RAINWATER CONSERVATION SYSTEMS BY COLE DESIGN MONTECITO

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County of Santa Barbara

Greetings County Officials and Park Directors...

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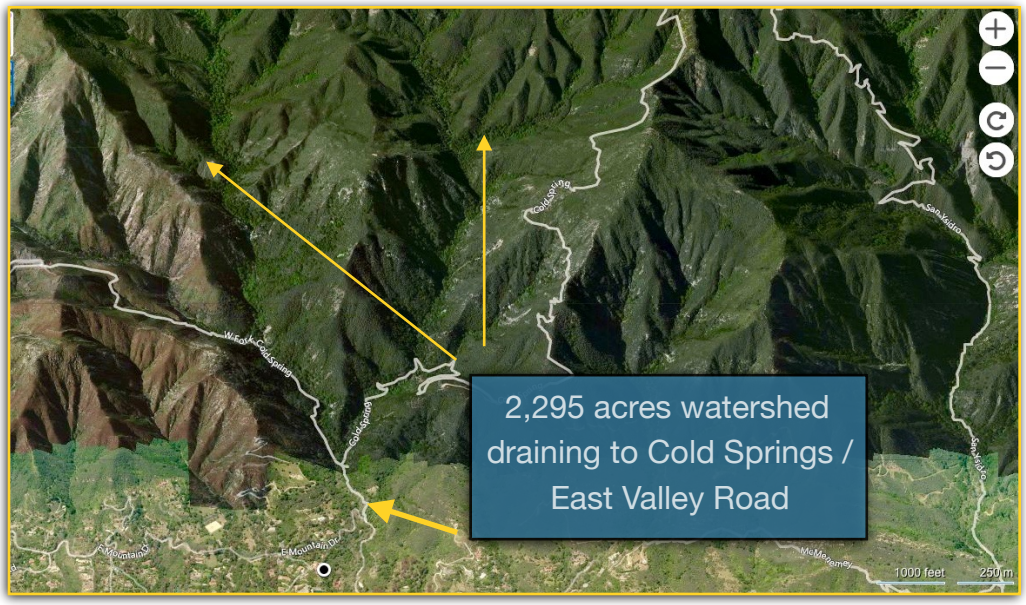
COLD SPRINGS 250/YEAR AF PILOT PROJECT

81.5 Million Gallons

WATER SAVINGS FOR COUNTY PARKS

I am Monty Cole a longtime builder/designer in Montecito with a science background. I have 35 years experience in designing and building water drainage systems and am an EPA qualified Water Wise Landscape Professional. My company designs and installs rainwater catchment systems for estates, schools, businesses and homeowners in Santa Barbara County.

We recently designed a water catchment system for *Lotusland, which gathers and stores* in underground cisterns over 2,700,000 gallons per year for them at roughly *one cent a gallon*. We are using Lotusland parking lots, driveways and channels to collect water each rain and store it in underground cisterns.



I have created a survey and proposal for a 300 AF water collection and storage facility adjacent the Cold Springs Creek debris basin, Here are my findings.

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East Mountain Drive Crossing / Cold Springs

2,295 Acres total water shed area

30% Runoff figure equals 688 acres of sandstone, brush, actually gets into Cold Springs Creek.

