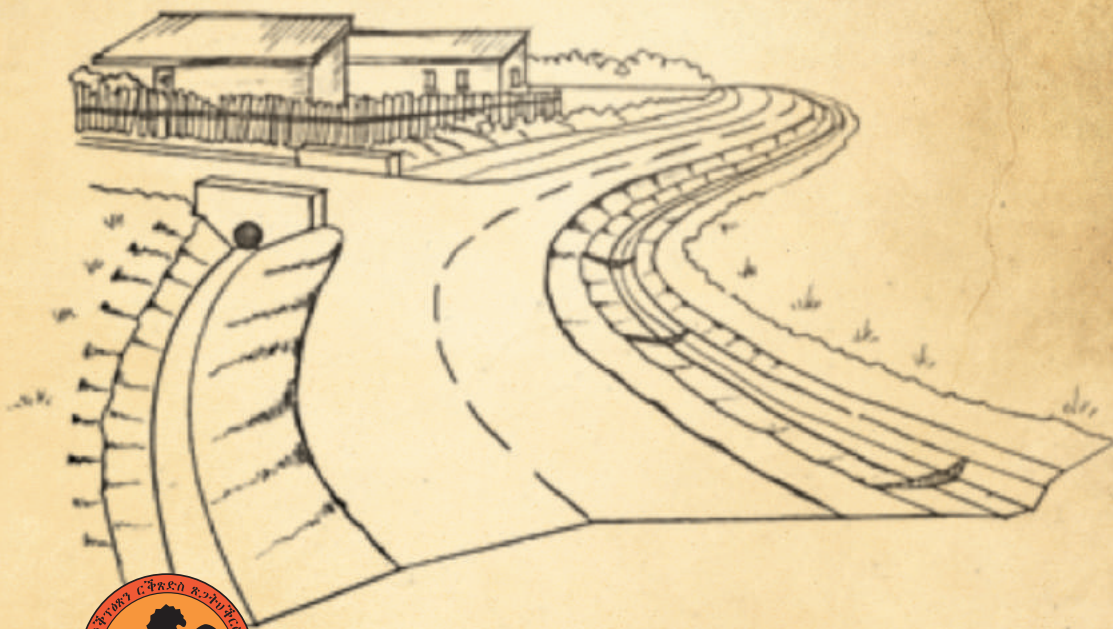


# WEREDA ROAD MAINTENANCE GUIDE

**PRESERVING COMMUNITY ACCESS**



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# 1. ACKNOWLEDGEMENTS

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## 2. INTRODUCTION

This Road Maintenance Guide is designed for use by supervisors and managers at wereda level, to assist them to identify road defects and remedy them on a regular basis.

The pictorial format is designed to help with the instruction of labourers and community members on the various maintenance tasks on earth, gravel and paved road surfaces, and the off-road features.

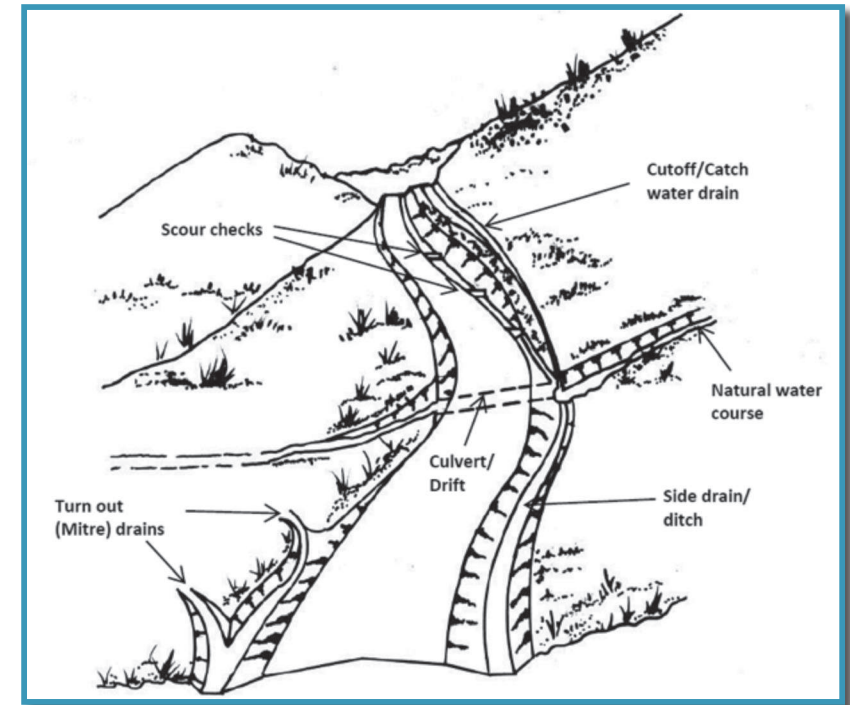
**For each Defect, the Remedial Maintenance Activity is shown on the facing page of the Guide.**

All of the tasks can be carried out by unskilled or skilled labour. Some light equipment may be required occasionally to support the labour activities or improve efficiency. For the maintenance works to be effective and lasting, they should be carried out in accordance with this Guide and the ERA Low Volume Roads (LVR) Design Manual Part G.

