WASC Proposal ID: Smallman: Storm Aquarries

The Storm Aquarries Plan

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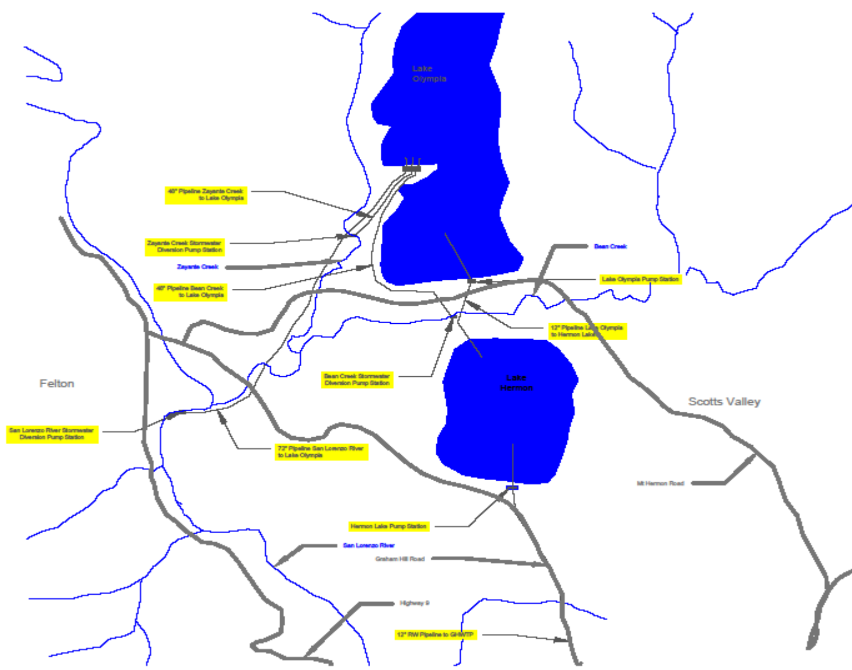
Introduction

The Storm Aquarry plan involves remodeling the existing Zayante Diversion Dam on the San Lorenzo River so that it collects mainly heavy storm water flows, rather than the lower flow, clear water it does now. This water is pumped up to two reservoirs which are built on the existing, abandoned, Olympia and Hanson sand quarries. These sites will also have both treatment facilities and recreational facilities. A pipe shall be installed to connect to Loch Lomond, where water either can be pumped up there, or some water drained out of Loch Lomond, just before winter, (Jerry Paul's "Lochquifer" Plan), and this water stored and used to enhance the treatment process. A significant amount of water would percolate into the ground water basin in a key area near the confluence of Bean Creek, Zayante Creek, and the San Lorenzo River. A conventional treatment plant would be constructed at the Hanson Quarry site and piping connected to the nearby distribution systems.

Reservoir Construction

The overall cost of the reservoir construction would be significantly reduced and also help the local economy from the following reasons. Both quarries have additional sand that can be sold to underground utility contractors. Most contractors have to haul clean fill to private landowner in Watsonville, the Buena Vista Landfill, or Marina. Millions are spent in trucking costs and dump fees to do this each year. These sites could charge a dump fee to further cut construction costs. The dirt with a certain amount of clay content can be engineered to be used both for dam and liner construction. The different types of soil would need to be staged, mixed and placed appropriately.

