Appendix A

SACRAMENTO SUBURBAN WATER DISTRICT

Memorandum

Date: October 12, 2007

To: Dan York, Manager Field Operations

Cc: Warren Jung, Manager Engineering Services

From: James Arenz, Superintendent Production

Subject: 2007 Survey of Well Site Electrical Panels

Attached please find a survey of the electrical panels for all of the District well sites. The panels were rated using 13 categories, the criteria for each is defined on Attachment A. Each category is based on a scale of 1 to 10, 10 being best. All categories were weighted equally. The data on the attached survey was sorted first by Degree of Hazard, then by the Total Rating to determine which panels posed the largest risk to operators.

The survey shows the electrical panels at Wells 26, 27, 47, N9 and 9 to be of greatest risk to operators and in the most need of upgrades. The following is a brief overview of problems that exist at these five wells:

Well 26, Greenwood / Marconi

The MCC panel does not meet NEC code for clearance and is not "finger safe" for an operator. There is no main disconnect, leaving 480V power "hot" on the incoming side of the fuses in the MCC panel. Also, since the addition of the fluoride equipment, there are now 3 separate step-down transformers, each providing 120V power to different pieces of equipment. This panel could be made safer by simply changing the existing meter panel to one with an integrated main disconnect. This solution may have further implications as SMUD may require the District to upgrade the incoming power conductors from 3-wire to 4-wire.

Well 27, Melrose / Channing

The MCC panel is not "finger safe" for an operator. In fact the incoming power conductors enter the MCC panel first, travel across the fuse bank, enter the SMUD meter panel then return to the MCC panel to the top of the motor starter. This configuration is an NEC code violation. It would be best to completely replace this panel with a new one. As stated above, this solution may have further implications as SMUD may require the District to upgrade the incoming power conductors from 3-wire to 4-wire.

Well 47, Copenhagen/Arden

The MCC panel does not meet NEC code for clearance, there are no schematics or documentation on any of the panels, and the overall wiring is haphazard and poorly labeled. The natural gas engine currently will not start and troubleshooting is problematic at best. This well is located in a low pressure area and runs nearly 100% of the time; therefore, staff would like to get the engineering started for a new exterior mounted panel as soon as possible.

Well N9, Cameron Ranch

The pump disconnect is very unsafe and requires more force to operate than can be supplied by the attached handle. In addition, a submersible well pump was reinstalled several years back but the well has not been running for production because the old motor starter is in need of replacement. Replacement parts can not be located for the existing motor starter and the cabinet is too shallow for a modern starter. This panel is very old, dating back to the early sixties, has very little documentation, and is not suitable for modernization. It would be best to replace the entire panel and add a PLC and RTU to the site.

Well 9, Ravenwood / Eastern

The MCC panel does not meet NEC code for clearance and is not "finger safe" for an operator. There is no main disconnect, leaving 480V power "hot" on the incoming side of the fuses in the MCC panel. Also, since the addition of the fluoride equipment, there are now 3 separate step-down transformers, each providing 120V power to different pieces of equipment. This panel could be made safer by simply changing the existing meter panel to one with an integrated main disconnect.

Recommendations:

- CY2007: Staff recommends replacing the panel at Well N9 with a new 3-bay Tesco panel with a PLC and RTU and the panel at Well 9 with a new 2-bay Tesco panel. These two wells were chosen for CY2007 because they will require the least amount of engineering and least amount of time to complete. In addition, staff would also like to begin the engineering on Well 47's new panel in CY2007. This would allow a panel to be built and be ready for installation in the first quarter of CY2008 while system demand is still low.

- CY2008: Staff recommends the of the replacement of the electrical panel at Well 47 be completed and the electrical panels at Wells 26 and 27 be replaced or upgraded as soon as possible in the first quarter of the year to insure operator safety.

Price quotes for all projects listed above are forthcoming at this time.

Enclosure

Attachment A

Rating Criteria Category Descriptions

All ratings are based on a scale of 1 to 10, 10 being best.

Run Status (Summer / Winter)

This category designates the well's run status during Summer peak demand and Winter off-peak demand. Summer is defined as mid-May through mid-October and Winter is defined as mid-October through the middle of May. The letter designations are as follows: M = Main Runner, L = Lag Runner, I = Inactive Well.

Age of Equipment

This category was rated based on the actual age of the electrical equipment, if known, as well as the age of the key components. If actual age of the panel was not known, the rating was based on the age of key components. Most panels had some documentation pointing to a manufacture date. (Each decade prior to the year 2000 resulted in the loss of two points.)

Condition of Equipment

This category was rated based on the overall condition of the panel and components. (i.e.: wear, corrosion, condition of conductors, fuses vs. breakers, overall appearance, type of mounting support, etc.)