Supervisors should take time to ensure that contractors, community members and labourers understand the work to be undertaken. Training and familiarisation are an important part of the introduction of effective maintenance. Guidance is provided for the range of productivities expected for each activity.

If not maintained, the kebele access roads will deteriorate rapidly and possibly become impassable during the rains. Roads in poor condition will discourage transporters, minibuses, service providers, and retard investments, social and economic development.

## 3. ROAD TERMS & FEATURES



**Camber or Crossfall** – The road surface is normally sloped from the centre line to either shoulder to shed rainwater. For earth or gravel roads this fall should be 4 to 6 cm every 1 metre across the road. For paved roads this should be 2 to 3 cm every 1 metre.

**Camber board** – a wooden or metal template to be used with a spirit level to check the road surface crossfall.

**Drain template** – a wooden or metal template of the correct drain profile.

**Dry masonry** – Natural stone work using dry (no mortar) joints and relying on the natural interlock of the individual stones for stability.

**Gabion** – Stone-filled wire or steel mesh cage.

**Mortared masonry** – Natural stone work using sand-cement mortar in the joints to improve the natural interlock of the individual stones for stability.

**Outfall** – Outlet of a drain or culvert.

- Scour Check** – Constructed in a drain or ditch to reduce water speed/erosion.
- Shoulder** – The edge of the road surface, next to the side ditch or side slope.
- Turn out (or mitre drain)** – a drain constructed at an angle to the centreline of the road to divert water from the side drains.

## 4. SAFETY

Whenever work is carried out on the road, the safety of workers and road users must be a priority. Warning signs should be placed at either end of works being carried out on the road surface.



## 5. MANAGE THE RAIN WATER

Drainage of an earth or gravel road to ensure year round access must be achieved by two key features:

- 1 Maintaining cross fall (camber) to drain rain water off the road

**and**

- 2 Ensuring that rain water flows from the edge of the road surface (the shoulder) into the side drains, or down the embankment slopes, and away from the road.

If these features do not exist now, then they should be provided as soon as possible.

Rain water is the main enemy of the road. The water must be managed to minimise damage to the road.

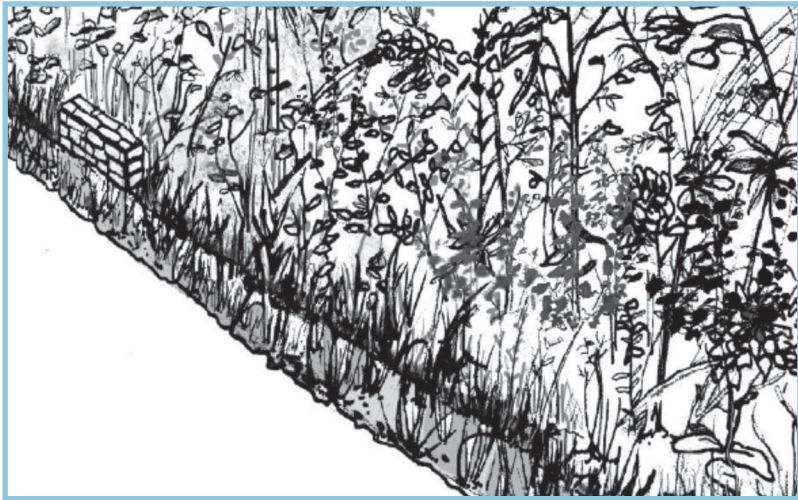
If water is allowed to stay on the road it will cause damage. The drainage system includes the camber, side drains, turn out and cut-off drains and culverts/drifts to manage the rain water. Maintenance of the drainage system is the most important road maintenance responsibility.

Although the maintenance tasks can be carried out at any time of the year, the recommended seasonal priorities are indicated for each activity:

Before the rains	✓		
During the rains		✓	
After the rains			✓

**DEFECT 1.**

Trees, bushes, grass overgrown on the side and shoulder of the road



**ACTIVITY 1.**

Bush clearing and grass cutting



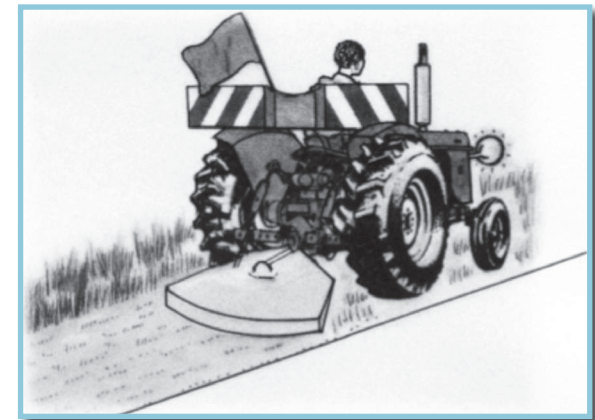
Dispose of cuttings safely. Do not leave in the drain or burn.