Creek drains over cement crossing at East Mountain Drive

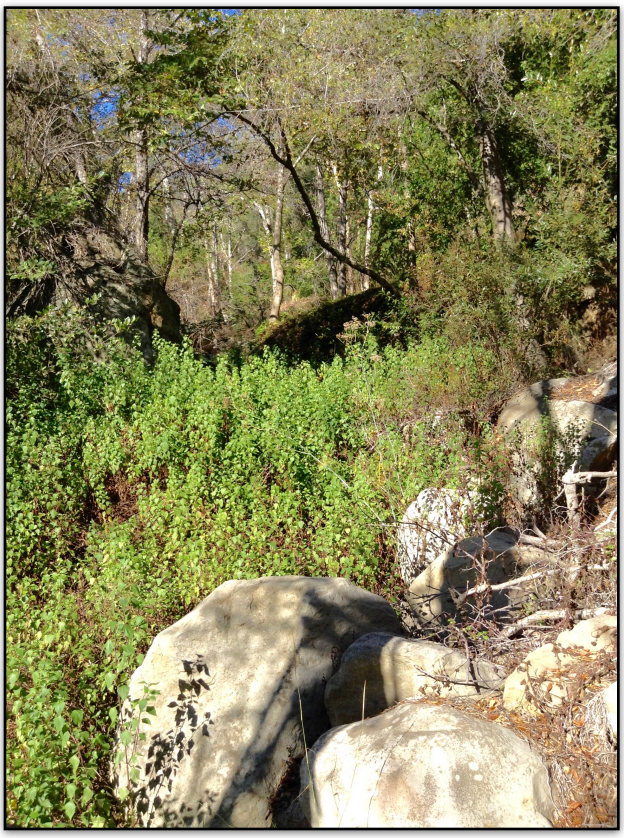
One inch rain creates 57 acre feet (AF) at the road/ creek crossing...

or 216 gallons per second (GPS) for 24 hours...

SITE RAINWATER AMOUNTS AND CALCULATIONS

Using Cold Springs Creek that flows out of the foothills across E. Mountain Drive we can gather more water than can be used by 50 county parks. The watershed feeding these two points is 3,000' to10,000 wide and about 10,000' deep. From East Mountain Drive at the Cold Springs crossing, up to Camino Cielo at the top of the foothills...

Fact is, on the coast we have nearly as much drainage area as the Cachuma reservoir watershed, and more rainfall... the difference is this water runs off in creeks and culverts to the ocean, instead of into a lake. If we added up all major creeks on the Santa Barbara coast, the combined watershed is over *70 square miles.*



The area we are concerned with is completely uninhabited and consists of mostly sandstone hills, brush, creeks, pools, tributaries and a few hiking trails. We are talking about 2,295 ares of watershed, all draining to the crossing at E. Mountain Drive. We are using a 30% coverage number, so we assign 30% of this area as impermeable and this drains to the Crossing at E. Mountain Drive. That means 688 acres of usable drainage, creating 688 AF of water from one foot of rain, all draining across the East Mountain Drive crossing.

My design here involves collecting runoff water at the E. Mountain Drive Crossing (Crossing) where it flows across East Mountain Drive. At this point Cold Springs Creek is a boulder strune creek with house sized boulders to refrigerator sized rocks lining and filling the channel.

Our plan to capture part of this relatively clean creek water where it crosses the road. From here pipe the water out of the channel and down to the debris basin 2,000 feet to the South. Across this area there are three open areas owned by the county that we recommend as spots for cistern storage of this water. A 200' X 300' X 14' cistern will hold 19.2 acre feet (AF) so three will store 57.6 AF.

THE NUMBERS

With 688 acres of drainage that creates 688 acre feet of water with a foot of rain. One inch of rain creates 57 AF of water, or 18,682,124million gallons. So when an inch of rain falls in a short period of time, East Mountain at the crossing receives 57 AF of clean rainwater.

That boils down to...

