El Toro. We have submitted the appropriate number of copies of this work plan to individuals listed on the attached transmittal. No comments on this report are expected.

We appreciate the opportunity to be of service to you on this project. If you have any questions or would like further information, please contact Tim Latas at (619) 687-8848, or myself at (619) 687-8802.

Very truly yours,

David K. Cowser
Project Manager

DKC/sp



Bechtel National, Inc. Systems Engineers-Constructors

PUMP INSPECTION REPORT MARINE CORPS AIR STATION EL TORO, CALIFORNIA

1 INTRODUCTION

1.1 Project Scope

This report presents the activities and results of a dedicated pump survey and monitoring well development event conducted at Marine Corps Air Station (MCAS) El Toro, located in Orange County, California. The objective of this survey was to assess the operation and material condition of 73 electric submersible pumps and associated equipment in preparation for first-round groundwater sampling activities in 1996 (Table 1). This survey was performed in accordance with the scope of services outlined in modification number three contained in CTO-0076, T01 dated 05 January 1996. During the course of the CDM sampling activities, 3 additional monitoring wells were found to contain electric submersible pumps bringing the total to 76.

1.2 Project Description

Between 22 December 1995 and 07 February 1996, Mr. Dan Eldridge and Mr. Greg Sherman of the CLEAN II team with assistance from Layne Drilling, conducted a basewide survey of 76 electric submersible pumps (Table 1). This survey consisted of well-head inspection and pump operation. In the event that the pump did not operate properly, it was removed and the well was redeveloped. These activities were coordinated and prioritized by schedule for the first-round 1996 groundwater sampling of MCAS El Toro monitoring wells.

2 PUMP SURVEY

2.1 Project Background

Between 1988 and 1992, 165 groundwater monitoring wells were installed by the Navy and Marine Corps. These monitoring wells were installed on- and off-Station to delineate the extent of groundwater at MCAS El Toro. Ninety-two of these wells have installed dedicated electric submersible pumps of three primary varieties. Fifty-two wells contain Grundfos 2-inch-diameter Redi-Flow 2 submersible electric pumps; 26 wells contain Grundfos 5S07-18 (3/4-HP) submersible electric pumps; and 11 wells contain Grundfos 10E-11 (3/4-HP) submersible electric pumps. Of the remaining 73 wells, 51 are Westbay Wells, and 22 have no pumps installed and, therefore, were not within the scope of this survey.

In August 1995, Tom Judy of the CLEAN II team was tasked with testing these 16 CLEAN I pumps prior to sampling (Table 1). This effort provided the data necessary for a remedial investigation study of the landfill sites at MCAS El Toro. Seven of these 16 wells contained pumps that did not work or had insufficient purge/sampling yields. In December and January 1995, Paul Stoppelman of the CLEAN II team removed these seven pumps and stored all pumps and associated equipment in the environmental restoration yard.

**Table 1
Dedicated Pump Summary**

PUMP INSPECTION						
Wells	Pumping Rate (gpm)^a	Comments	Water Level (MSL)^b	Reporting Date	Repairs	Repair Date
Working Pumps						
01DGMW57	6.00	Clear		1/17/96	NA ^c	NA
02DGMW59					NA	NA
02DGMW60					NA	NA
02DGMW61					NA	NA
02UGMW25					NA	NA
03DBMW39					NA	NA
04UGMW63					NA	NA
05DBMW41					NA	NA
05DGMW67					Hinges were rewelded to box	3/21/96
05UGMW27					NA	NA
06DGMW69	5.00	Silty - clear (after 40 gallons)		01/11/96	NA	NA
07DBMW100	10.00	Clear		01/10/96	NA	NA
13DBMW49	6.00	Clear		01/15/96	NA	NA
13DGMW78	7.00	Clear		01/15/96	NA	NA
13UGMW32	4.50	Clear		01/15/96	NA	NA
14DGMW50	6.00	Clear		01/15/96	NA	NA
14DGMW79	6.00	Clear		01/15/96	NA	NA
15DBMW51	5.50	Clear discharge after 10 gallons			NA	NA
16DBMW52	3.00	Clear		01/15/96	NA	NA
16UGMW33	5.50	"Function loss" ^d error on converter box	165.58	01/15/96	Rewired - working	1/24/96
17DGMW82				01/06/96	NA	NA
18BGMW03E	5.50	Clear (pumped dry after 14 minutes)		01/10/96	NA	NA
18BGMW05A	6.50	Clear discharge (after 40 gallons)		01/09/96	NA	NA

