

State of California  
California Natural Resources Agency  
Department of Water Resources  
Division of Safety of Dams

Memorandum of Conference  
Mill Pond Dam, No. 2381  
Mendocino County  
Lakhbir Singh

October 9, 2012

*L.S. Singh 10/22/2012  
YDE 10/22/12*

On October 9, 2012, a meeting was convened in the DSOD Conference room. The meeting was requested by Arcadis to update DSOD about its additional engineering work to resolve the deficiencies issues at Millpond dam. The following participants attended the meeting:

1. Michael Waggoner Chief, DSOD Field Branch.
2. Y-Nhi Enzler DSOD Field Branch
3. Lakhbir Singh DSOD Field Branch
4. Sharon Tapia Chief, DSOD Design Branch
5. Wallace Lamb DSOD Design Branch
6. Bill Fraser Chief, DSOD Geology Branch
7. [REDACTED] Georgia Pacific (GP), Owner
8. [REDACTED] Arcadis, Consulting Engineer, San Francisco Office
9. [REDACTED] Arcadis, Consulting Engineer, Folsom Office
10. [REDACTED] RMC Geoscience

After introductions, Y-Nhi Enzler briefed the visitors about the organizational structure of DSOD and our regulatory role in this project including the function of all 3 branches and the primary contact person for the various phases of this project.

[REDACTED] from Arcadis introduced himself as the Project Manager. He said that [REDACTED] and a non-participating person, [REDACTED], will assist him on technical issues related to the project. He stated that GP decided to take a step back to evaluate other options beside dam removal. The original estimated volume of the sediments to be stabilized was around 54,000cy. It is now estimated in the range of 100,000 cy and the cost has though greatly increased. He added that the sediments in Pond 8 (Millpond reservoir) are not significantly contaminated and pose no significant risk to both the human and eco systems. Therefore they can stay in-place with some treatment of the hot spots. (This fact is not accepted yet by Department of Toxic Substance Control, DTSC).

[REDACTED] from GP stated that the original estimate of the dam removal cost was



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in the range of \$10-15 million. The cost now has now jumped to \$30 million. Because of the changed economics, GP had decided to explore the possibility of dam rehabilitation. A human health risk assessment report to justify the non-treatment of the contaminated sediments in Pond 8 will be prepared for this dam rehab option. If this report is approved by DTSC, this option will have a chance to get selected. Arcadis will then prepare the engineering feasibility report. He also added that DTSC is aware of the shift from dam removal to possibly dam rehabilitation.

██████████ added that the development plan for this once valuable 415 acres of land (sub-divide the land in different parcels and type of development) for the City of Fort Bragg is currently on hold because of lack of interest from developers possibly due to economic downturn in the last few years. Consequently, GP is focusing on the clean-up of the site and the remediation to address dam safety concern. GP will continue to be the sole owner of the property for the foreseeable future. GP became the site and dam owner in 1973 when the company bought the property from Boise Cascade Company.

██████████ said that Pond 8 is not part of any waste management and that it stores mostly storm water run-off from the creeks. The spillway spills often onto the sea. Pond 8 has some heavy metal, organic, or petroleum contamination but their concentration are very low and therefore in GP and Arcadis's opinion, pose no significant health risk or any other concern. He also added that the permeability of the sediments, as determined ASTM 6066, was in the order of 10<sup>-6</sup> cm/sec which is very low.

Arcadis/RMC proposed a geotechnical investigation program to define the depth of treatment of the dam. They envision deep soil cement mixing but are open to other schemes. ██████████ stated that the four boreholes which were drilled to get material properties and to investigate the condition of the dam and foundation were too widely spaced. Also, no piezometer head information is available. The phreatic surface shown in the report is based on the water level information on the day of drilling. Additional information is needed to fill in the gaps for the conceptual design of the various rehabilitation schemes.