Seasonal Priority:

After the rains			✓
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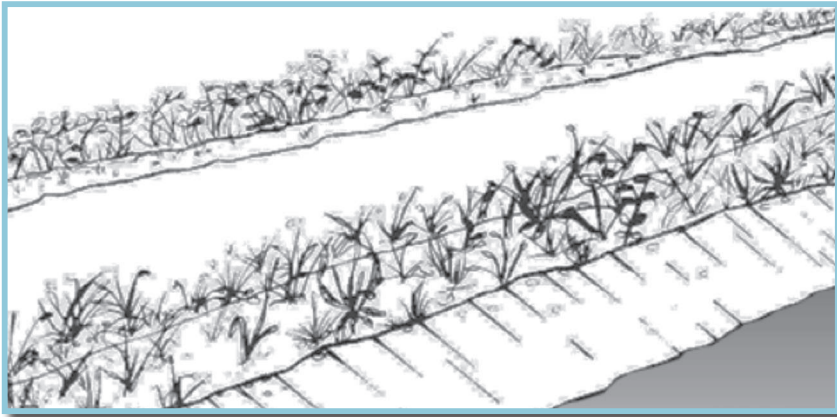
**ACTIVITY 1.**

Mechanised grass cutting



**DEFECT 2.**

Shoulder uneven or does not drain away from road surface



**DEFECT 3.**

Shoulder erosion



**ACTIVITY 2.**

Reshape shoulder



Ensure road surface drains to side drain or slope.

Seasonal Priority: 

After the rains			✓
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**ACTIVITY 3.**

Repair erosion, plant grass and water

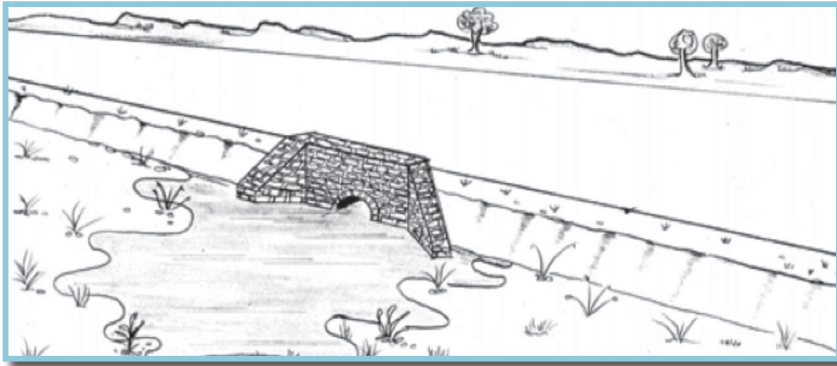


Seasonal Priority: 

During the rains		✓	
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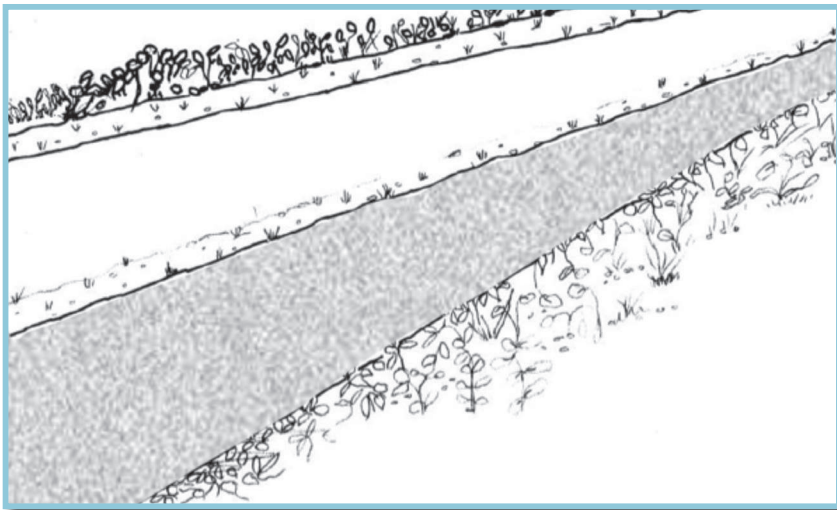
**⚠ DEFECT 4-01.**