(table continues)

Table 1 (continued)

PUMP INSPECTION						
Wells	Pumping Rate (gpm)	Comments	Water Level (MSL)	Reporting Date	Repairs	Repair Date
18BGMW07	4.50	Clear		01/10/96	NA	NA
18BGMW101	10.50	Very silty - slightly silty		01/11/96	NA	NA
18BGMW12	2.00	Clear		01/12/96	NA	NA
18BGMW15	3.00	Clear		01/12/96	NA	NA
18BGMW16	5.00	Clear		01/12/96	NA	NA
18BGMW17	7.50	Silty - clear (after 90 gallons)		01/11/96	NA	NA
18BGMW18	5.50	Clear		01/12/96	NA	NA
18BGMW19E	5.50	Clear		01/10/96	NA	NA
18BGMW1A	6.00	Clear discharge		01/08/96	NA	NA
18BGMW1B	6.50	Clear discharge		01/08/96	NA	NA
18BGMW1C	6.00	Clear discharge		01/08/96	NA	NA
18BGMW1D	8.30	Clear discharge		01/08/96	NA	NA
18BGMW1E	2.80	Clear discharge		01/08/96	NA	NA
18BGMW22	5.00	Clear		01/12/96	NA	NA
18BGMW24	6.00	Clear		01/15/96	NA	NA
18BGMW2A	5.70	Clear discharge		01/08/96	NA	NA
18BGMW2C	7.00	Clear discharge (after 40 gallons)		01/08/96	NA	NA
18BGMW2D	5.70	Clear discharge (after 35 gallons)		01/08/96	NA	NA
18BGMW2E	2.30	Clear discharge		01/08/96	NA	NA
18BGMW4B	10.00	Clear		01/11/96	NA	NA
19UGMW35	5.00	Silty - clear (after 10 gallons)		01/11/96	NA	NA
20DGMW88	4.50	Clear		01/12/96	NA	NA
20UGMW36	4.00	Clear		01/12/96	NA	NA
21DGMW90	7.00	Clear discharge (after 40 gallons)		01/08/96	NA	NA

Table 1 (continued)

PUMP INSPECTION						
Wells	Pumping Rate (gpm)	Comments	Water Level (MSL)	Reporting Date	Repairs	Repair Date
Pumps Removed						
01DGMW58		"Function loss" error on converter box	40.56	01/17/96	Removed pump and redeveloped well	02/08/96
03DGMW64		No pump		01/02/96	Removed pump and redeveloped well	01/02/96
03DGMW65X		No pump		01/02/96	Removed pump and redeveloped well	01/02/96
03UGMW26		No pump		01/02/96	Removed pump and redeveloped well	01/02/96
04DBMW40		No pump		01/02/96	Removed pump and redeveloped well	01/02/96
04DGMW66		No pump		01/02/96	Removed pump and redeveloped well	01/02/96
05DGMW68		No pump		01/02/96	Removed pump and redeveloped well	01/02/96
06UGMW28				02/08/96	Removed pump and redeveloped well	02/08/96
07DBMW43		"Function loss" error on converter box	113.08	01/09/96	Removed pump and redeveloped well	02/20/96
07DBMW70		"Function loss" error on converter box	122.30	01/09/96	Removed pump and redeveloped well	02/06/96
07DGMW71		"Function loss" error on converter box	109.50	01/09/96	Removed pump and redeveloped well	02/05/96
07DGMW72		"Function loss" error on converter box	104.82	01/09/96	Removed pump and redeveloped well	02/02/96
07DGMW91	6.00	Silty to clear after 20 gallons	102.75	01/08/96	Removed pump and redeveloped well	02/15/96
08DGMW73		"Function loss" error on converter box	83.95	01/08/96	Removed pump and redeveloped well	02/12/96
08DGMW74		Well head, casing, and cover repaired	NA	03/19/96	Removed pump and redeveloped well	02/09/96
08UGMW29		"Function loss" error - corrosion	86.94	01/08/96	Removed pump and redeveloped well	02/08/96
09DBMW45		No vibration - pump bad	112.57	01/08/96	Removed pump and redeveloped well	01/16/96
09DGMW75		No discharge - pump bad	104.82	01/08/96	Removed pump and redeveloped well	02/07/96
10DBMW77		Unsafe plug - not tested	96.63	01/08/96	Removed pump and redeveloped well	02/08/96
12UGMW31		Unsafe plug - not tested	96.63	01/08/96	Removed pump and redeveloped well	02/07/96
12DBMW48	3.00	Clear - function marginal		01/11/96	Removed pump and redeveloped well	02/15/96
16DGMW81	4.50	Connector corrosion	172.64	01/15/96	Removed pump and redeveloped well	01/30/96
18BGMW03A	10.00	Clear discharge (after 20 gallons)		01/09/96	Removed pump and redeveloped well	02/16/96
18BGMW3B		Thermoprotect ^c load - no load	105.39	01/09/96	Removed pump and redeveloped well	01/31/96

