Republic of the Philippines
Department of Environment and Natural Resources
FOREST MANAGEMENT BUREAU
Visayas Avenue, Diliman, 1100 Quezon City
Tel. No. (632) 927-47*-88 / Fax. No. (632) 928-9313
E-mail Address: fmbdenr@mozcom.com/Website: http://forestry.denr.gov.ph

MEMORANDUM

FOR/TO : All Regional Directors
All Regional Technical Directors for Forest Management Service
All PENROs and CENROs

FROM : The Director

SUBJECT : **TECHNICAL BULLETIN NO. 13 STANDARD COST AND DESIGN FOR FOREST PROTECTION AND SOIL AND WATER CONSERVATION (SWC) MEASURES**

DATE : NOV 14 2014

1. **The Technical Bulletin**

This Technical Bulletin enumerates some of the forest protection and soil and water conservation measures commonly used to ensure the effective management and maintenance of established plantations. This will serve as guide to all regions and field offices for their formulation of annual Work and Financial Plan. It provides standard cost for their targets on soil and water conservation and infrastructure development under watershed rehabilitation and protection. In addition, this endeavour will benefit the communities within certain watershed to enhance and stabilize the condition of soil and provide enough water supply in the area.

2. **Scope and Coverage**

This Technical Bulletin shall apply to all components of all forestland development programs and projects.

3. **Users of this Technical Bulletin**

The intended users of this technical bulletin are personnel of DENR field offices who are involved in planning, implementing and managing of forest resources and forestlands.

4. **Definition of terms**

4.1 Soil Conservation refers to land-based management practices for minimizing, if not totally eliminating, soil erosion and movements from higher to lower slopes to maintain fertility and productivity of the land. Soil conservation techniques may be in the form of vegetative, structural and combination of vegetative and structural approaches/measures.

4.2 Rill Erosion are narrow drainage lines less than 30cm deep and progressed when surface water concentrates in depressions or low points through paddocks and erodes the soil. It commonly occur in bare agricultural land, particularly overgrazed land, and in freshly cultivated soil where the soil structure has been loosened.

4.3 Gully Erosion are channels deeper than 30cm that cannot be removed by normal cultivation. It occurs when smaller water flows concentrate and cut a channel through the soil.

4.4 Sheet Erosion is the removal of soil in thin layers due to impacts of raindrops and shallow surface flow during rainy season. It can cause nutrient and organic matter loss of the soil.

4.5 River Bank Erosion is the removal of soil/scouring due to the intensity of flowing water along riverbank. It can be observed by erosion on the outside of a bend and deposited materials on the inside bends of the river.

5. Types of Forest Protection and Soil and Water Conservation Measures

SOIL AND WATER CONSERVATION MEASURES	
1. Structural Measures structures constructed in more **advanced stages/severe cases of erosion** such as **gullies** and **rills** in stream/river channels. Vegetative measures in this case may be may be inappropriate as they cannot control and hold the soil in place. Severe erosion can be found along barren areas, road cuts, and steep slopes devoid of vegetation that need urgent remedial measures in view of the effect of run-off or overflow from hillside down to the riverbank. Application/establishment of **gabions, check dams, riprap/stonewalls and water impounding system** can help eliminate and reduce impacts of flooding and severe cases of soil erosion.	
Engineering Structure	**Description**
1.1 Gabions	are cage-like baskets constructed on a non-corrosive wire and filled with rock. The water flows easily through this type of structure. By the time the gabions have reached their final stability, fill rocks will have combined with soil and vegetation into permanent structure (refer to Figure 1).
1.2 Check Dam	is a small dam, which can be either temporary or permanent. It is built across a minor channel/river, irrigation canal or drainage ditch. Established to reduce erosion and gullying in the channel and lower the speed of water flow during heavy rain (refer to Figure 2).
1.3 Riprap/Stone Walls	are foundation or sustaining wall of stones or chunks of concrete established commonly on any waterway or water containment where there is potential water erosion (refer to Figure 3).
1.4 Water Impounding System/Tank	is a box-type structure built across a narrow depression or valley to restrain water and develop a reservoir that will store rainfall and run-off during the rainy season for immediate or future use. It provides water for supplemental irrigation, domestic purposes and livestock production in critical, less accessible upland areas. However, if the purpose of construction is to provide potable/drinking water from springs to the surrounding communities, it is suggested that the water undergo appropriate water treatment process in order to

	ensure the health and safety of the community (refer to Figure 4).
2. **Vegetative Measures** work measures done in **gradually eroded** areas where **sheet erosion** is most likely to occur. This measure involves the applications of *grading and terracing* through natural **vegetative strips/ hedgerows**, **wattling** and **grass/cogon matting**; and **reforestation** (planting of forest species).	
Vegetative Structure	**Description**
2.1 Hedgerows/Natural Vegetated Strips	are natural strips of vegetation in cultivated farms or along the contour. Planted approximately one-meter wide strip following the contour preferably ten (10) meters apart in 15-20% slopes and closer in steeper slopes to regulate water and help prevent soil loss and reduce flooding. This will serve as "filter" of eroded soil particles from upslope of cultivated farm lots and prevent them from reaching streams, rivers and creeks. Preferred hedgerow species are Madre de Cacao, *Flamingia macrophylla, Desmodium renzonii* and *Pennisetum purpureum.*
2.2 Wattling	is established through construction of poles/pegs intertwined with twigs or branches used for walls and fences. The most common species used and suitable for wattling is Kakawate, for it has the ability to coppice. Cogon, napier, talahib or sometimes sunflower can also be used instead of branches/twigs and this is called **modified wattling** (refer to Figures 5 and 5.1).
2.3Riverbank Stabilization	is a method to stabilize the soil along riverbank. The preferred species to be planted on both sides of river or stream is bamboo specifically Kauayan (*Bambusa spinosa*), Kawayan killing (*Bambusa vulgaris*) and Boho (*Schizostachyum lumampao*), wherein the roots hold the soil in place and eventually reduce the impact of water flow thereby preventing the streams from being eroded or scoured and it has economic value.
2.4 Hillside Work/ Stabilization	is a measure to stabilize an eroded area which includes planting of cover crops such as *centrozema, kudzu, collopogonium* and the like. Establishment of cover crops as an erosion control is preferably done together with other vegetative measure such as wattling, terracing and installation of matting.
FOREST PROTECTION MEASURES	
3. **Infrastructure Development** for this purpose is defined as one of the forest protection strategies used for monitoring and evaluation of established plantations for forestland development programs and projects. This includes establishment of graded foot trail, fire lines and look-out tower to prevent the occurrence of fire and for maintenance and protection of established plantations	

Infrastructure	Description
Graded Trail/Foot Trail	is approximately 1-meter wide maintained access path which facilitate the transport of seedlings from the nursery to planting site. This foot trail provides easier project supervision, monitoring and evaluation.
Look-out Tower	is a small building, usually constructed at strategic places such as high vantage point in order to maximize the viewing distance and range; from this vantage point the personnel that manned the tower will detect early the occurrence of forest fire in the plantation site.
Fire Lines	are strips established around or following the perimeter of the plantation to prevent the occurrence of fire coming from adjacent area. It is commonly done on the onset of dry season to clear the plantation from all combustible materials such as grasses, plant debris, etc.

