Waters of LIFE

Runoff Risk Assessment

Guide for Advisors

June 2025

www.watersoflife.ie

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

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Contents

What is this document for?

This document is to help advisors follow the right steps in completing a runoff risk assessment (RRA).

Advisors should review it before starting one or more visits to farmers participating in the Waters of LIFE pilot agri-environmental programme.

What is a run-off risk assessment?

A runoff risk assessment is the first main action for a farmer in the Waters of LIFE pilot agri-environmental programme.

It is a chance for farmers and their advisors to map opportunities to protect or improve water quality on the farm. This is a whole-farm assessment including the farm yard. It is not used to validate regulatory compliance.

The assessment focuses on identifying sources of pollutants, flow pathways and any actions that can stop pollutants getting into local drains and rivers.

The advisor and farmer walk the farm together and use the Waters of LIFE app to map sources and flow pathways which may be a threat to water quality.

Once they have identified a potential threat or water quality pressure, they can select from a list of supporting actions which aim to solve the problem.

When all these opportunities for improved water quality are mapped and submitted, the Waters of LIFE project team create a water quality farm plan. This plan becomes an important management tool for farmers during their participation in the project.

The actions approved in this plan are the ones which a farmer will receive payment for carrying out during their participation in the programme.

They can also improve nature quality on the farm which can increase area-based payments to the farmer.

Key steps:

There are three key steps to completing a runoff risk assessment

- Preparing for the farm visit before you attend
- Meeting the farmer on their farm to carry out the runoff risk assessment
- Reviewing the assessment after the visit and submitting to Waters of LIFE

The basic principle: source-pathway-receptor model

Advisors should apply the source-pathway-receptor model when conducting the runoff risk assessment.

The potential source of a pollutant must be identified, followed by the pathway connecting the source to the receptor (e.g., the stream/river).

Applying this model ensures that the most suitable measures can be targeted to locations/activities that pose a water quality risk to receiving streams and rivers.

Follow these 4 principles to guide you:

1. The **source** is the area from which a pollutant comes. It can be a single pressure point or spread over a large are such as a heavily fertilised field. Types of pollutants are described in Appendix 1.

2. The **pathway** is the way a pollutant gets to the receptor. If this is a surface water pathway, water will carry a pollutant along the path of least resistance along the surface of the farm.

3. In water quality protection, the first objective is to reduce or eliminate the pollutant the source.

4. The **receptor** is the stream or river. The next objective is to increase the resistance the water will meet along the pathway, before it meets the receptor.

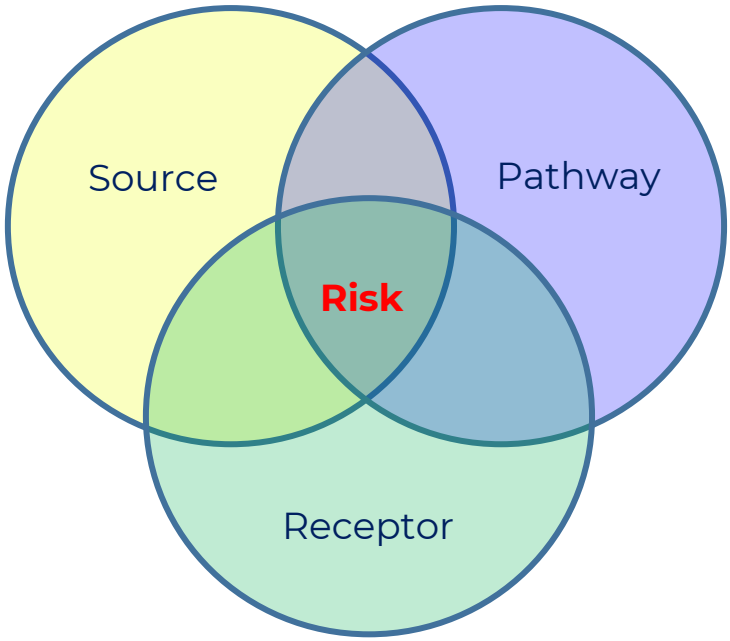

Fig 1. Source-Pathway-Receptor Model. Where all three parts of the model are combined, then a potential risk to water quality is present.