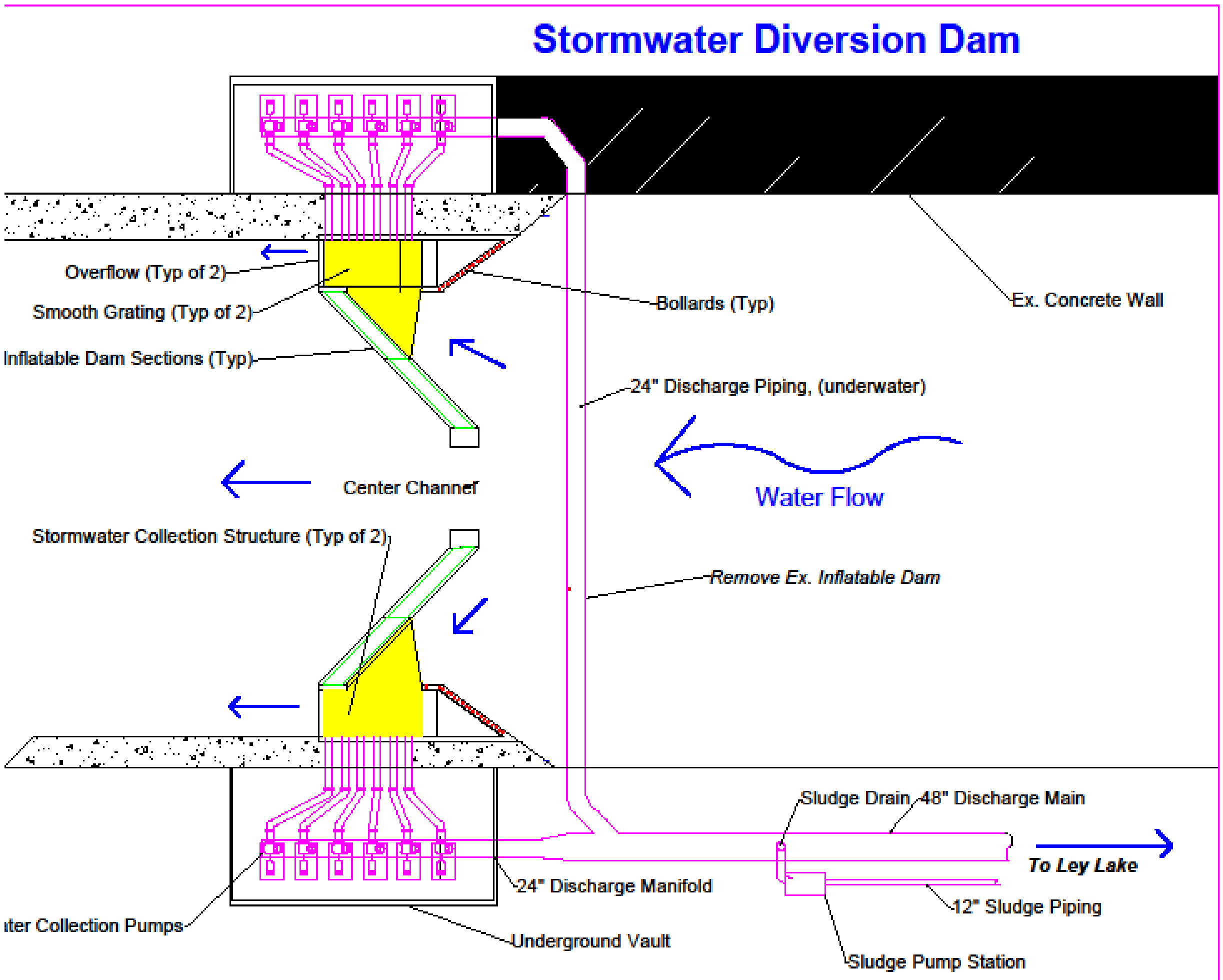


Stormwater Diversion

The water which flows down the San Lorenzo River during storms is heavy laden with silt from erosion of developed areas and sewage water from numerous septic tank leech fields. As these issues are continually being improved, the amounts of pollution will decrease. This will not only lower the cost of treating this water, but will help the fish habitat enormously.

Contrary to what many people believe, the fish do not need this high amount of water, in short time periods, to thrive. This is water ends up flooding the estuary in Santa Cruz, and spills into the ocean. What the fish do require enough water for year round access, and shaded pools. They also need many “nooks and crannies” created by rocks and trees etc. to protect themselves from these large storm flows and predators. The problems include silt filling up these, “nooks”, and people cutting down or removing trees. And, what is even worse, if the ground water basin lower enough, the river dries up too quickly in the summer/fall, and basically destroys the habitat all together. Below is a picture of the existing diversion dam, with it deflated, right after a fairly large storm. Diverting this water provides flood control, and may even make the levees through Santa Cruz obsolete.