6. Standard Cost for some Forest Protection and Soil and Water Conservation Measures

The activities stipulated hereunder, specifically on structural measures and infrastructure development, are computed including costs of labor and materials for construction:

Activities	Unit of Work Measure	Unit Cost (Php)
I. Construction of Soil and Water Conservation		
1.Structural Measures		
1.1 Gabion check dams	Cubic meter	3,000.00
1.2 Mixed boulder and concrete check dams	Cubic meter	4,000.00
1.3 Grouted Riprap or stone walls	Cubic meter	3,200.00
1.4 Water Impounding System/Tank	Cubic meter	18,300.00
2.Vegetative Measures		
2.1 Hedgerows/ Natural Vegetated Strips (Madre de Cacao/*Flamingia macrophylla/ Desmodium renzonii/Pennisetum purpureum*)	Cuttings	6.00
2.1 Wattling (Kakawate+twigs/branches)	Cuttings	5.00
2.2 Modified Wattling (Kakawate+Napier/Talahib/Cogon)	Cuttings/Bundle	15.00
2.3 Riverbank Stabilization (Bamboo)	Culm	35.00
2.4 Hillside work/stabilization (*centrozem/Kudzu/Collopogonium* spp.)	Linear meter	5.00
2.5 Planting of forest species (Ipil-ipil/Hauili/Tibig; Leguminous spp.)	Seedling	6.00
II. Infrastructure Development		
Graded trail/foot trail (1 m wide)	Kilometer	9,000.00
Construction of look-out tower	Unit	20,000.00
Combination of look-out tower and range station	Unit	600,000.00
Fire line construction	10m width,	**

	120m/manday	
Fire line maintenance	200sq. m/ manday	**

** Depends on the existing minimum wage in a particular area (attached is the list of minimum wage per region as published by DOLE, August 2014)

References: DMC No. 11 series of 1988 with inflation rate of 3% per year
FMB Technical Bulletin No. 10 Standard seedling cost and unit cost of activities of the National Greening Program
Approved Five-Year National Forest Protection Program, 2014
Submitted Watershed Management Plans
Unit of Work Measure for 2014
Southern Philippines Irrigation Sector Project (SPISP) Submitted Management Plans
DMC 2000-19 Forestry Sector Project (Policies and Guidelines) p.237
Department of Labor and Employment website (Summary of Minimum Wage per Region)
Agpoa, A. et. al (1976). Manual of Reforestation and Erosion Control for the Philippines as compiled by H.J. Weidelt.

Refer to FMB Technical Bulletin No.10 *Standard Seedling Cost and Unit Cost of Activities of the National Greening Program* for reference on the costing of preparatory activities such as site preparation and site validation, assessment and planning.

FOR INFORMATION AND GUIDANCE.

RICARDO T. CALDERON, *CESO III*

Republic of the Philippines
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
FOREST MANAGEMENT BUREAU
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Activities	Unit of Work Measure	Standard Unit Cost (Php)	Unit Cost before (Php)	References
Construction of Soil and Water Conservation				
1.Structural Measures				
1.1.Gabion check dams *		3,000.00	2,951.20	Based on Estimated Cost of FMB
1.2. Mixed boulder and concrete check dams *	Cubic meter	4,000.00	3,888.64	Based on Estimated Cost of FMB
1.3.Grouted Riprap or stone walls *	Cubic meter	3,200.00	3,116. 12	Based on Estimated Cost of FMB
2.Vegetative Measures				
2.1.Hedgerows/ Natural Vegetated Strips	Cuttings	6		Unit of Work Measure (UWM) for 2015 (FMB)
2.2 Modified (Kakawate)	Cuttings (branch)	**5**	3	Submitted Watershed Management Plans
2.2.1 Modified Wattling (Napier/Talahib/Cogon)	Cuttings/Bundle	**15**	6-8	Submitted Watershed Management Plans
2.3 Riverbank stabilization (Bamboo)	Culm	35		FMB Technical Bulletin No. 10 Standard seedling cost and unit cost of activities of the National Greening Program
2.4 Hillside work/stabilization	Linear meter	5	1-3	Submitted Watershed Management Plans
2.5 Planting of forest species	Seedling	6		FMB Technical Bulletin No. 10 Standard seedling cost and unit cost of activities of the National Greening Program (Fuelwood)
Infrastructure Development				
Water Impounding Tank *	Cubic meter	18,300.00	18,219.32	Based on Estimated Cost of FMB
Graded trail/foot trail (1 m. wide) *	Kilometer	9,000.00	215.00	DMC No. 11 series of 1988 with inflation rate of 3% per year
Fire line construction *	(10m width, 120m/md)	**		DMC 2000-19 Forestry Sector Project (Policies and Guidelines) p.237
Construction of ordinary look-out tower *	Unit	20,000.00	7,500.00	DMC No. 11 series of 1988 with inflation rate of 3% per year
Combination of look-out tower and range station *	Unit	600,000.00	100,000.00	Approved Five-Year National Forest Protection Program, 2014
Fire line maintenance *	(200 sq. m/md)	**		DMC 2000-19 Forestry Sector Project (Policies and Guidelines) p.237

* all in cost (including labor and materials)

** Depends on the existing minimum wage in the particular area (Attached is the list of minimum wage per region as per DOLE)

**Summary of Current Regional Daily Minimum Wage Rates
Non-Agriculture, Agriculture

(In Pesos)
(As of August 2014)

Region	WO No. Date of Effectivity	Non-Agriculture	Agriculture	
			Plantation	Non-Plantation
NCR a/	WO 18/Oct 3, 2013	P 429.00 - 466.00	P 429.00	P 429.00
CAR b/	WO 16/Feb 3, 2014	263.00 - 280.00	247.00 - 268.00	247.00 - 268.00
I c/	WO 16/Feb 5, 2014	213.00 - 253.00	233.00	213.00
II d/	WO 16/Jan 5, 2014	247.00 - 255.00	235.00 - 243.00	235.00 - 243.00
III e/	WO 17/Oct 11, 2012	285.00 - 336.00	270.00 - 306.00	258.00 - 290.00
IV-A f/	WO 16/May 1, 2014	261.00 - 362.50	261.00 - 337.50	255.00 - 317.50
IV-B g/	WO 06/Feb 1, 2013	205.00 - 275.00	215.00 - 225.00	215.00 - 225.00
V h/	WO 16/ Jan 10, 2014	236.00 - 260.00	236.00	236.00
VI i/	WO 21/ Nov 29, 2013	245.00 - 287.00	255.00	245.00
VII j/	WO18/ Mar 21, 2014	295.00 - 340.00	275.00 - 322.00	275.00 - 322.00
VIII k/	WO 17/Oct 16, 2012	260.00	235.00-241.00	220.50
IX l/	WO 18/ Jun 10, 2013	280.00	255.00	235.00
X m/	WO 17/Jun 20, 2013	291.00 - 306.00	279.00 - 294.00	279.00 - 294.00
XI n/	WO 18/Jun 1, 2014	312.00	302.00	302.00
XII o/	WO 18/Aug. 1, 2014	270.00	252.00	252.00
XIII p/	WO 12/May 21, 2013	268.00	258.00	238.00
ARMM q/	WO 15/ Feb. 1, 2014	250.00	250.00	250.00