778,421 gallons per hour (GPH) (2.38 AF),

12,973 gallons per minute (GPM) and

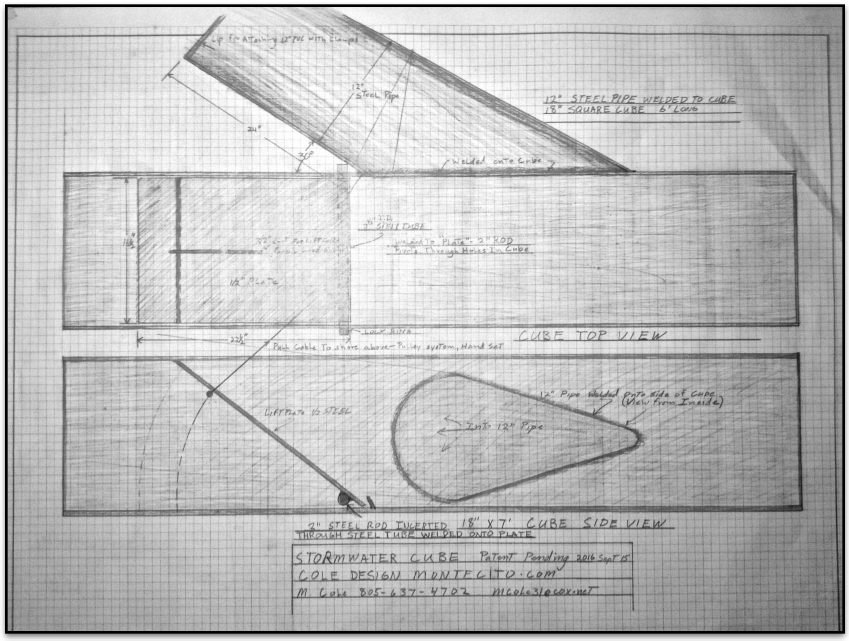
216 gallons per second (GPS).

For a quick one inch rain we calculate an 24 hour average flow of 28.8 CFS cubic feet per second at this crossing. This water in draining out of wilderness pools, falls and channels and then into a debris dam, so it's not deemed available for fish spawning. Therefore it is up for grabs. With the looming water shortage getting worse I recommend the County get in there and grab this water for county use now.

THE DESIGN

Here is an overview of the design. We gather water at the crossing mentioned using the cube water diversion device, which diverts water from the creek into a 12" pipe. From there we pipe this water along the upper reaches of the creek bank in a pipe, just below East Mountain Road... as it winds down past the debris basin. Water in 12" PVC pipes, 2270" feet down to the open areas adjacent the debris basin.

In this open area build underground storage cisterns 200' X 300' X 14' to store a total of 19.3 Acre feet of water. Simply put the County can now store19.3 Acre feet water from a one inch rain. This one inch rain is a common occurrence and so if ten such rains occur the county now has stored and released 193 Acre Feet of fairly clean rain water. This water is superior to recycled sewer water because there are no chemicals, poisons, bleaches in the water, which are added to recycled water, and it doesn't smell like a sewer. Great water for parks and recreation. Good for plants and flushing or cleaning.



THE CUBE

This is my *patented device* that safely and efficiently collects water from a rushing channel. These cubes are six feet long and 16" square tubes... that allow rushing water to pass straight through when open. Various sized and shaped cubes operate in differing conditions and efficiencies.

The cube is closed or opened via a steel cable operated from above on a bridge or side abutment. When closed, water entering the cube is redirected through a steel pipe exiting the side of the cube, and onto PVC pipes installed on the banks of the river, creek or channel. From there water moves downhill