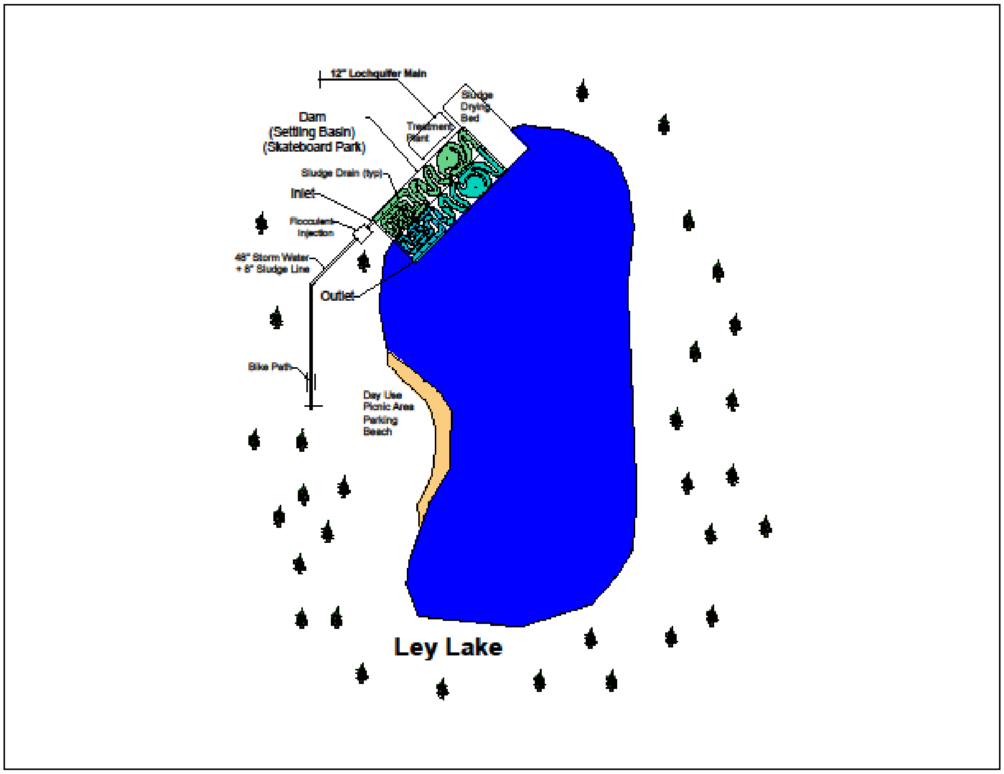
Diversion Types



This is a design that I did. It uses inflatable dams, with steel protection plates, shaped in the form of a “V”. A permanent center channel in the deepest part of the river is maintained for the fish. Most of the water is diverted over to the sides, over smooth grates. Most of the water goes into large concrete vaults where the water is pumped into a large pipeline, and pumped up to Ley Lake, (Olympia Sand Quarry). The pipeline would go through open space and then across Graham Hill Rd, and again up an abandoned rail corridor, which can also be restored as a bike path, to the quarry. Below is a Ranney Collector on the Mad River in Humboldt County. It is placed in a large gravel bed. I don’t believe the Mad River has nearly as much silt during heavy storm flow, moreover, the silt is so fine that is would not get filtered from the gravel enough so that the water would not have to go to a settling basin for treatment, but this is a proven technology, and there are hundreds of these around the world.