Reference: *Department of Labor and Employment (DOLE) Website retrieved (8/13/2014)*

a/ Provides P10 increase in basic pay upon effectivity and integration of the P15 COLA under W.O. No. NCR-17 into the basic pay on January 1, 2014.
b/ Granted P1, P8.00 & 6.00 increase in basic pay and P2, P6, P12 & P17 COLA integration.
c/ Granted P8.00-P20.00 wage increase depending on asset size.
d/ Granted P9.00-17.00 increase in basic pay for retail/service establishments employing less than 10 workers.
e/ Provided integration of the P24 COLA and granted P6-P8 wage increase
f/ Granted P2-90 wage increase (for workers receiving belowP255) for 5 years; P12.50 Conditional Temporary Productivity Allowance (for workers receiving above)
g/ Granted P5 COLA & P1-66 increase in basic pay
h/ Granted P8.00 increase in basic pay.
i/ Granted P10.00 wage increase
j/ Granted P13.00 COLA
k/ Provided P10 COLA integration and additional new COLA of P7
l/ Granted P13 wage increase.
m/ Granted P20 increase (P10 in basic pay & P10 COLA), the COLA will be integrated into the basic pay on January 1, 2014.
n/ Granted P11 increase in basic pay upon effectivity & P5 COLA effective Dec. 1, 2014; integrated the P15 COLA under WO No. 17 into the basic pay.
o/ Integration of P10 to P14 COLA under WO No. 17, into the basic pay and granted P5 COLA effective Jan. 1 2015 and P3-P4 basic wage increase due to simplification of Industry classification.
p/ Granted P10 wage increase in basic pay & integrated into the basic pay P2 COLA under W.O. No. 11.
q/ Granted P18 wage increase.