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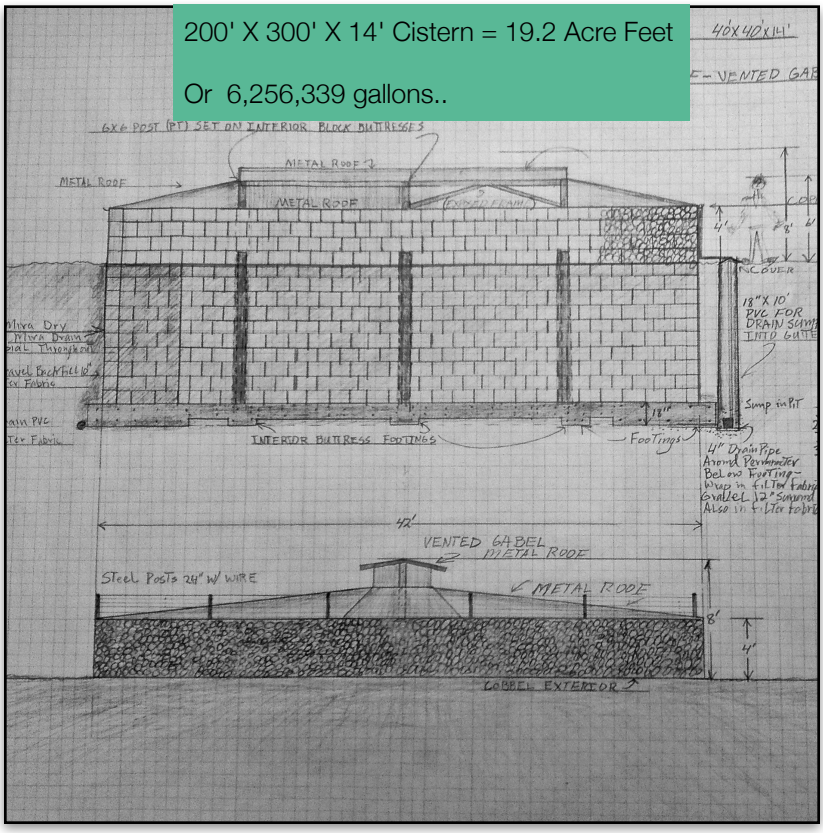


to storage in the new cisterns.

The cube thus pulls and extracts water out of the channel on command and sends water to storage. Once primed and running, the syphon effect adds to the force removing water from the creek or channel.

This system has *only one moving part*, a steel plate on a pivot inside the cube. The plate operates to open or close the flow through the cube, thus diverting water out the side exit pipe. No dangerous electrical wires or motors to break and get torn out by flooding creeks. And no pipes getting broken by floods or jammed with rocks or sand.

CUBE OPERATION

This devise is simply operated by a pulley and cable system that is hand cranked and set from above the creek bank, and set in an open or closed position, depending on water flow rates and desired water extraction. This patented device solves this long time problem of channeling rushing water without a dam, and without endangering any operating personal.

Operators stand well above and away from a running creek and observe conditions. A hand crank pulls in a cable connected to the steel plate within the cube. As the plate closes off the end of the cube, water begins to flow into the exit pipe. A simple flow rate meter at the 12" downhill pipe indicates flows and the plate is adjusted to achieve optimum settings. As water begins to flow downhill through the pipes, other workers at the storage facilities communicate the rates of flow and confirm function. Basically it's an adjustable, indestructible valve placed where no electrical or hydraulic controls will function, in the middle of thousands of tons of rushing water.