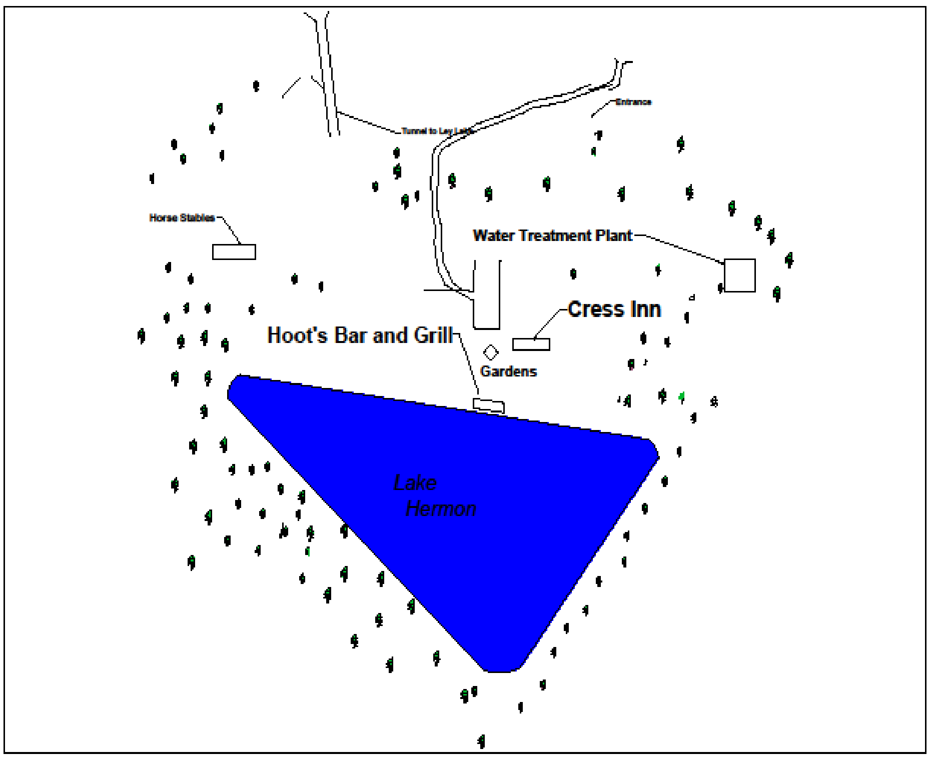
Ranney Collector

Ley Lake



An earthen dam would be constructed on the northwest corner, and the top portion of the dam would be a reinforced concrete structure which would serve as a settling basin. The water would enter basin after a flocculent is mixed with it. This removes the negative charge of all the silt particles. The curvy channels slow the water so it becomes still. Clean water from Loch Lomond is sprayed on the top. This forces the silt laden water down under pressure to enhance the particles to combine, become heavy, and settle to the bottom to a drain where the sludge is pumped to a drying bed. The drying bed also has a drain with a filter. The second portion of the settling basin channel, aerators treats the water by enhancing bacteria growth. This removes nitrates and other chemicals from pollution. Larger detention chambers and treatment facilities may be required to achieve this. These chemicals need to be removed because some water will percolate into the ground water basin, and there are potable water production wells nearby. Then the water simply overflows into the lake. The bottom and sides of the lake may need a compacted layer of soil with certain amount of permeability to control the amount of percolation. The lake would have day use facilities with restrooms, lawn, beach, picnic tables and barbecue pits. Outside of the rainy season, the settling basin would be cleaned, drains covered, sprayers and aerators removed to become a skateboard park. Over on the other side of the lake the top water would be pumped over to Lake Hermon, constructed on the abandoned Hanson Quarry.