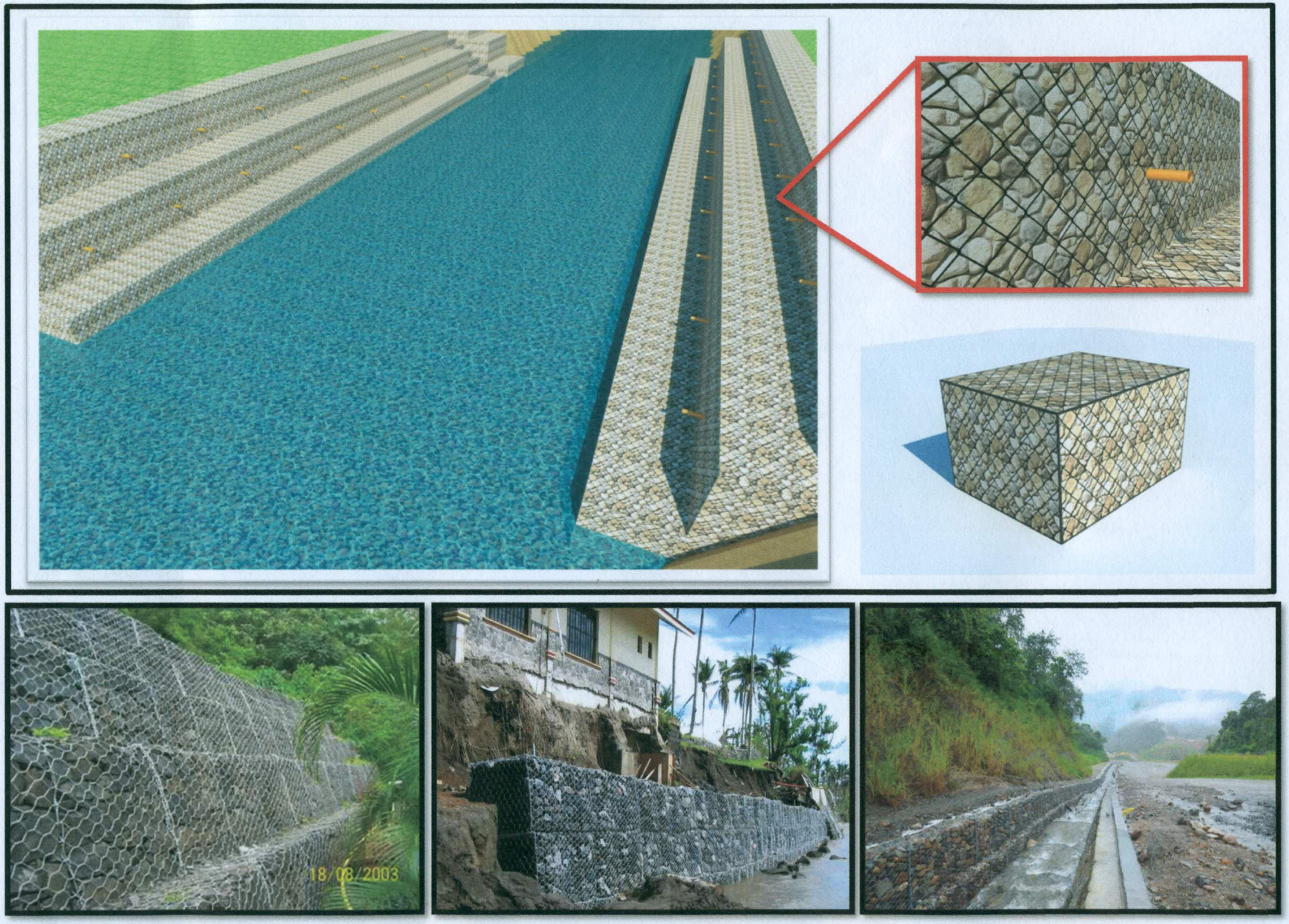


Figure 1. Examples of constructed gabion chekdam

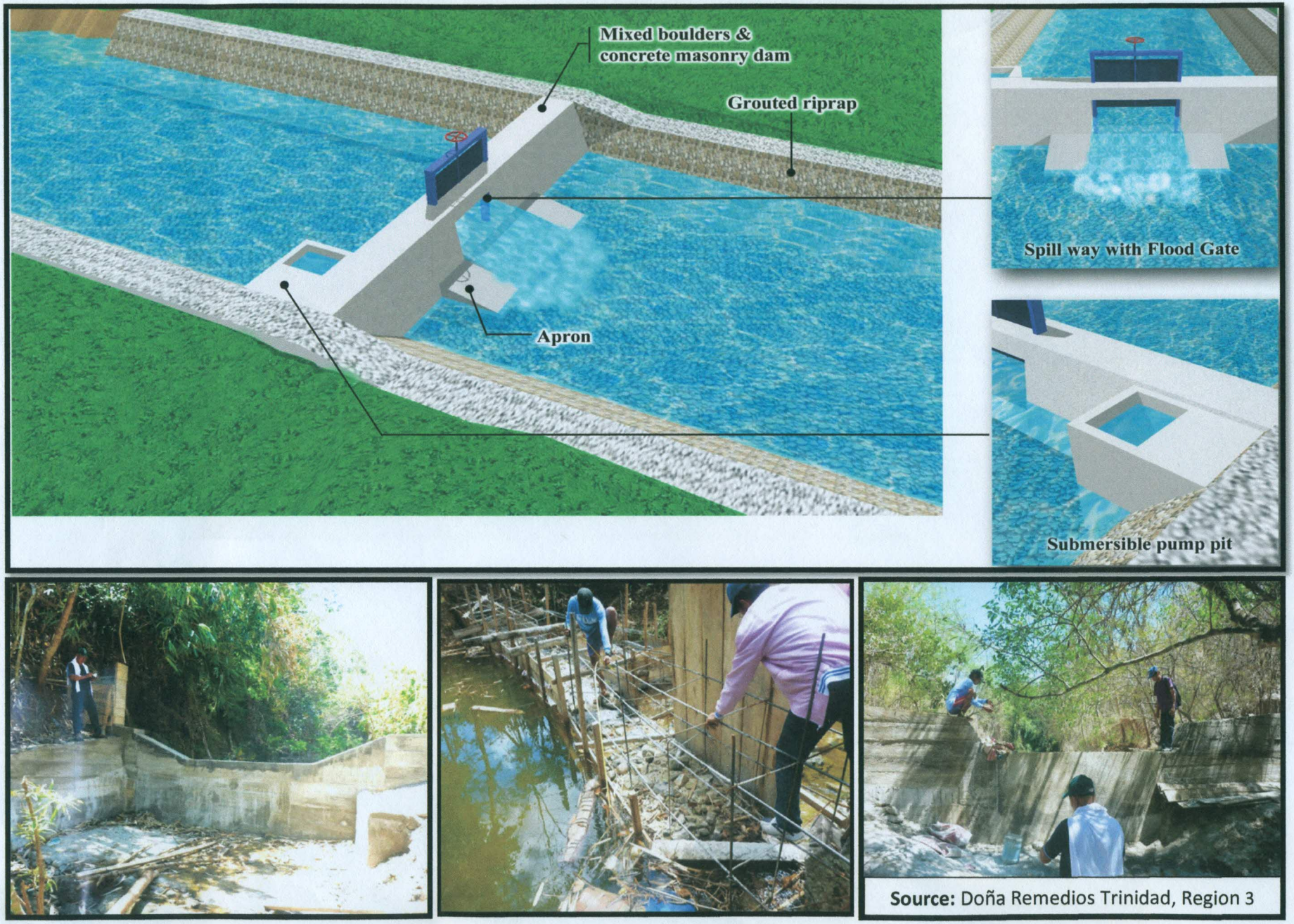


Figure 2. Example of mixed