

Ditching is Cost-Effective

GETTING WATER SAFELY AWAY FROM THE ROAD

As water runs off the surface of a road it becomes concentrated, creating a potential for washouts.

As more water collects and begins to move faster.

Good drainage requires removing runoff from the road surface and preventing groundwater from infiltrating the road base.

These two distinct drainage problems require an understanding of the difference between surface water and groundwater (subsurface water).

Any road (even properly constructed ones) will alter natural surface water drainage patterns.

The trick is to recognize these changes and to prevent them from causing problems.

VOLUME AND VELOCITY

A large amount of water traveling slowly often has less effect on the ground surface than a small amount of water traveling very fast.

West Road prior to repairs 2009



A garden hose directed onto one spot of exposed ground creates a gully very quickly. A large

volume of water traveling rapidly over the same unprotected soil can have devastating effects. Therefore, proper design of a drainage system must seek to reduce the concentration of flow whenever possible.

Inspecting a road ditch during a heavy rainstorm can help determine whether it is properly constructed and sized to handle storm water runoff. The presence of muddy/silty water, and/or water overtopping the banks of the ditch are generally indicative of an improperly sized ditch.

POOR DRAINAGE EXAMPLE in Waterboro



DITCHES are essential for proper drainage.

Road ditches should be designed to handle total volume and velocity of water for the particular road location.

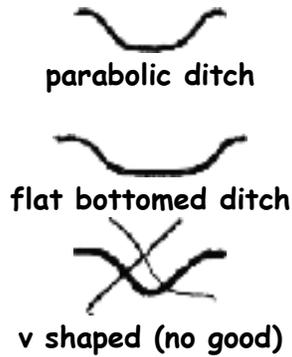
SIZE: The width and depth of a ditch should be based on runoff volume and on the drainage needed for the road base.

This includes the groundwater drainage needed to lower the water table in the road base ,if necessary. As a rule of thumb, the water

in a ditch should never come closer than 1 foot from the edge of the road.

This will also allow for ice buildup in the winter and an occasional hurricane or other major rainstorm.

SHAPE: Flat bottom ditches spread runoff water over a larger area than V-shaped ditches, helping to reduce erosion



Chadborne Ridge redone...



STABILIZATION: Ditches must have some means to protect the soil from washing such as vegetation or rock lining.

Ditches that lack such protection, or are too small or incorrectly shaped, will continue to erode until one or a combination of two things occurs:

All erodible material is washed away, usually leaving large stones behind, and/or,

The channel widens until the velocity slows to a point where erosion stops.

GULLY's formed HAPHAZARDLY in Waterboro



Ditch erosion can be reduced a number of ways:

Widen the channel. The wider and flatter the channel is, the more volume it can handle at a slower velocity.

Provide for a stable ditch bottom by armoring it with rocks or other material. Installing rock lining comparable in size to that left by the stormwater is a good design rule of thumb.

Side slopes are that part of the road most prone to erosion as they have the steepest slope and are made of materials that erodes most easily.

They should not be so steep that it is difficult to establish vegetation or hold stone on them.

Problems encountered and some solutions..

In many situations it may not be possible or desirable to continue a drainage ditch along one side of a road because:

Another Example of POOR DITCHING in WATERBORO



- Changes in grade or side hill contours force water to drain toward the other side of the road,
- Obstructions such as boulders, ledge, driveways or other roads block the flow of water,
- Adjacent areas are prohibited from receiving runoff because they are environmentally sensitive or protected by landowner's rights.

In each of these cases it is necessary to provide a means to allow water to cross the road without causing erosion or danger to vehicle traffic. As it is usually the most complex and expensive portion of any road, cross drainage is often the most overlooked.

CROSS DRAINAGE utilize various structures to channel water either under, or over the road surface in a controlled manner. The volume and seasonality of traffic and the type flow to be contained control which type of structure should be used.

CULVERTS are generally considered to be commercially available round pipes made of metal, concrete or plastic.

They are usually used where:

- There is a need to allow an intersecting stream or brook of moderate size, or a seasonal runoff to continue to flow as it did before the road was built.
- Water flow in the side ditch becomes too much for the ditch to handle but cannot be drained away on the same side of the road.
- Boulders, ledge, changes in grade, or road intersections interrupt the flow in the ditch, or adjacent property is protected from receiving storm water by individual owner's rights or because of environmental sensitivity.

Choosing which cross drainage structure to use

CULVERTS: Properly installed culverts are unnoticeable to the traffic passing over them, which is why they are the method of choice for most cross drains. Improperly sized, installed, or maintained, culverts can quickly become a liability.

SIZING: Culverts must be large enough to handle maximum anticipated flow or they can result in the loss of the road when excess water washes over it in a heavy rain.

Culverts must also be large enough to permit proper maintenance and long enough to completely reach from the bottom of the road slope on one side to the bottom of the slope on the other.