**Culvert/drift silted/obstructed**



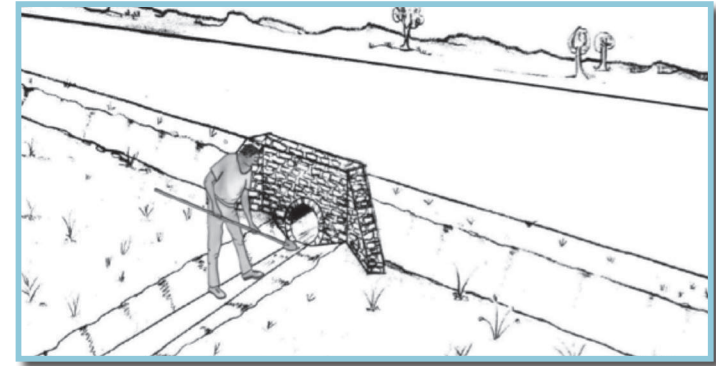
**⚠ DEFECT 4-02.**

**Drain silted**



**🛠 ACTIVITY 4-01.**

**Clean culvert/drift and inlet and outlet**



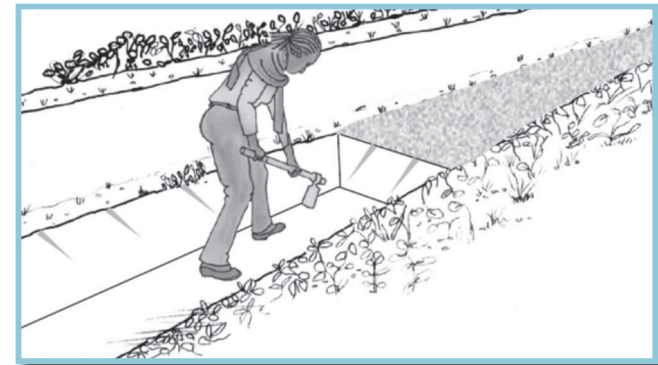
Place excavated soil well clear of culvert/drains, so that it does not wash back into the culvert or drain.

Seasonal Priority: 

Before the rains	✓		
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**🛠 ACTIVITY 4-02.**

**Clear side drain and turn outs**



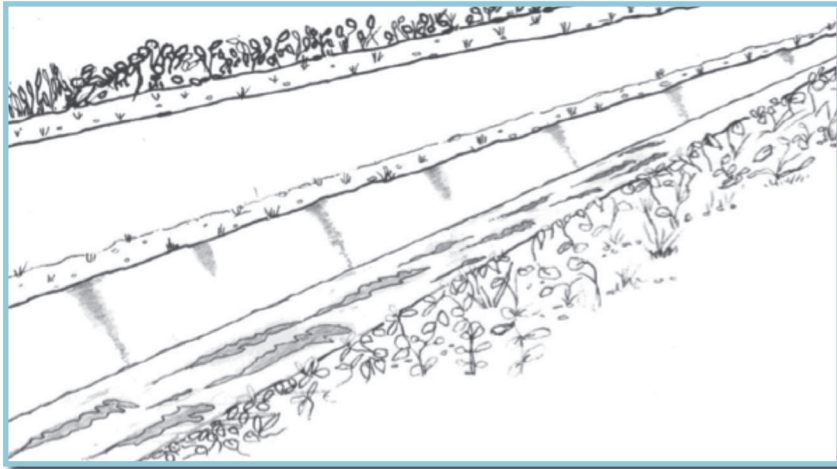
Use a drain template to achieve the correct drain profile.

Seasonal Priority: 

Before the rains	✓		
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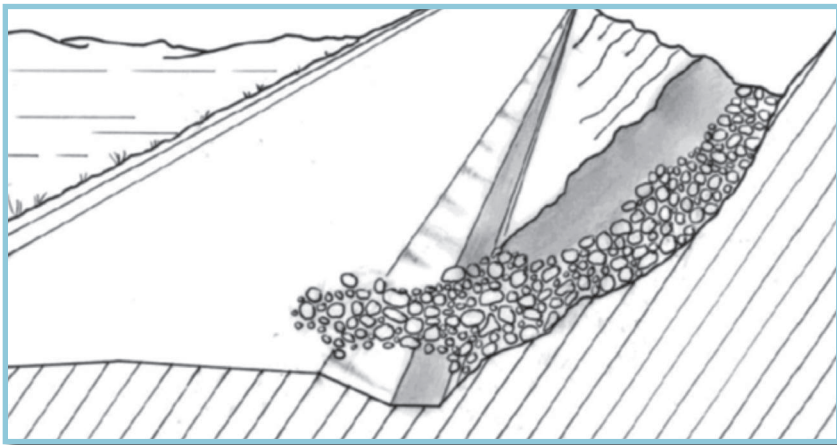
**⚠ DEFECT 5-01.**

**Ditch or slope eroded (Minor)**



**⚠ DEFECT 5-02.**

**Ditch or slope eroded (Major)**



Consult with the Regional Road Authority regarding cause and remedy. May be caused by unstable ground or water problems. Specialist advice is required.

**🛠 ACTIVITY 5-01.**

**Repair erosion damage**



Fill erosion channels with good material. If necessary, build scour checks (Activity 8) in drain and provide terracing or wattling on eroded side slopes.

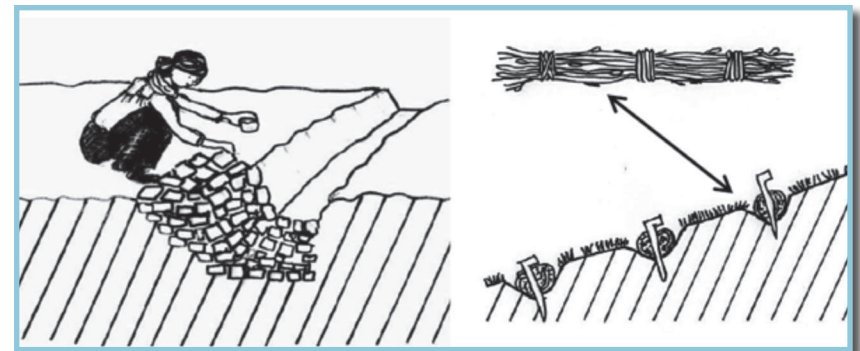
Seasonal Priority:

Before the rains



**🛠 ACTIVITY 5-02.**

**Repair erosion damage; rockfill, terracing or wattling**



Refer to Regional Authority regarding cause and remedy.