boulder and concrete checkdam

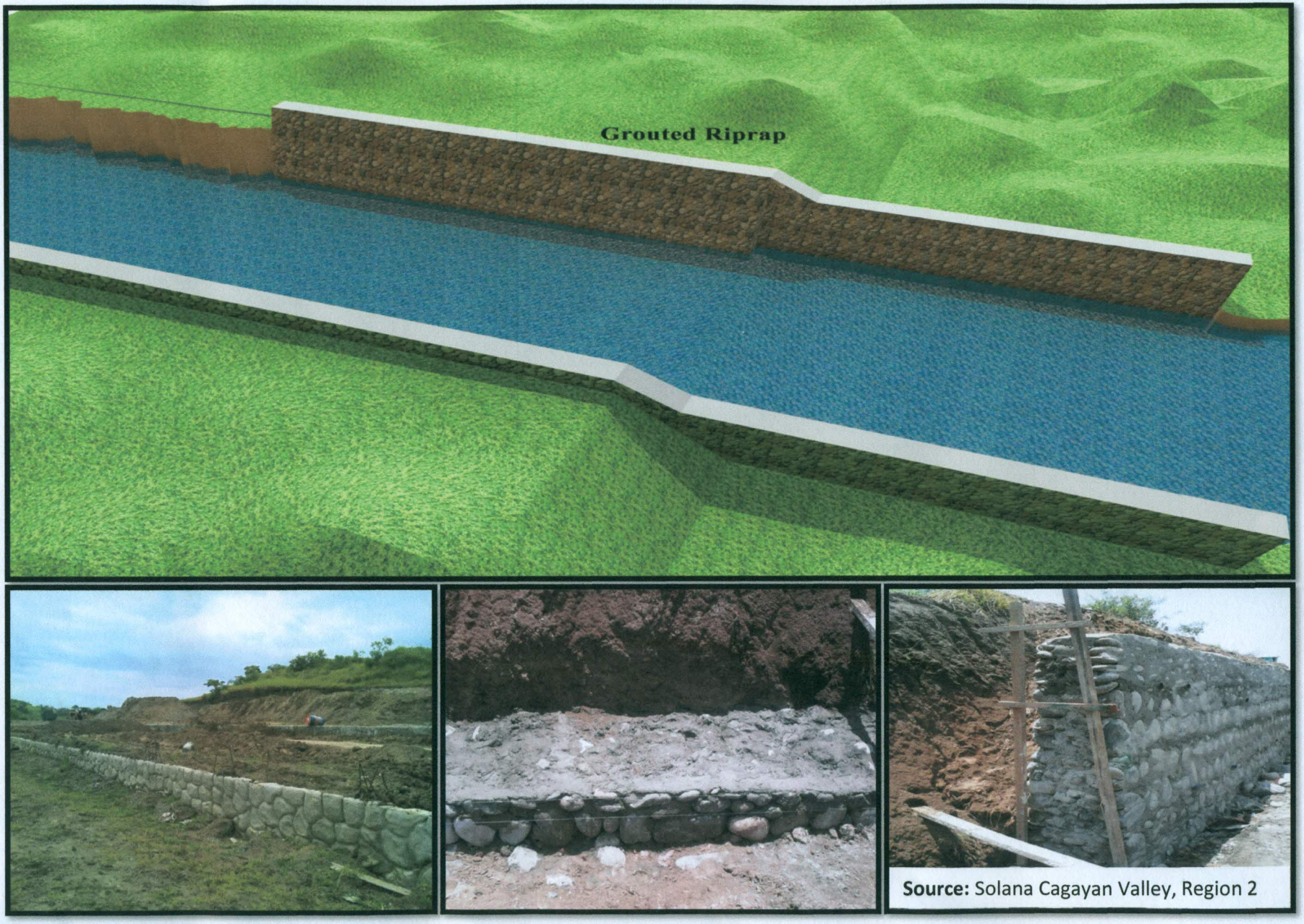


Figure 3. Examples of constructed grouted riprap or stonewalls

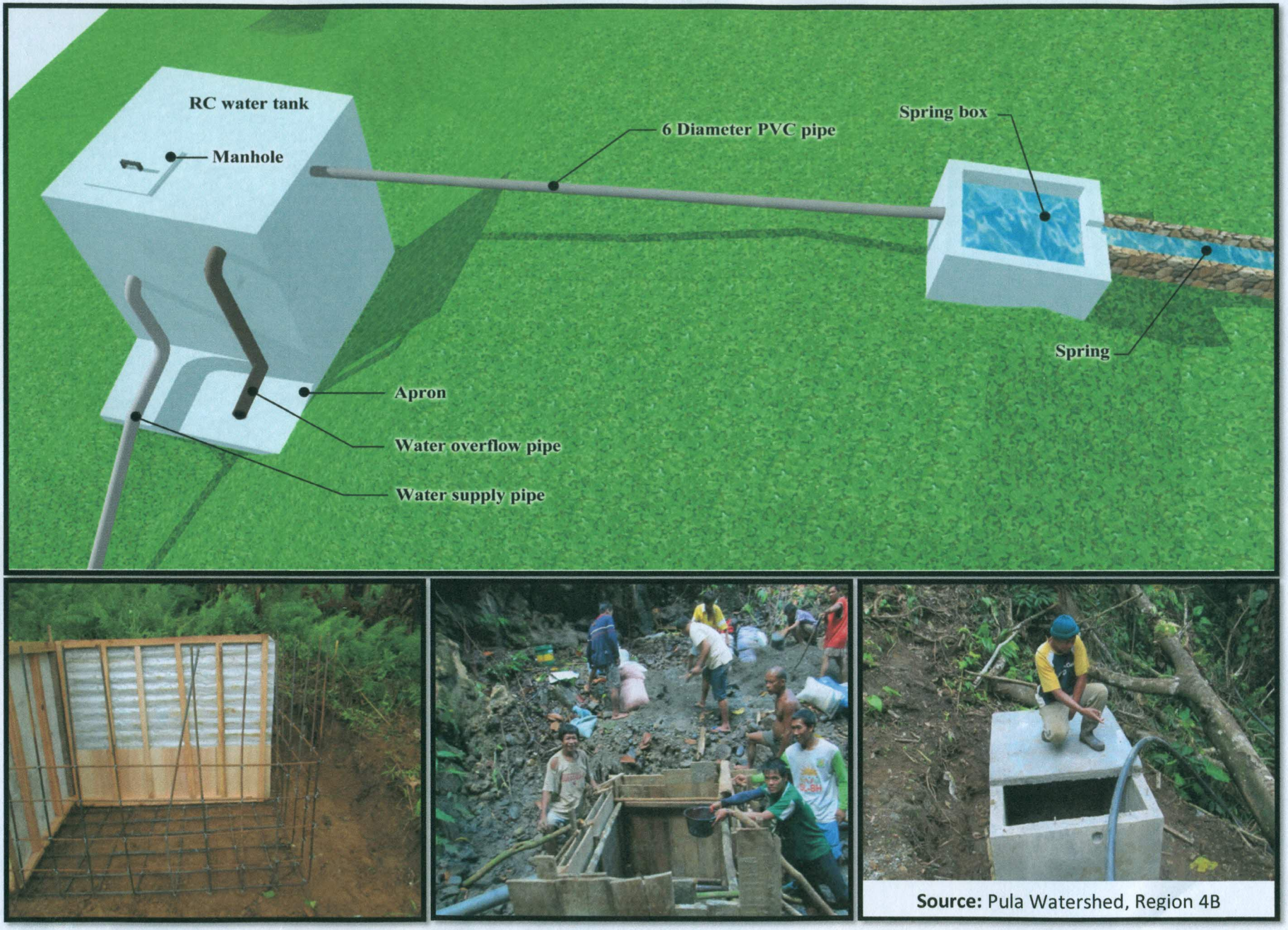