Reliability

This category is subjective and was rated based on the limited experience with the equipment by the surveyor, as well as information obtained through discussion with Production Operators.

Ease of Use

This category was rated based on information obtained through discussion with Production Operators. Most panels are fairly simple and straightforward, to operate, the manganese treatment facilities and ground level reservoir not withstanding.

Serviceability

This category was rated based on the ease of repair or removal of components from the panel. (i.e.: proximity of components within panel, component mounting methods, placement of components within panel, panel height, obstructions in and around panel, etc.)

Ease of Troubleshooting

This category was rated based on the ability to quickly diagnose problems within the panel. (i.e.: consistency in wire numbering and color coding, conductor type and size, and/or availability of accurate documentation, etc.)

Level of Standardization
This category was rated based on the quantity of components in the panel that met general guidelines for safety, reliability and serviceability.

Availability of Replacement Parts
This category was rated based on the ability to procure exact replacements for the components within the panel.

Degree of Hazard
This category was rated based on the level of safety to the operator. The best rating was given to a panel that was completely "finger-safe" when the main panel door was open and equipment was hot. The worst rating was given to panel with no dead-front and no way to fully isolate power from the panel.

Ease of Modernization
This category was rated based on the ability to install modern components in the existing cabinet in the event OEM equipment is no longer available. The best rating was given to those cabinets with a suitable configuration and ample room to accommodate upgrades.

Code Compliance
This category was rated based on the level to which a panel met general NEC code requirements. The best rating was given to those panels with no visible code deficiencies. Most low scores were given to panels with violations that were related to clearance issues in front of panel.

Documentation
This category was rated based on the level of documentation available at the site or in the office. (i.e.: schematics, drawings, component profiles or data sheets, etc.)

Life Expectancy
This category was very subjective and was based on the general impression that the surveyor had of the panel and related components. It was also based on the average usage or demand on the equipment it powered.

Total Rating (Max.130)
This category was rated based on the total amount of points accumulated from the previous thirteen categories. The maximum score possible was 130.

Comments
This category relayed general concerns and/or observations of the surveyor about the equipment.

2007 Well Site Electrical Panel Survey

Rating Criteria - Sorted by Degree of Hazard (Worst to Best)

Well #	Run Status - Summerer	Run Status - Winter	Age of Equipment	Condition of Equipment	Reliability	Ease of Use	Seviceability	Ease of Troubleshooting	Level of Standardization	Availability of Repl.Parts	Degree of Hazard	Ease of Modernization	Code Compliance	Documentation	Life Expectancy	Total Rating (Max. 130)	Comments
26	L	L	2	2	8	5	8	8	2	4	2	8	2	2	4	57	Code clearance, no main disconnect messy wiring, odd main voltage
27	L	L	3	6	6	10	10	10	4	4	2	4	2	2	4	67	No main disconnect, Incoming power routed thru panel, no ground
47	M	M	4	6	4	4	4	2	2	6	4	10	2	2	3	53	Code clearance, poor wiring, no documentation, MCC has problem
N9	L	L	2	4	6	10	4	6	2	2	4	2	10	2	2	56	Main Disconnect in-op, too noisy to run, heat damage to flow meter
9	L	L	2	2	6	10	6	6	2	6	4	10	2	2	4	62	Code clearance, no main disconnect,oversized fuses
34	L	L	3	6	6	10	10	10	4	4	4	2	2	2	4	67	Code clearance, cloth insulation, no main disconnect, grounding issues
N31	M	M	4	8	10	10	6	8	6	8	4	2	2	2	4	74	Code clearance, no main disconnect
35	M	L	4	6	8	10	10	10	8	10	4	10	10	6	8	104	No main disconnect
25	M	L	8	8	8	10	10	10	8	10	4	10	10	6	8	110	No main disconnect, no motor ground to panel
N29	M	L	4	4	10	10	2	2	2	2	6	2	10	2	2	58	No Local Disconnects, not finger-safe, no Doc. Hodgepodged, messy.
2A	M	L	2	2	8	10	2	4	2	4	6	10	8	2	4	64	No main disconnect, code clearance,old equipment
N20	M	L	4	8	6	10	4	4	4	6	6	2	2	4	4	64	Code clearance, no local main disconnect obsolete engine control.
76	L	L	2	6	6	10	4	4	2	4	6	6	10	2	6	68	No main disconnect, 480 volt control circuit, motor/panel not grounded
24	M	L	2	2	8	10	10	10	2	4	6	6	10	2	6	78	No main disconnect, 480 volt control circuit
77	L	L	2	6	8	10	10	10	2	4	6	4	10	2	4	78	No main disconnect, old contactor, 480 volt control circuit
12	L	L	2	6	8	10	8	10	4	8	6	10	2	2	4	80	No main disconnect, code clearance,old equipment
N30	M	L	4	6	4	10	8	4	6	8	6	10	10	2	4	82	No wire #s, little documentation. Unreliable, sticky cabinet doors..
20A	M	L	7	6	8	10	6	6	4	6	6	10	9	2	4	84	No main disconnect, iffy ground, easy upgrade
N26	M	L	4	6	10	10	10	6	4	4	6	8	10	4	6	88	No main disconnect
N6	L	L	4	8	10	10	8	4	6	8	6	10	10	2	4	90	Exposed line lugs, wire numbers not consistant.
N22	M	L	4	8	10	10	8	6	4	8	6	6	10	6	4	90	Main breaker does not kill power all power in panel
13	L	L	2	6	8	10	10	10	4	8	6	10	10	4	6	94	No main disconnect
23	L	L	2	6	8	10	8	10	6	8	6	10	10	4	6	94	No main disconnect
69	L	L	2	8	8	10	10	10	2	6	6	10	10	4	8	94	No Pump disconnect
52	M	L	6	6	10	10	10	8	4	8	6	10	10	1	6	95	No main disconnect, grounding issue.
N10A	L	L	8	10	10	10	10	10	8	10	6	10	10	8	8	118	No Local Disconnect
MC10	L	L	6	6	6	8	2	2	2	2	8	2	2	2	4	52	Code clearance issues. Abandoned equip. needs to be removed
N5	M	L	4	4	6	4	4	6	2	2	8	10	10	2	4	66	No motor ground, abandoned VFD and associated parts need removal