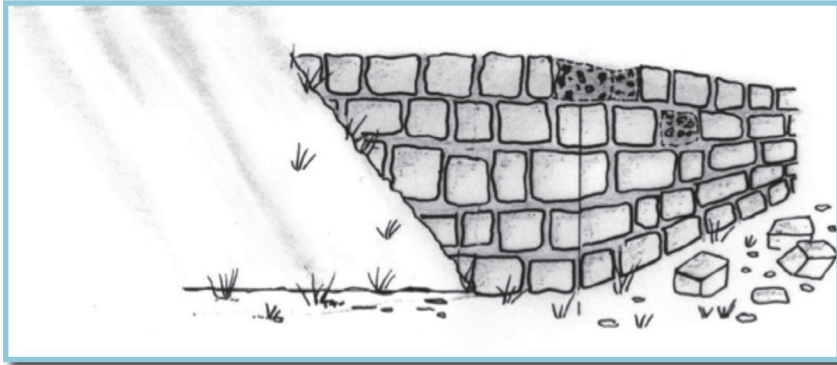
Seasonal Priority:

Before the rains



**DEFECT 6-01.**

**Mortared Masonry damaged**



Damage to headwalls or retaining walls.

**DEFECT 6-02.**

**Dry masonry damaged**



**ACTIVITY 6-01.**

**Mortared masonry repair**



Use sand-cement mortar to secure replacement stones.

Seasonal Priority: 

Before the rains	✓		
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**ACTIVITY 6-02.**

**Dry masonry repair**



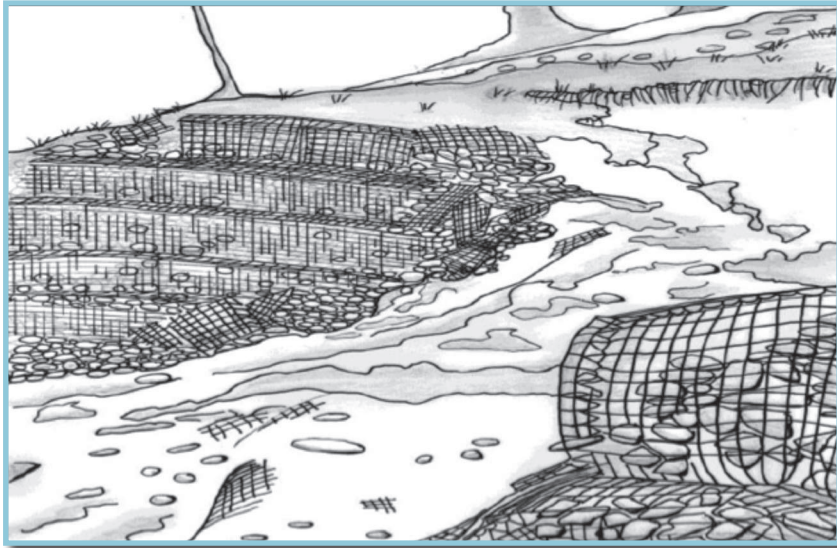
It may be advisable to mortar the replacement stones in place, particularly the top layer.

Seasonal Priority: 

Before the rains	✓		
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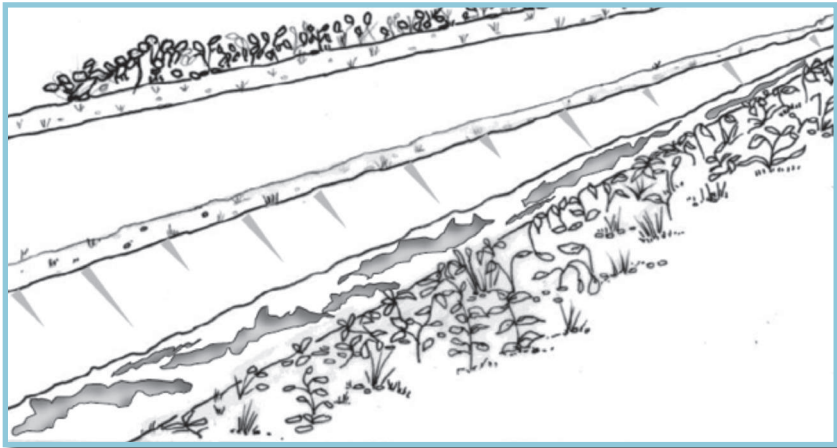
**DEFECT 7.**

**Gabion damaged**



**DEFECT 8.**

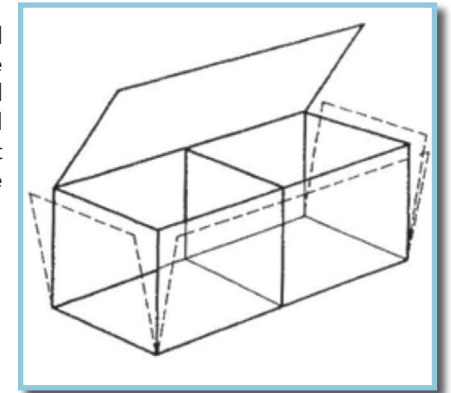
**Erosion in drain**



**ACTIVITY 7.**

**Gabion structure repair**

Seek guidance from Regional Road Authority on repair works. Refer to the ERA LVR Manual Part G for detailed instructions on gabion work. For fill material the individual stone size must be larger than the gaps in the wire mesh.