Figure 4. Example of Water Impounding System/Tank

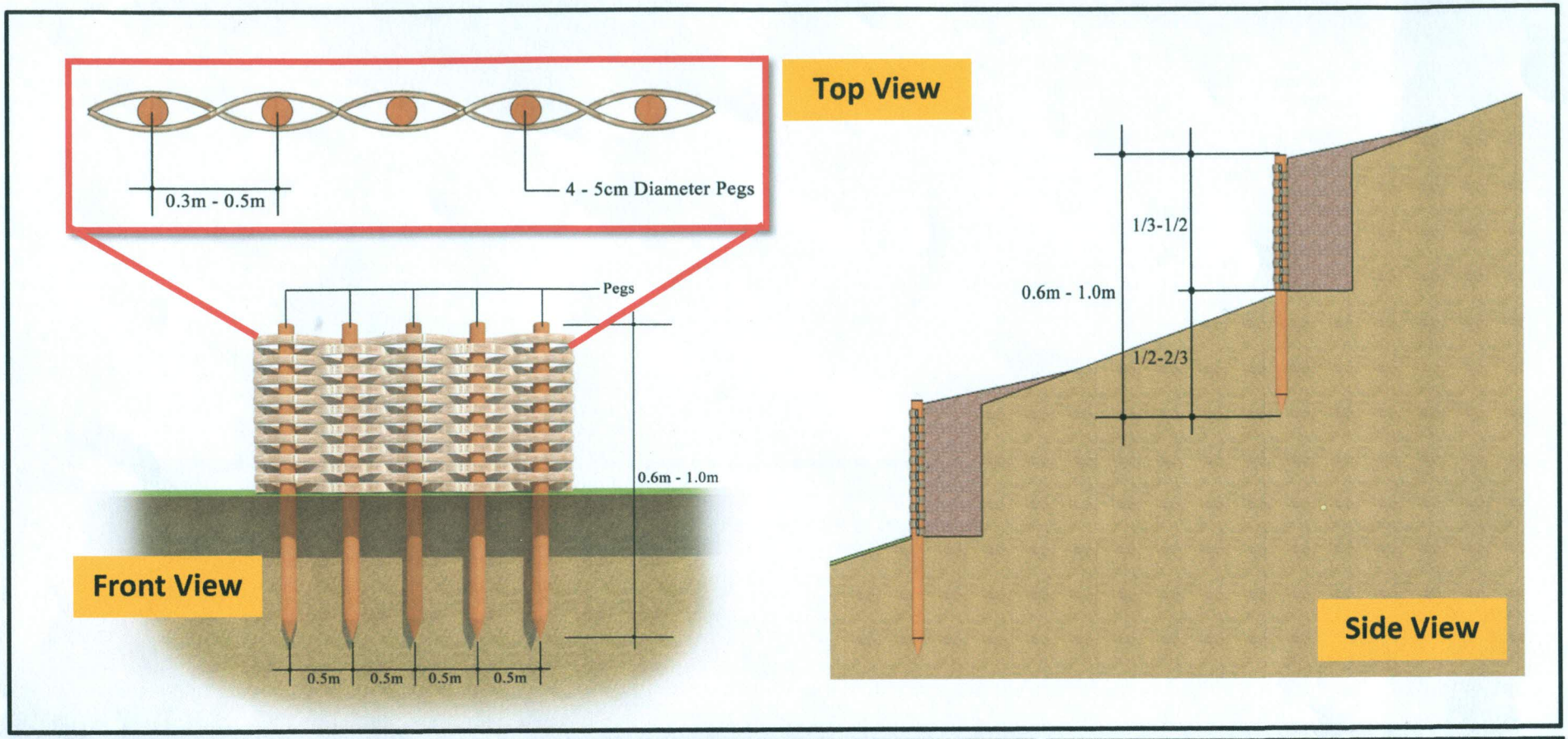


Figure 5. Examples of established wattling