(Fig 1) Cube Capture Rates for 7fps Stream Flow

14" water height (2) 16" X16" X 6' cubes

78.6 GPS Gallons Per Second

4,716 GPM Gallons Per Minute

282,960 GPH Gallons Per Hour

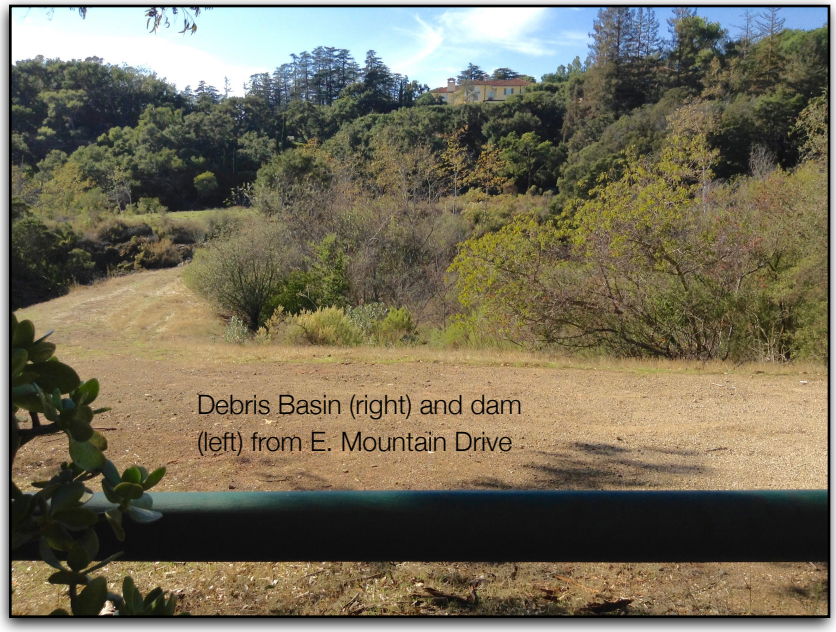
6,791,040 GPD Gallons Per Day

24 Hour Rate / 325,851 = 20.8 Acre Feet

CAPTURE RATES

The capture rates relate to how much water is taken per cube at various creek flow rates. The figure (1) shown here are based on a *7 foot per second* (FPS) stream at a 14 inch height.

When securely installed in the creek channel, the cube gathers 39.3 gallons per second (GPS) as an average.



With *two cubes installed* as I propose, the total water gathered is 78.6 gallons per second GPS... or

4,716 GPM Gallons Per Minute

282,960 GPH Gallons Per Hour