(table continues)

Table 1 (continued)

PUMP INSPECTION						
Wells	Pumping Rate (gpm)	Comments	Water Level (MSL)	Reporting Date	Repairs	Repair Date
18BGMW3C		Thermoprotect		01/09/96	Removed pump and redeveloped well	01/31/96
18BGMW4A		"Function loss" error on converter box	N/R	01/11/96	Removed pump and redeveloped well	02/08/96
18BGMW05B		Thermoprotect	82.42	01/09/96	Removed pump and redeveloped well	02/13/96
18BGMW05C		Thermoprotect	80.44	01/09/96	Removed pump and redeveloped well	02/07/96
18BGMW05D		Thermoprotect	80.10	01/09/96	Removed pump and redeveloped well	02/15/96
18BGMW14		well casing repaired		03/19/96	Removed pump and redeveloped well	02/13/96
18BGMW19A		Thermoprotect 5 cycles ^f , connector good	92.70	01/10/96	Removed pump and redeveloped well	02/16/96
18BGMW19B	10.00	Clear	94.32	01/10/96	Removed pump and redeveloped well	02/16/96
18BGMW19C		Clear discharger (after 100 gallons)	91.10	01/10/96	Removed pump and redeveloped well	02/12/96
18BGMW19D		Clear discharger (after 150 gallons)	90.80	01/10/96	Removed pump and redeveloped well	02/12/96
18BGMW23	10.00	Clear		01/10/96	Removed pump and redeveloped well	02/15/96
19DBMW54		"Function loss" error on converter box		01/08/96	Removed pump and redeveloped well	02/15/96
19DGMW85		"Function loss" corrosion on connector	141.52	01/11/96	Removed pump and redeveloped well	02/16/96
19DGMW86	4.50	Connector corrosion	150.15	01/11/96	Removed pump and redeveloped well	02/22/96
20DBMW55		Traffic box repaired	N/R	03/19/96	Removed pump and redeveloped well	02/12/96
21DBMW56		"Function loss" error on converter box	89.92	01/09/96	Removed pump and redeveloped well	02/01/96
21UGMW37		"Function loss" error on converter box	91.10	01/08/96	Removed pump and redeveloped well	02/01/96
22DBMW47		"Function loss" error on converter box	114.25	01/08/96	Removed pump and redeveloped well	02/06/96
18PSMW3		Not working - CDM ^g		02/07/96	Removed pump and redeveloped well	02/16/96
18PSMW4		Not working - CDM		02/07/96	Removed pump and redeveloped well	02/16/96
18DGMW135		Not working - CDM		02/07/96	Removed pump and redeveloped well	02/15/96

Notes:

^a gpm – gallons per minute

^b MSL – mean sea level

^c NA – not applicable

^d "Function loss" error – converter display indicates thermal problem, motor lead, or pump problem

^e "Thermoprotect" on 4-inch Grundfos 10E-11 – the pump motor has a self-resetting circuit breaker

^f 5 cycles refers to allowing the controller to trip off 5 times without discharging water; a pump is considered to fail if it is cycled 5 times

^g CDM – Camp, Dresser, McGee

The majority of these pumps had not been run in over 2 years. Because the initial failure rate of these pumps was so high (45 percent) and because the Navy was preparing to conduct four rounds of groundwater monitoring, an evaluation of the operational status of the remaining 73 pumps prior to the first round of sampling was recommended by the Navy.