They need to be kept clear of ice during particularly cold and wet winters to keep from plugging. As some culvert materials deteriorate over time, culverts can require periodic replacement.

FROST ACTION: Not only can culverts freeze up, plug up, rust out or wash out, they also are subject to the action of frost. Because cold usually settles into an open culvert sooner than it goes into the surrounding soil (*remember, bridges freeze first!*), many culverts in frost active soils heave up into the road as winter progresses.

Over the years,
this action can lift a buried culvert right up out of the roadbed and leave a cavity beneath that allows storm water to flow under rather than through it, eventually washing it out.

Oppositely, culverts that contain constantly flowing water have the tendency to lag behind as the rest of the road pushes up due to frost action. The heat of the flowing water keeps the culvert from lifting with the rest of the road and creates a sharp depression across the road surface.

In spite of all this, culverts remain the most suitable way to get water across a road in most situations.

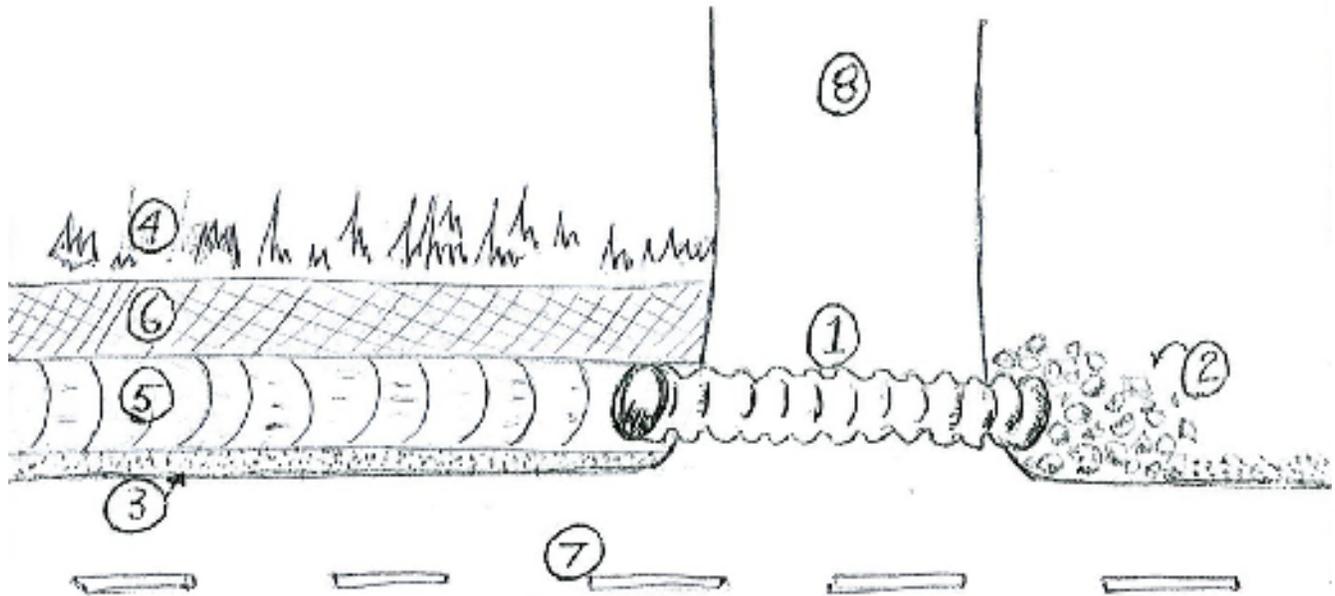
87% of the roads in Waterboro needing ditching improvements, and the info presented thus far should help to illustrate *why* **DITCHING** makes for good roads..

If we keep letting these roads get to the point where they need reconstruction it will cost **millions** of dollars.

Remember: A road with improper ditching has a repair expectancy of five years.

The same road with proper ditching can be extended to ten to fifteen years, saving tens of thousands of dollars. Surely, one can see the reason why proper ditching is really the best value for the taxpayers to consider when it comes to a return on investment in the long run.

★ DITCHING BASICS ANATOMY ★



Materials	Equipment Needed
(1) Culvert (2) Rip-Rap (3) Shoulder Gravel (4) Brush Cutting & Removal (5) Material Removal (excavator scoops) (6) Erosion Control (7) Road (typical) (8) Entrance Road (example)	1 or 2 14-yard Dump Trucks & Operators 1 Excavator & Operator 1 or 2 Flaggers <i>Prepared by: The Waterboro Road Review Committee '2010' J. Gendron / J. Tufts</i>

Ditching is cost-effective

Ditching is a preventative measure to future road repair. This can save tens of thousands of dollars every five years per road.

Prepared by the Waterboro Road Review Committee
 J.Gendron chair December 2009