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N3	M	L	4	6	6	10	4	4	4	6	8	2	10	2	4	70	No main disconnect, transfer switch corroded, panel wiring issues
N25	M	L	4	6	4	10	6	4	2	4	8	6	10	2	4	70	Missing wire #'s, booster pump not being used, little documentation
65	M	L	4	4	8	10	4	4	2	4	8	8	10	2	4	72	Pump disconnect handle is in-op
N8	L	L	1	8	10	10	6	4	4	2	8	4	10	4	6	77	No wire #s, little documentation. Un-protected penetrations, old parts.
44	L	L	4	6	6	10	8	6	2	8	8	4	10	2	4	78	No main disconnect
7	L	L	4	8	10	10	10	10	6	8	8	8	10	4	6	102	No main disconnect, 480 volt control circuit
19	M	L	8	10	10	10	10	10	6	10	8	10	10	8	8	118	No main disconnect
72	L	L	8	10	10	10	8	8	10	10	8	10	10	10	6	118	Control power is present when MCC breaker is off. Long start times
73	M	M	8	10	10	10	8	8	10	10	8	10	10	10	6	118	because of too many timers. Documentation lacking upgrades
74	M	M	8	10	10	10	8	8	10	10	8	10	10	10	6	118	VFD's dictate expected life span
51	L	L	8	10	10	10	10	10	10	10	8	10	10	8	10	124	No main disconnect
38	L	L	2	8	9	9	9	9	9	9	9	9	9	9	9	109	Gas engine well
42	L	L	2	10	9	9	9	9	9	9	9	9	9	9	9	111	Gas engine well
40	L	L	4	9	9	9	9	9	9	9	9	9	9	9	9	112	Gas engine well
39	L	L	6	9	9	9	9	9	9	9	9	9	9	9	9	114	Gas engine well
45	L	L	6	10	9	9	9	9	9	9	9	9	9	9	9	115	Gas engine well
MC-C2	L	L	2	4	8	6	4	4	2	2	10	2	10	2	6	62	Abandoned equipment should be removed.
MC-C1	M	L	2	4	8	10	6	4	2	2	10	4	2	4	6	64	Battery placement causing code violation. Panel mounted too high
41	M	L	2	6	8	8	6	2	2	6	10	2	10	2	4	68	No safety issues
31A	L	L	4	8	10	10	4	4	4	4	10	2	10	2	6	78	Old panel, odd construction, not conducive to internal upgrade.
MC-C3	L	L	2	4	8	10	8	6	2	2	10	6	10	4	6	78	Abandoned equipment should be removed.
70	L	L	4	6	6	10	6	6	2	8	10	10	10	2	4	84	480 volt control circuit
50	L	L	6	8	8	10	10	10	4	2	10	2	10	2	4	86	Older soft start.
3A	L	L	4	8	8	10	6	6	2	6	10	10	10	2	6	88	No issues
N1	L	L	4	8	10	10	8	6	4	4	10	4	10	6	6	90	No Issues
N24	M	L	4	6	8	10	8	8	4	6	10	10	10	2	5	91	No Issues, good solid panel
N15	M	L	4	8	8	8	8	6	6	6	10	8	10	4	6	92	No Issues
43	L	L	4	8	8	10	8	8	8	8	10	4	10	2	6	94	No issues