6,791,040 GPD Gallons Per Day 24 Hour Rate / 325,851 = 20.8 Acre Feet

So using this system, a one inch rain will produce 20.8 Acre Feet of storable water delivered to one or more new storage cisterns adjacent the Cold Springs debris basin. And notice zero electrical costs. Zero because it's all gravity fed. Some pumps needed at the storage area to filter, skim and otherwise clean the stored water.

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STORAGE-USE-COSTS

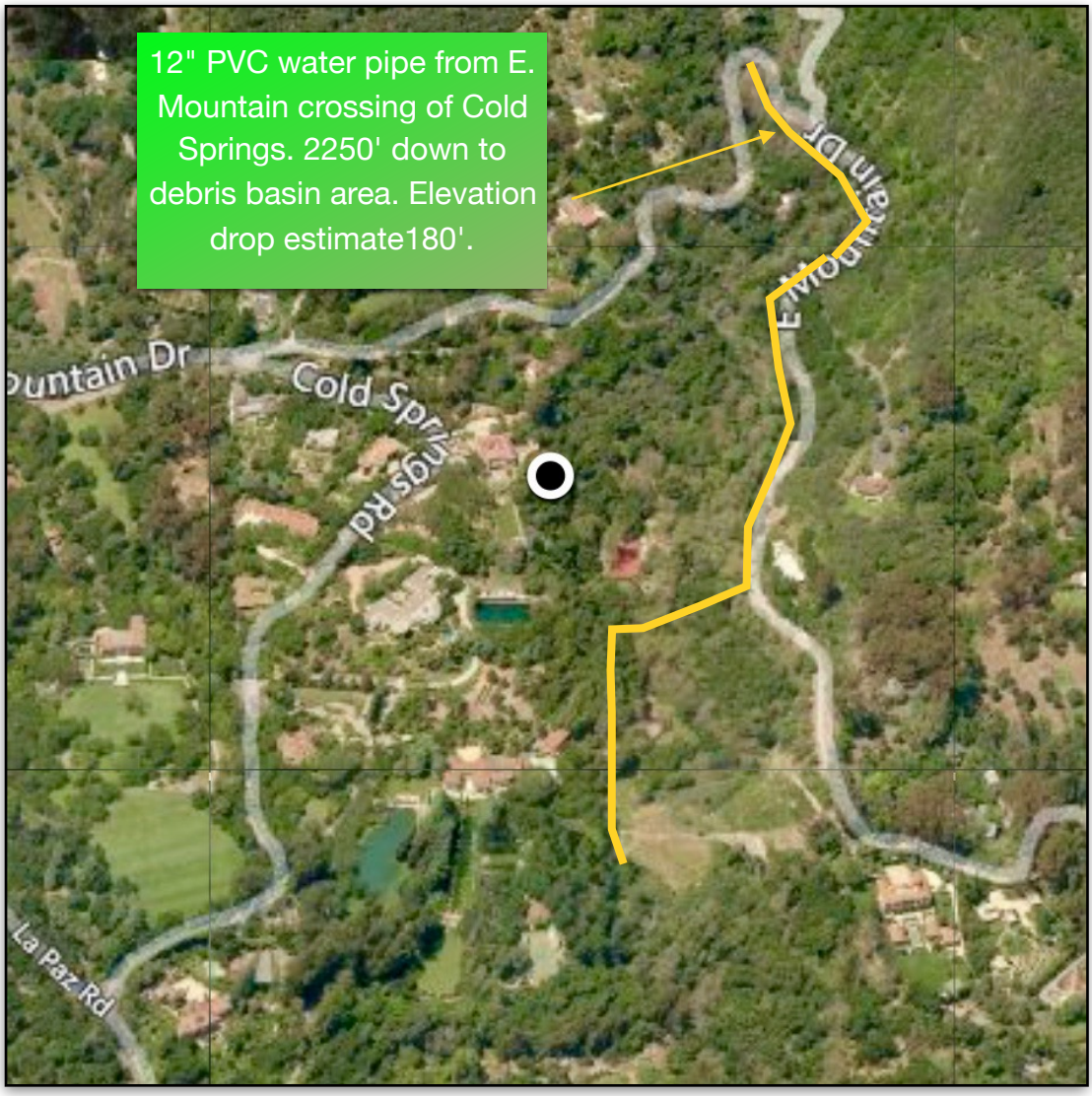
To store 38.4 acre feet at a time build two cisterns, 200' X 300' in the flat areas adjacent the debris basin as shown. A simple storage method is 12" block walled cisterns placed mostly underground with a cover or no cover. Easy to build and maintain and cheap.