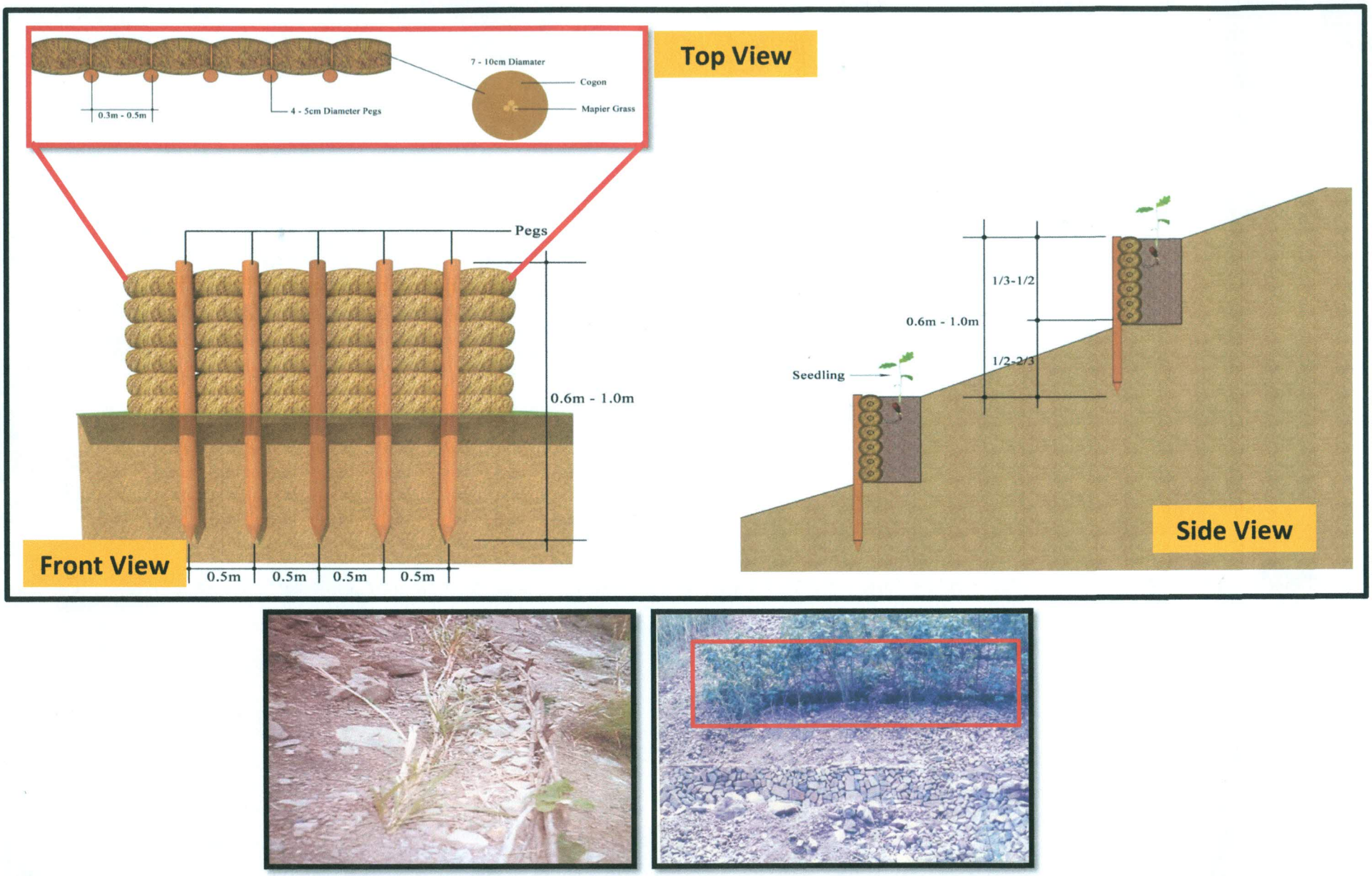
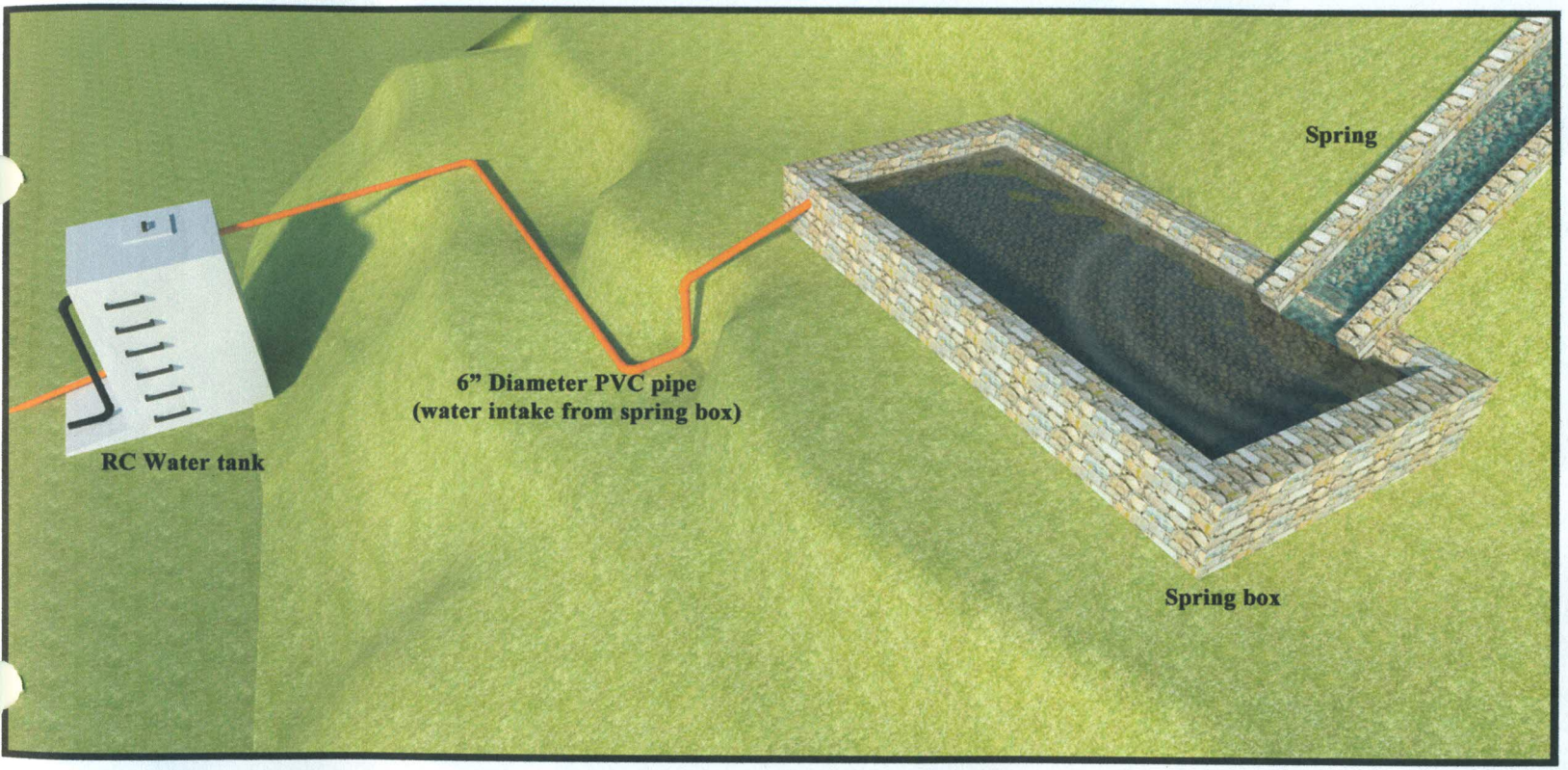
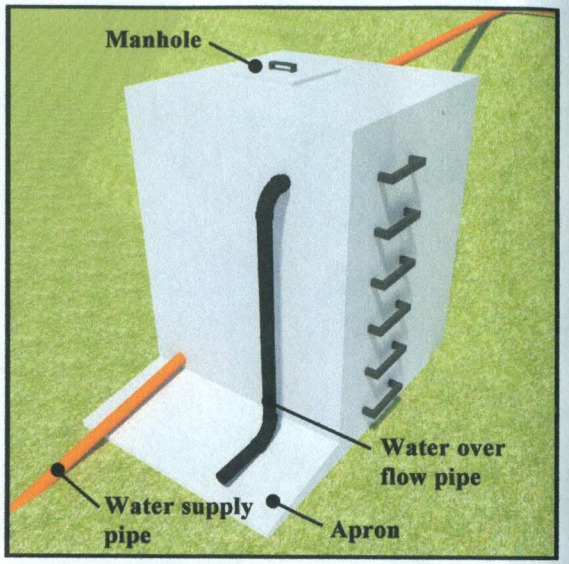
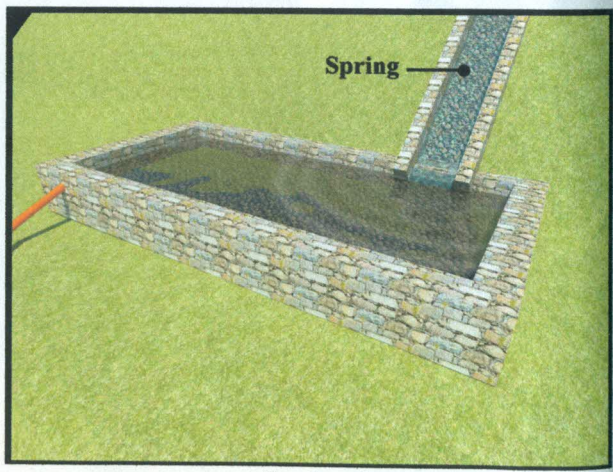