Seasonal Priority:

Before the rains	✓		
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**ACTIVITY 8.**

**Repair erosion in drain and build stone scour checks**

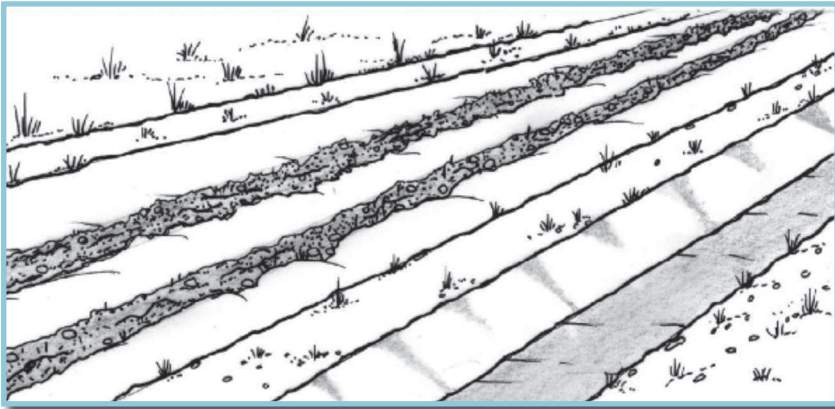


Seasonal Priority:

Before the rains	✓		
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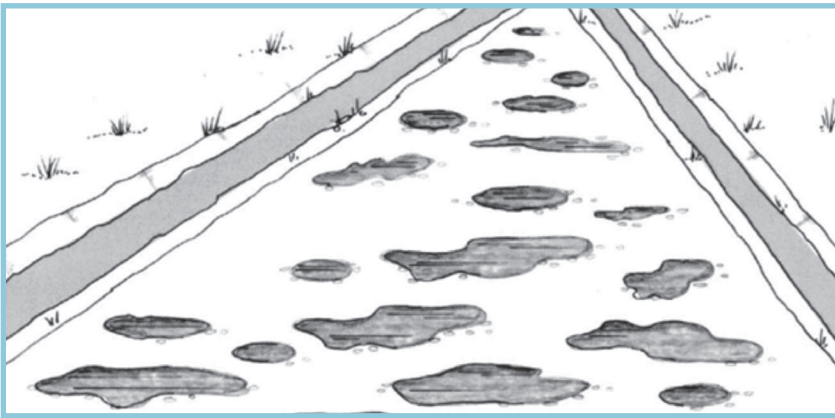
**DEFECT 9.**

Earth road surface potholed, uneven or does not drain to shoulder



**DEFECT 10.**

Gravel surface potholed



**ACTIVITY 9.**

Reshape and compact earth road camber



Drain off any standing water. Add good material if necessary. Can be done manually or with tractor towed grader. Crossfall 4-6%. Check with camber board.

Seasonal Priority: 

During the rains		✓	
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**ACTIVITY 10.**

Spot repair, gravel material



Remove loose material. Use good quality new material. Wet the material a little if necessary and compact using vertical blows with the hand rammer.

Seasonal Priority: 

After the rains			✓
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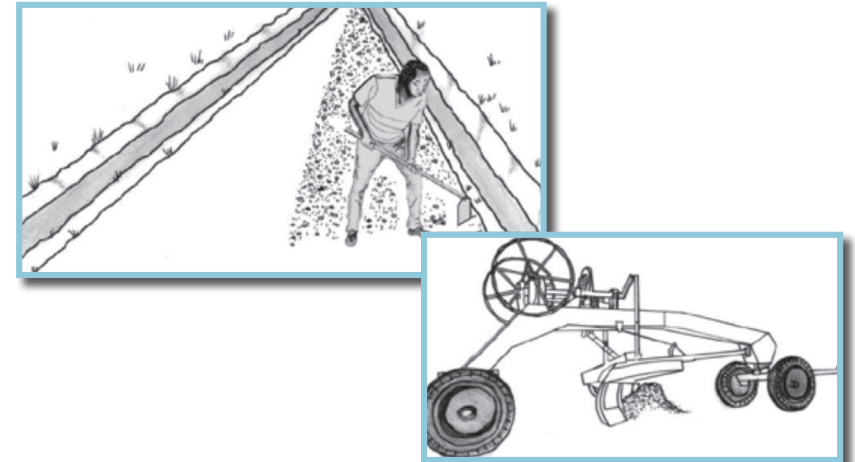
**DEFECT 11.**

Gravel surface uneven or does not drain to shoulder (minor < 3cm)