He proposed several CPT boreholes and six additional SPT boreholes, (three on the dam crest and three along the south edge of the pond where there is no dam) to collect soil and rock samples for laboratory testing; samples will be collected using a SPT sampler and Shelby tube where appropriate. He elaborated that data obtained from the borings will be used to characterize the soil condition for stability analysis.

Bill Fraser believed that liquefaction is a foregone conclusion based on the result of the



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previous 4 boreholes and therefore CPTs are not going to provide any meaningful data which is already not known. He strongly recommended against CPTs and said that only SPTs should be used as proposed to get strength data. Bill Fraser also added that buttressing the dam may require a base width five times the height of the dam such that the new buttress size may be many times larger than the existing dam. This will be expensive due to the sizable excavation of the sediments. He recommended that should the owner choose to build a new dam, they should consider a RCC dam instead.

On the presence of timber cribs on the downstream face, none of the attendees knew the extent of the logs within the embankment as no information is available in the available record of the dam. [REDACTED] was of the opinion that an EM-31 conductivity meter supplemented with some electrical resistivity meter can be used to better define the extent of the timber cribs within the dam. [REDACTED] also added that adding a buttress on the downstream side of the shallower north dam may be a challenge because the adjacent pond 7 is a wet land.

Wallace Lam discussed the standard DSOD requirements for a safe dam. They include a functional spillway for a design flood, likely a 1000 year in this case, a concrete encased gravity outlet for emergency reservoir release, and adequate performance of dam and foundation during the postulated maximum earthquake. This dam presently has no outlet and there is no means to lower the water below the spillway crest. Bill Fraser said that DSOD will use the latest NGA formulas for establishing the design earthquake load to review the proposed rehab dam. The level of loading will likely be at 67<sup>th</sup> percentile.

Liquefaction of the embankment and foundation during earthquake is a concern and should be addressed using in-situ testing such as SPT of sandy material. Soil stratification is minimal and sampling through Shelby tube should be attempted with the understanding that there will be disturbance. SPT may not need to be performed by the per-inch basis since there is not much gravel on site except near the sandstone. The post earthquake stability will be based on the correlated residual strength. The ICUE shear strength tests will be performed. Wallace Lam said that the effect of the additional upstream loading by the flowable reservoir sediment onto the upstream dam slope should be analyzed. [REDACTED] said that shear wave velocities will be measured. It is to determine the behavior of the embankment fill during earthquake.

[REDACTED] asked about the possible restrictions DSOD may impose after the December 2015 dead line for completion of dam removal or remediation construction. DSOD acknowledged the complexity of the environmental processes and the significant costs of various alternatives. He was informed that future restrictions may include a lower



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spillway or an interim lowering of the reservoir level to below the spillway crest to reduce the risk of failure. This option will require an in-place siphon outlet pipe or another type of gravity outlet to maintain the restricted reservoir level.

GP and Arcadis were informed that the CEQA process will need to be completed before the application can be approved. The CEQA compliance is the most difficult part of the project. The CEQA process will need a lead agency, and since dam safety is just a component of the cleanup of this site, City of Fort Bragg will maintain the lead position if it is willing. DTSC is the major regulator for this site and could logically be the lead agency as well. This matter is still open at this time but needs clarification for the project to proceed. The engineering feasibility report is expected to be complete and under review by DTSC by 2014. It will identify the preferred alternative from the point of engineering and cost. The focus of GP, Arcadis and DTSC is now dam rehabilitation. Until this alternative is acceptable to DTSC, the dam removal option stays as an option for CEQA study. The development of the environmental impact study and permitting efforts will occur in 2015 and 2016.

To conclude the meeting, Y-Nhi Enzler went over the application process that will need to be followed upon selection of the preferred alternative. GP may file a dam removal application if it opts for removing the dam; or a repair application if it chooses to stabilize the dam; or an alteration application if it reduces the dam/reservoir size to take it out from DSOD's jurisdiction. An alteration application will need to be filed for the upcoming soil exploration. It will need to come in with the plans, specifications and an application fee. The contact person remains Lakhbir Singh for the overall project and Wallace Lam for the alteration application.