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55A	M	M	6	6	8	10	10	6	4	4	10	10	10	8	2	94	Soft start is old and not repairable when it fails
N12	L	L	4	8	10	10	8	4	4	8	10	10	10	2	6	94	Change main switch to breaker and eliminate fuses
N23	M	L	4	8	10	10	8	8	4	8	10	8	10	4	4	96	No Issues
75	M	M	10	8	4	4	4	6	10	10	10	8	10	6	8	98	Complex program
N14	L	L	6	8	6	8	8	8	6	8	10	8	10	4	8	98	Could not open booster mcc.
46	L	L	8	10	8	10	10	10	4	8	10	4	10	2	6	100	No issues
22	L	L	4	10	8	10	10	10	6	8	10	6	10	4	6	102	No issues
N10	M	M	7	6	10	10	8	6	6	6	10	10	10	8	6	103	No Issues
N27	L	L	4	8	10	10	8	10	6	10	10	10	10	2	6	104	No Issues
37	L	L	2	8	10	10	10	10	10	10	10	10	10	2	7	109	Gas engine well
66	M	M	8	8	10	10	10	8	8	8	10	10	10	8	6	114	No Issues
18	L	L	8	10	10	10	10	10	8	8	10	10	9	4	8	115	Easy upgrade to a Tesco 3 bay panel
64	L	L	4	8	10	10	10	10	6	10	10	10	10	10	8	116	No Issues
N17	L	L	9	10	10	10	10	10	6	10	10	8	10	6	10	119	No Issues
4B	M	M	8	10	6	10	10	8	10	10	10	10	10	10	8	120	No issues
32A	M	M	8	10	8	6	10	10	10	10	10	10	10	10	8	120	No Issues
N34	M	M	4	10	10	10	10	8	10	10	10	10	10	10	8	120	No Issues
N32A	M	M	8	10	10	10	8	10	10	10	10	10	10	10	5	121	VFD's starting to show their age
N32B	M	M	8	10	10	10	8	10	10	10	10	10	10	10	5	121	VFD's starting to show their age
N7	L	L	8	10	10	10	10	8	8	10	10	10	10	10	8	122	No Issues
33A	M	M	10	10	8	10	10	8	10	10	10	10	10	10	9	125	No issues
5	L	L	8	10	10	10	10	10	8	10	10	10	10	10	10	126	No issues
59A	M	M	10	10	8	10	10	8	10	10	10	10	10	10	10	126	Line reactor noisy, instrument wiring issue, "line" run in-op
68	L	L	8	10	8	10	10	10	10	10	10	10	10	10	10	126	No issues
N32C	M	M	8	10	10	10	10	10	10	10	10	10	10	10	8	126	No Issues
71	M	M	8	10	10	10	10	10	10	10	10	10	10	10	9	127	No Issues
14	L	L	8	10	10	10	10	10	10	10	10	10	10	10	10	128	No issues
30	L	L	8	10	10	10	10	10	10	10	10	10	10	10	10	128	No issues

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40A	M	M	10	10	8	10	10	10	10	10	10	10	10	10	10	128	No issues
56A	M	M	10	10	8	10	10	10	10	10	10	10	10	10	10	128	No Issues
28	L	L	10	10	10	10	10	10	10	10	10	10	10	10	10	130	No issues
58	L	L	10	10	10	10	10	10	10	10	10	10	10	10	10	130	A good example of a safe, basic efficient motor control panel
60	M	M	10	10	10	10	10	10	10	10	10	10	10	10	10	130	New panel
N33	M	M	10	10	10	10	10	10	10	10	10	10	10	10	10	130	No Issues
N35	M	M	10	10	10	10	10	10	10	10	10	10	10	10	10	130	No Issues
N11	I	I	2	0	0	0	0	0	0	0	0	0	0	0	0	2	Abandoned
8	I	I	2	2	0	0	0	0	0	0	0	0	0	0	0	4	Inactive Well
10	I	I	2	2	0	0	0	0	0	0	0	0	0	0	0	4	Inactive Well
54	I	I	2	2	0	0	0	0	0	0	0	0	0	0	0	4	Inactive Well
67	I	I	2	2	0	0	0	0	0	0	0	0	0	0	0	4	Inactive Well
N18	I	I	4	0	0	0	0	0	0	0	0	0	0	0	0	4	Abandoned
N19	I	I	2	2	0	0	0	0	0	0	0	0	0	0	0	4	Inactive Well
N21	I	I	2	4	0	0	0	0	0	0	0	0	0	0	0	6	Abandoned
57	I	I	6	2	0	0	0	0	0	0	0	0	0	0	0	8	Abandoned
16	I	I	4	6	0	0	0	0	0	0	0	0	0	0	0	10	Abandoned, No meter, no salvageable components.

Natural gas engine only.

Inactive well sites.