**ACTIVITY 11.**

Light reshaping gravel surface



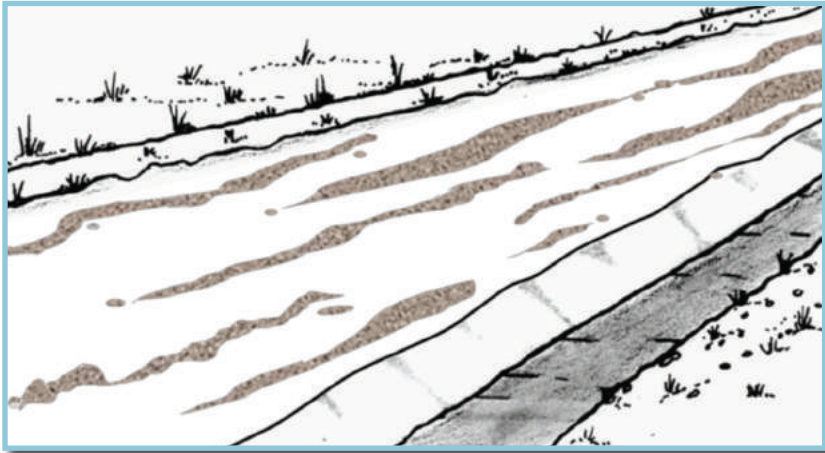
May be carried out manually or using a tractor towed grader. Cross fall 4-6%. Rain season moisture in the material helps it to bed down after reshaping.

Seasonal Priority:

During the rains		✓	
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**DEFECT 12.**

Gravel surface uneven/does not drain to shoulder (major > 3cm)



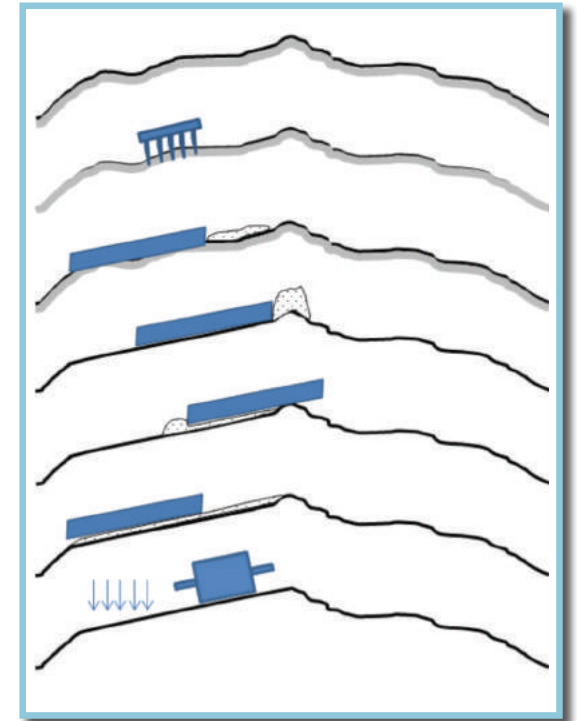
**ACTIVITY 12.**

**Blade gravel road (heavy)**

This is best carried out by a tractor and heavy towed grader, plus watering and compaction. The steps are illustrated below. The process is shown for one side of the road. The same process can be used to heavy grade an earth road.

Part G of the LVR Manual shows how this activity it can be done by labour.

1. Scarify
2. First cut pass
3. Second cut pass
4. First spread pass
5. Second spread pass
6. Water & compact



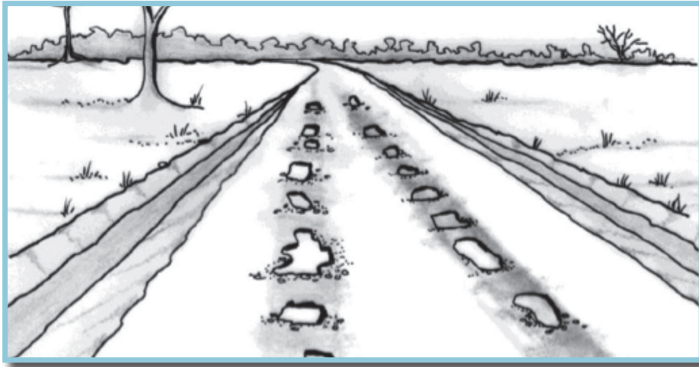
Additional passes may be required.

Seasonal Priority:

Any time	✓	✓	✓
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**DEFECT 13.**

**Gravel Surface too thin**



**DEFECT 14.**

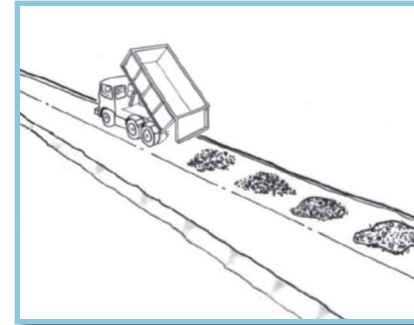
**Paved road pothole or surface defect**



Potholes or other surface defects can occur in any paved surface.