2.2 Survey Activities

The pump survey was conducted by first identifying the well locations and type of pump installed (Table 1). The wells that contained electric submersible pumps were then scheduled for inspection. The pump inspection consisted of recording surface conditions of the monitoring well, sample ports, and pump connections, and measuring the depth to water. An attempt was then made to operate the installed pump. This was done by allowing the pumps to discharge groundwater into 55-gallon steel drums for 15 minutes or until discharge was visually free of sediment. The pumping rate (gallons per minute) and total discharge volume were monitored during each purge cycle. The 15-minute period was determined to be sufficient to discharge a total volume of water consistent with that required for purging these wells prior to groundwater sampling.

2.3 Survey Results

Because 16 dedicated pumps had already been evaluated as part of a Phase II Remedial Investigation study of the landfill sites, a total of 76 electric submersible pumps required evaluation. Of the 76 pumps, 43 were found to be functioning properly; the remaining 33 pumps were not operating.

Once the survey was completed, the decision was made to rewire the surface end of the electrical service to each of the nonoperational pumps. This resulted in five of the nonoperational pumps becoming operational. However, when the first round of groundwater sampling activities began, six of the previously operational pumps failed. This was confirmed by Mr. Greg Sherman of the CLEAN II team. At the conclusion of the pump survey, 47 pumps were found to be working and 45 were nonoperational (Table 1). These nonoperational pumps were scheduled for removal and the wells were redeveloped.

3 PUMP REMOVAL AND GROUNDWATER WELL REDEVELOPMENT

3.1 Pump Removal

Between 30 January and 22 February 1996, Mr. Greg Sherman, Mr. Art Matulac, and Mr. Darrell Miranda of the CLEAN II team along with crews from Layne Drilling pulled 45 of the nonoperational pumps, electrical leads, discharge pipes, and sounding tubes from each of the wells. Where possible the electrical leads, discharge pipe, and sounding tubes were wrapped in Visqueen and left on-site. Where this was not possible, the equipment was brought back to the MCAS El Toro Environmental Restoration Facility and wrapped in Visqueen for storage. Thirty-eight of the pumps were bagged, tagged, and stored at the Environmental Restoration Facility. Seven pumps were sent to Grundfos Corporation in Clovis, California, for testing to determine why there was such a high failure rate.

3.2 Well Redevelopment

Once the pumps and associated equipment were removed from the wells, the Layne crew surged the well with an 8-foot, Teflon™-ringed surged block for 20 to 30 minutes, depending on the height of screened casing in the well. An 8-foot stainless steel bailer was then used to remove the sediment-laden water from the well. This usually meant that 25 to 50 gallons of water were removed from the well before the pump was set. Once the bailing was complete, a 2-inch-diameter Grundfos Redi-Flow electric submersible pump was temporarily installed to remove an average of three casing volumes from the well. Temperature, pH, and conductivity were continuously monitored. When two separate sets of readings were within 10 percent of each other, the volume was considered sufficient to remove the stagnant water from the well. However, more water was usually removed until the water was clear. The water was discharged into either a 2,000-gallon water truck or a 500-gallon poly water tank and taken back to the MCAS El Toro Environmental Restoration Facility and disposed through the wastewater treatment system at this facility.

4 CONCLUSIONS AND RECOMMENDATION

Forty-five of 92 electric submersibles are nonoperational. This represents a 49-percent failure rate. Considering the fact that these pumps have only been operated twice in 3 years, this appears to be an extremely high rate of failure. Because these pumps have such a high failure rate and will need to be operated several times over the next 2 years, it can be assumed that the potential for failure in the remaining 47 operational pumps is likely.

Grundfos Corporation is attempting to assess the design factors that may have contributed to the failure of these pumps. With the cooperation of the Grundfos Corporation and the support of a corrosion engineer, a plan for preventing this sort of catastrophic failure should be formulated and implemented, for the use of electric submersible pumps to purge groundwater for quarterly monitoring activities to continue.