Figure 5.1 Examples of established modified wattling

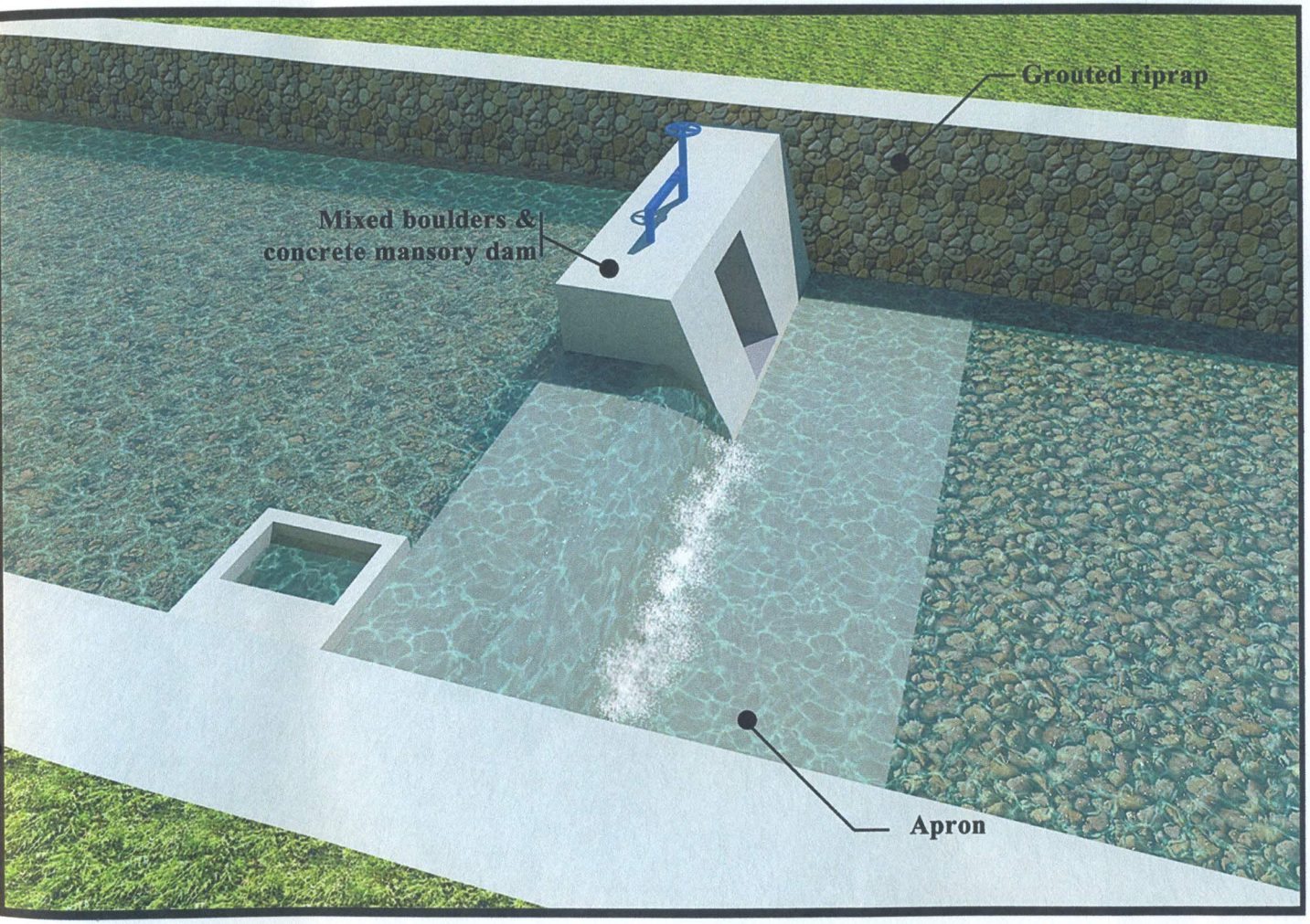


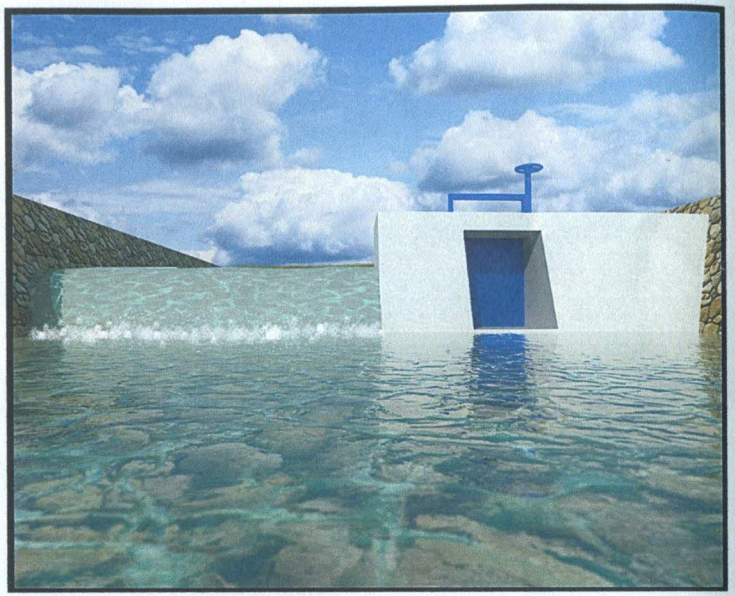


RC Water tank



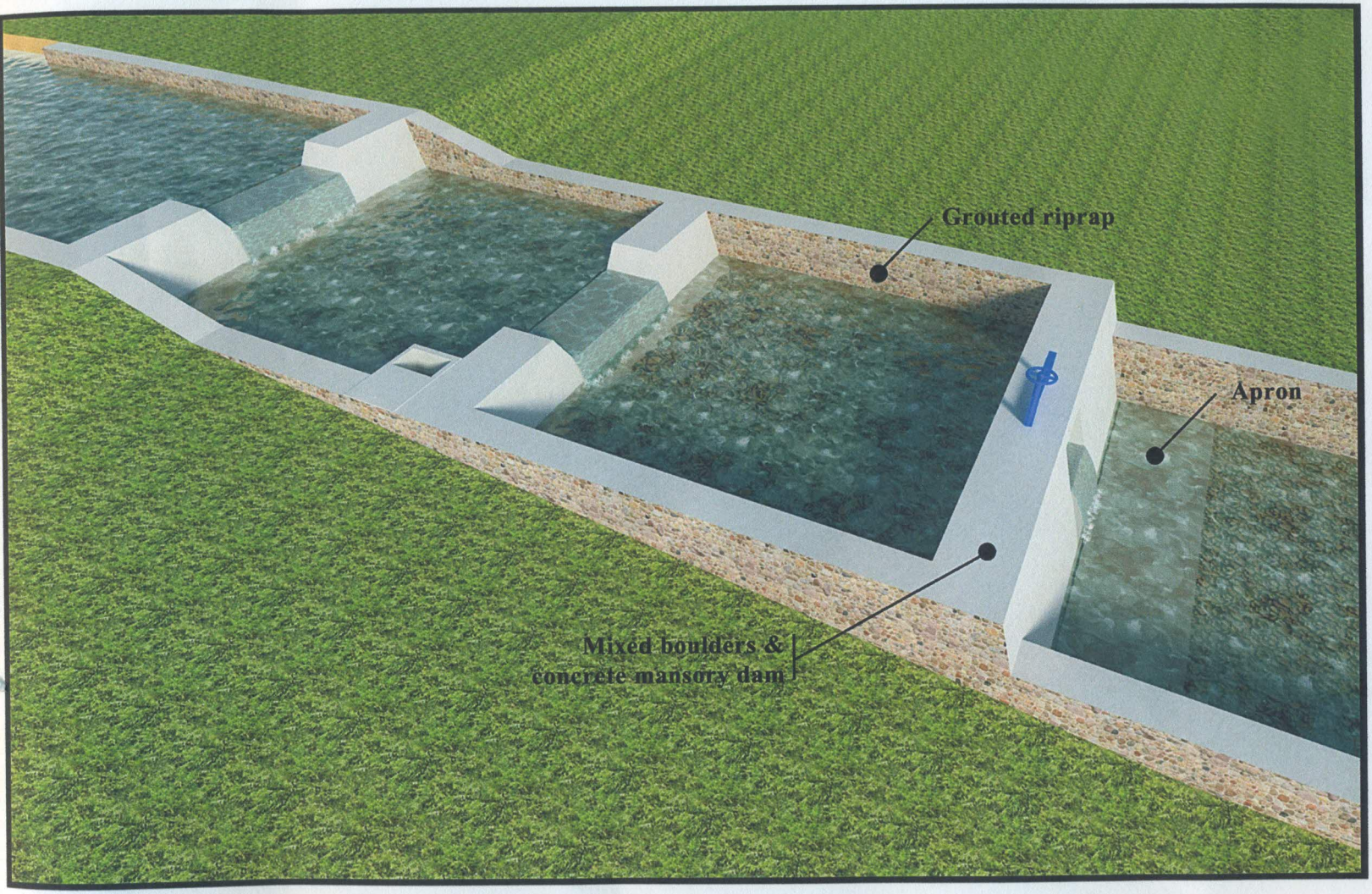
Spring box

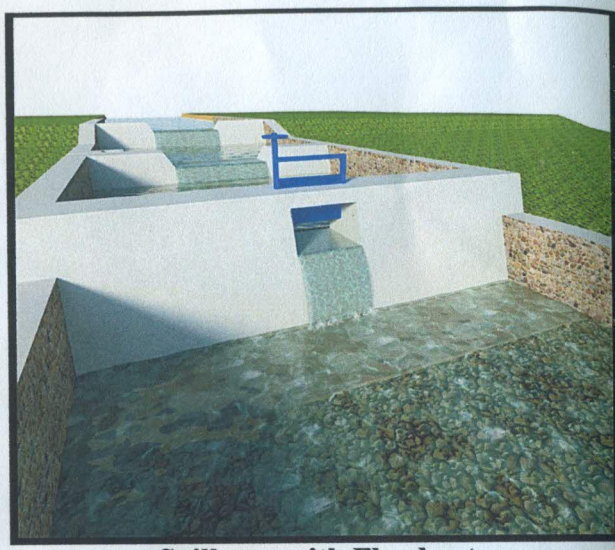




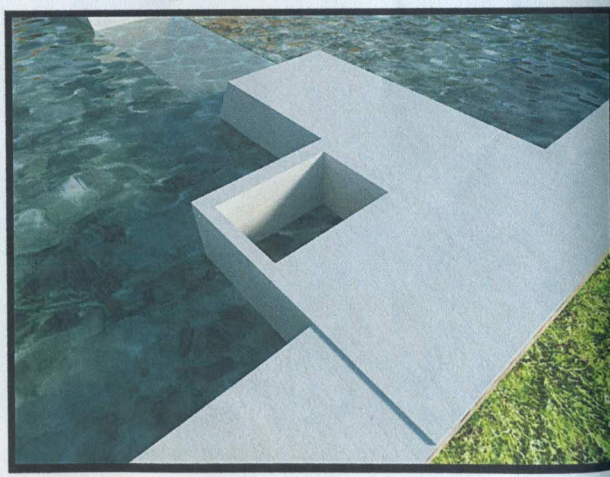
Spill way with Flood gate

Submersible pump pit





Spill way with Flood gate



Submersible pump pit