**ACTIVITY 13.**

**Gravel resurfacing**



This is a high cost operation that will require the provision of haulage, watering and compaction equipment. The Regional Road Authority should be consulted for advice. It is important to use only good quality gravel from an approved source.

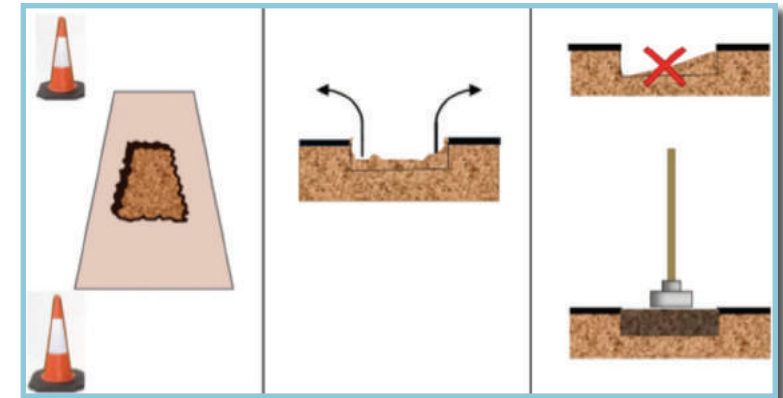
Seasonal Priority:

Any time



**ACTIVITY 14.**

**Repair paved road surface**



In general, the defective paving should be replaced with similar fresh paving materials and placed according to the Specifications. The Regional Road Authority should be consulted for advice.

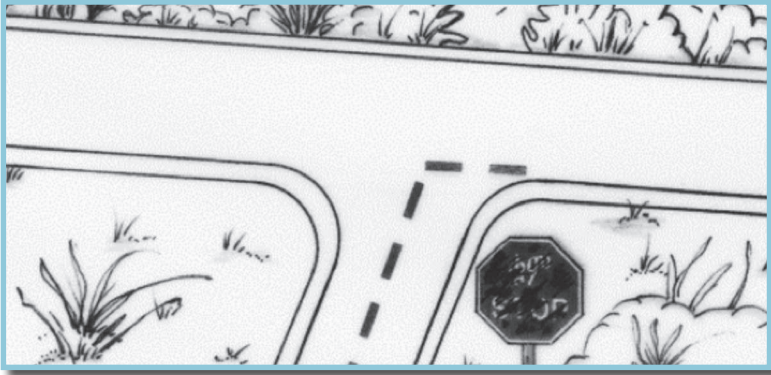
Seasonal Priority:

Any time



**DEFECT 15.**

Road sign dirty



**DEFECT 16.**

Road sign paint defective



**ACTIVITY 15.**

Cleaning road sign



Seasonal Priority:

Any time	✓	✓	✓
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**ACTIVITY 16.**

Repainting or replace road sign



Seasonal Priority:

Before the rain	✓		
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### Hand Tools

Wherever possible, construction quality hand tools should be used for road maintenance works. The following tools may be required for the various activities.



### Productivity Guidance

	Maintenance Activity	Unit	Task Range
1	Bush clearing (one side of road)	m/person-day	175 - 425
1	Grass cutting (one side of road)	m/person-day	175 - 425
2	Reshape shoulder (one side of road)	m/person-day	65 - 100
3	Repair erosion (one side of road)	m/person-day	23 - 100
3	Plant grass and water	m <sup>2</sup> /person-day	100
4	Clean culvert, inlet and outlet	culverts/person-day	1 - 4
4	Clear side and turn out ditches	m/person-day	18 - 65
5	Repair erosion damage	dayworks	
5	Repair erosion damage; rockfill and/or wattling	dayworks	
6	Mortared masonry repair	m/person-day	3 - 5
6	Dry masonry repair	m/person-day	4 - 7
7	Gabion structure repair	dayworks	
8	Build stone/wooden scour checks	No/person-day	5 - 7
9	Reshape and compact earth road camber (manual)	route-m/person-day	50 - 70
9	Light reshaping earth surface (light towed grader)	route-km/tractor-day	up to 10
10	Spot repair, gravel material	barrow/person-day	8 - 25
11	Light reshaping gravel surface (manual)	route-m/person-day	70
11	Light reshaping gravel surface (light towed grader)	route-km/tractor-day	Up to 10
12	Manually reshape gravel road (heavy)	route-m/person-day	50
12	Heavy Grading earth/gravel road (heavy towed grader)	route-km/tractor-day	up to 3*
13	Gravel resurfacing	km/unit -day	Resource dependent
14	Repair paved road surface	m <sup>2</sup> /person-day	Type dependent

**Note:**

\*Plus watering and compaction equipment

These guideline productivity rates are derived from Low Volume Road research in East and Southern Africa.

## When and where to obtain help

The Guide covers the commonly experienced defects and maintenance activities. For any aspects or technical issues not included in this Guide, the Regional Road Authority should be consulted for advice. The RRA should also be consulted if the road deteriorates to a very poor condition, requiring major works.

The maintenance work may be organised under a variety of arrangements; such as by a contractor, by the wereda authority, by the community themselves, or by religious or other groups. Guidance on overall planning and other management aspects is covered in the ERA LVR Manual Part G.