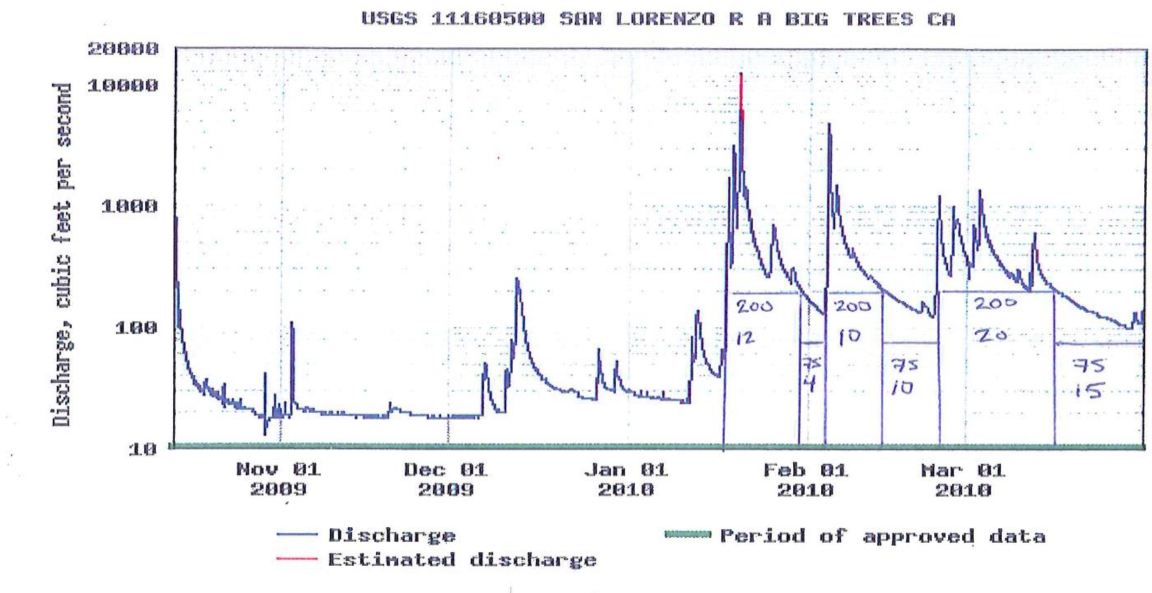
Lake Hermon



Either a bridge or a tunnel would go over or under Mount Hermon Road for the pipeline and public access to Lake Hermon. I envision this area capable of constructing a resort, perhaps something similar to the Benbow Inn. I could have a garden area and a restaurant on the water. This lake would be open for boating, fishing, and perhaps swimming. It could have horse stables. This lake would likely be able to remain full most of the time, but Ley Lake would go down during dry years. A conventional treatment plant would extract water and connect to the nearby distribution systems of Scotts Valley, San Lorenzo Valley and Mount Hermon Water Districts.

Cost and Productivity

Below is a flow chart for the San Lorenzo River at Big Trees during a relatively wet year, 2009-2010. The storm water diversion would be designed to collect a maximum of 200 cubic feet per second, and be adjustable so that a certain amount of water continues to flow. So if you did a rough calculation of collecting 200 cfs for 32 days, and 75 cfs for 29 days, this is equivalent of 17,009 acre feet of water.



It's extremely difficult to estimate the exact cost of building the reservoirs at the sand quarries. Extensive soil borings need to be performed. Some of this has already been done by the quarry owners. Bottom line there is more engineering work to be done, and the amount of additional sand to sell determined, before and accurate estimate can be created.

In 2000, the owner of the Olympia Sand Quarry claimed that he could build a 5000 acre feet reservoir if he was allowed to mine more sand, and build a dam. I believe Lake Hermon is also about 5000 acre feet. So, on a wet winter, these two reservoirs could be filled easily. Water could continually be pumped out of Lake Hermon, treated, and injected into distribution systems.

Regardless of the cost, this would create a very beneficial water source and recreation area. It has been considered to install injection wells at the Hanson Quarry. This basically negates creating a recreational area, and uses energy. The reservoirs can percolate more water into the basin with zero energy, and be made into recreational areas.

Effectiveness, Practicability, Environmental and Community Considerations

- ***Effectiveness:*** A major reason why storm water collection has be rejected is because of the cost to treat the water, even though it is less expensive, requires less energy, that desalination. Pumping all this water up to the Quarry does require a lot of energy, but only short, say 60 days per year, of use. The pipeline has to be cleaned every year. For treatment the water is basically detained. More energy is used for aerators and pumping sludge over to drying beds. Then the sludge has to be trucked away after it dries. Most of the silt comes from developed areas that are not controlling erosion. If both silt and septic pollution is reduced, it will not only reduce the cost of treating this water, it will also help the fish habitat enormously.

- ***Practicability:*** I believe up to 1997 SLVWD treated some of the Loch Lomond water at Glen Arbor. The City pumps some water from the Zayante Diversion back up to the Loch. Jerry Paul's "Lochquifer" plan calls to drain Loch Lomond a certain amount, just before winter if the Loch was full before the winter. Problem is there is no place to store this water. The sand quarry reservoirs would provide the most practical area for this. As stated earlier, the water can come down from the Loch, and go through a hydroelectric turbine at the settling ponds at Ley Lake. The quarries also are the most practical area to store and treat the silt laden water from the Zayante Diversion.

- ***Environmental Considerations:*** Some of the best records about fish come from fisherman. Some of the largest Salmon were caught on Bean Creek near the San Lorenzo River. If the fish could build a City, it would be in this area. Having two 5000 acre foot reservoirs straddling Bean Creek and adjacent to the San Lorenzo River and Zayante Creek will insure a high ground water level. Causing a low ground water basin is absolutely the worst thing we do to the fish, as it can cause the river to dry up completely during the summer. The other worse thing we do is silt and septic pollution described above.

- ***Community Considerations:*** Restoring the fish habitat to historical levels with be a wonderful boost for the Community, and will help the economy. In the interim, as the reservoirs are being built, the quarry operations will also create jobs and create an economical area to dump clean fill. The recreational areas will also create jobs and boost the economy. The skate board park could be world class, and be a fantastic opportunity for our children to advance their athletic ability not let their lives get ruined by drugs and alcohol. Because treatment and storage of water takes up so much land area, there is absolutely no reason not to also design these areas available for recreation as well.