This will provide water for the county nearly year round.

Send this water to county parks down hill from the debris basin, or sell it to the desal plant for filtering as drinking water. This would be 10X cheaper than using salt water. Or filter it on site and sell to MWD.

When the next one inch rains fall, gather another 20.8 AF of water...The County is now a water machine, able to irrigate numerous county properties, programs, parks. Or sell water to other agencies. Saving millions of dollars on water costs every year.

Even with a drought year rainfall of 12" that still creates 242.4acre feet saved and stored... If filtered and sold at Montecito prices of 1.4 cents per gallon that is $4561.91 per acre foot... times 12 inches of rain equals 242.2 AF X $4561.9 = $1,105,807 dollars... per year. This project would pay for itself in a year.



STORAGE DESIGNS

These designs show possible locations for new cisterns adjacent to the debris basin. There is a pressurized gas line running through the dam or basin itself, obviously a point of interest.

There is possible space for (4) new basins along this flat area up and down the creek. 19.2 Acre Feet per storage cistern would mean 76.8 AF of immediate storage. Stored water can be cleaned, filtered on site and then piped out via 12" pipes running down the creek corridors, placed at the top of the creek beds. This water can be sold to municipalities, MWD or SB Desal, or Carpinteria. the options are many for a valuable product.

1974 Army Corps Stream Chart

ABLE 5

PEAK FLOWS FOR INTERMEDIATE REGIONAL AND STANDARD PROJECT FLOODS*

Location	Distance upstream from mouth (miles)	Drainage area (square miles)	100-yr event Intermediate Regional Flood (cubic feet per second)	Standard Project Flood (cubic feet per second)
Montecito Creek				
at Highway 101	0.47	5.9	5,700	7,300
at East Valley Road	1.64	5.3	5,500	7,000
below confluence with Hot Springs Creek	2.25	4.8	5,000	6,500
Cold Springs Creek at elevation 500 feet	2.62	3.7	5,200**	6,700**
Hot Springs Creek above confluence with Montecito Creek	2.27	0.9	1,200	1,500
Oak Creek				
at Highway 101	0.16	1.4	1,800	2,300
at elevation 250 feet	1.73	0.4	600	800
San Ysidro Creek				
at Highway 101	0.20	3.9	3,500	4,400
at East Valley Road	1.62	3.4	3,500	4,300
at elevation 500 feet	2.27	3.0	5,000**	6,800**
[illegible]yon Creek [illegible]-101	0.23	5.8	4,900	6,300
[illegible]luence with Picay Creek	2.10	3.0	3,100	4,000
above confluence with Picay Creek	2.11	2.1	2,400	3,100
at Romero Canyon Road	2.77	2.0	3,400**	4,600**
Buena Vista Creek				
above confluence with Romero Canyon Creek	0.01	2.2	2,800	3,600
below confluence of East and West Branches	0.80	1.6	2,200	2,800
East Branch Buena Vista Creek				
at East Valley Road	0.95	0.8	1,200	1,500
at Piedras Drive	1.43	0.3	800**	1,100**
West Branch Buena Vista Creek at Bella Vista Drive	0.98	0.7	1,600**	2,200**
Toro Canyon Creek				
at Highway 101	0.26	3.6	3,800	4,800
below confluence of East and West Branches	1.21	2.9	4,500**	6,200**

East Valley

So how much is this water worth? It's not purified but its also way better than recycled sewer water. This water can be put directly on landscapes and can be easily and cheaply purified and used as drinking water. It is after all, rainwater with a few leaves.

ARMY CORPS SURVEY 1974

Army Corps of Engineers did a 1974 survey and found Cold Springs Creek at 500 feet elevation and 2.62 miles upstream from the ocean... produces in a standard flood... *6,700 CFS...cubic feet per second*. That's 50,116 GPS! (Gallons per second) This is a fine source of chemical free water.

The cube to cistern storage system I outline could be used in other county locations to varying degrees of efficiency.

Costs usually pencil out under 1/2 cent/gallon to capture and store rainwater in the Montecito hills. That's $1629/AF This is cheaper than municipal water, and with my calculations of desal costs coming in at 11cents/ gallon, we're going to need it.

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RETAIL WATER

The continuing drought and just the ability to grow as a county really calls out for this solution. I see every county park with some kind of rain/creek catchment system and/or onsite storage. Water in drainage channels is wasted as mud out to the ocean. It causes great erosion in overburdened creek beds and fish can't use mud...fish need a slow, non muddy release of water that will be provided by saving and slowly releasing storm waters into park grounds and letting it percolate through. So this is also a fish program, that makes money.

As stated before...even a drought year rainfall of 12" still creates 242.4acre feet of free water... If filtered and sold at Montecito Water District prices of 1.4 cents per gallon that is $4561.91 per acre foot. Times 12 inches or rain equals 242.2 AF X $4561.9 = $1,105,807... So this project will literally pay for itself in 3 years. Plus all this water is water we didn't have to import and buy.

WATER TRANSFER

Water from the creek is carried via 12" PVC pipes located along the top of the creek bed. Instal six foot X 2" steel pipes just off the far shoulder of the roadway. Use small steel cable to support the 12" PVC pipes every 6' along the course. The pipe line will crossover the creek as shown and continue to the cistern storage and filtering areas. Takes 375 pounded in 2" X 6' pipes. A very easy, cheap and effective transfer method

So how much is this water worth? It's not purified but its also way better than recycled sewer water. This water can be put directly on landscapes or can be easily and cheaply purified for use as drinking water. It is after all, rainwater with a few leaves

CONCLUSIONS

There are many lots, roads surfaces, and drain creeks throughout the Montecito and the entire channel Island coast that would provide an incredible amount of water during the rain season.

From my investigations around Montecito, *there are some 20,000 acre feet* going down our drains and creeks every drought year.

Most of this water runs off and travels so fast it destroys stream beds and fish habitat. We should investigate and build structures to harness this resource and utilize it.

The major construction on these projects will be put out to bid. My part is to lease and instal my proprietary cubes into place, oversee, assist and monitor their operation, and recommend adjustments of operation. These plans, excepting the cubes are offered as a concerned citizen.

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WaterSense
Meets EPA Criteria