Stage 1 of 3: Preparing your farm visit for a runoff risk assessment

What you'll need to complete a runoff risk assessment:

- Access to the Waters of LIFE web portal on your computer
- The Waters of LIFE app downloaded to your smart phone
- Full battery and/or a portable charger for your smart phone
- Suitable outdoor wear and sun protection

In addition to the information provided through the Waters of LIFE portal, you should also be able to access any other information which can help you conduct the assessment.

If the farmer is in ACRES or any other programme with water quality measures, you should have access to these plans also. Waters of LIFE supporting actions can't be carried out if there are already plans to put the same measures in place through another scheme.

Taking 10 minutes to prepare for your farm visit can be worth an hour spent in the field. You might also find that you'll get quicker at this prep time as you do more assessments.

Web portal access:

The Waters of LIFE web portal can be accessed via https://wol.dogsear.dev

To access:

- Download the Google Authenticator app to your phone
    - Android
    - iOs
- Input your email
- Use the password you received from Waters of LIFE
- Follow the prompts for two-factor authentication using Google Authenticator
- Have your farmer reference spreadsheet to hand

When you enter the web portal, you will see a list of reference numbers that look like AVO_2025_xx; AWB_2025_xx; GRA_2025_xx; ISL_2025_xxx; or SHO_2025_xx.

These references are linked to the farmers that have nominated you as their advisor for the Waters of LIFE pilot agri-environmental programme.

You will need to use the farmer reference spreadsheet, provided separately, to see the farmer's names, addresses and herd numbers. This is for data protection.

To access the runoff risk assessment desktop overview, click on "view farm" and click on the button labelled 'RRA'.in the top right hand corner of the screen. This will bring you to maps of the farm, showing the parcels included in the scheme.

Reviewing desktop information:

Once you have clicked into 'RRA' to see the runoff risk assessment desktop, you will see an overview of the farm. You will also see a number of different map layers on the right hand side. These can be used to guide your desktop overview. These layers they are shown in Fig 2 and described below.

Flow units:

When you open the desktop overview you will see the farm split into sections called "flow units."

The purpose of these units is to split the farm up and make the assessment more manageable. Each of these flow units will be visited and assessed separately.

Points of interest:

Points of interest (POIs) are used to mark areas on the farm that should be followed up for investigation during the on site assessment.

Points of interest include:

- Potential sources of pollutants
    - Poaching/erosion
    - Areas used for silage bale storage etc

- Significant pathways for pollutants
    - Farm trackways
    - Drainage ditches
    - In-field flow pathways

Points of Interest can be identified using aerial imagery and assessing the PIP flow pathway maps.

The Waters of LIFE team have noted a number of POIs for some flow units, but this may not be complete. You should also add POIs using your best judgement and the information provided on the desktop overview.

POIs are broken into the following categories:

- Drainage
- Dumping/Burning
- Farm yard manure/Silage bale storage
- In field flow pathway
- Livestock/Machinery crossing point
- Livestock/Machinery field gateway
- Poaching/Sediment

Choose a category that is closest to the POI you have identified, and use the comment box for notes.

Remember - This is to help with your own assessment in the field, a note made online will save a lot of time on the ground.

Farmyards:

A separate point layer is used to show farmyards within the farm boundary. Farmyards are often pinch points for traffic, as well as sources of pollutants.

The Waters of LIFE team have added the location of farmyards when they are present within the area. However, you should still review these locations to verify accuracy or to include any farmyards that have been missed.

You should also add any observed notes about the farmyard and the likely inflow and outflow of water. That flow can come from drains or surface water pathways. More information on the farmyard assessment is given later in this document.

Fig 2: Run off Risk Desktop Overview

Aerial imagery:

Aerial Imagery is often the best source of information for identifying potential pressures to water quality on the farm.

Areas of heavy poaching are often visible as light brown patches, contours and depressions in the landscape. They can often be seen as darker linear features winding through fields, all of which are indicative of potential flow pathways.

Studying aerial imagery may also identify water courses such as ditches or small streams that are not mapped.

Unmapped farm roadways which can often act as flow pathways for pollutants can also be identified using aerial imagery.

Land use practices can also indicate potential pollutant sources. Tillage and intensive grasslands generally have higher inputs such as fertilizer and pesticides, as well as soil disturbance in the form of reseeding, ploughing etc. These types of inputs can cause issues when washed into a watercourse will cause issues.

Semi-natural grasslands generally have lower inputs and less activity, so have lower levels of risk.

Aerial imagery may not be up to date with current practices and must be verified on the ground.

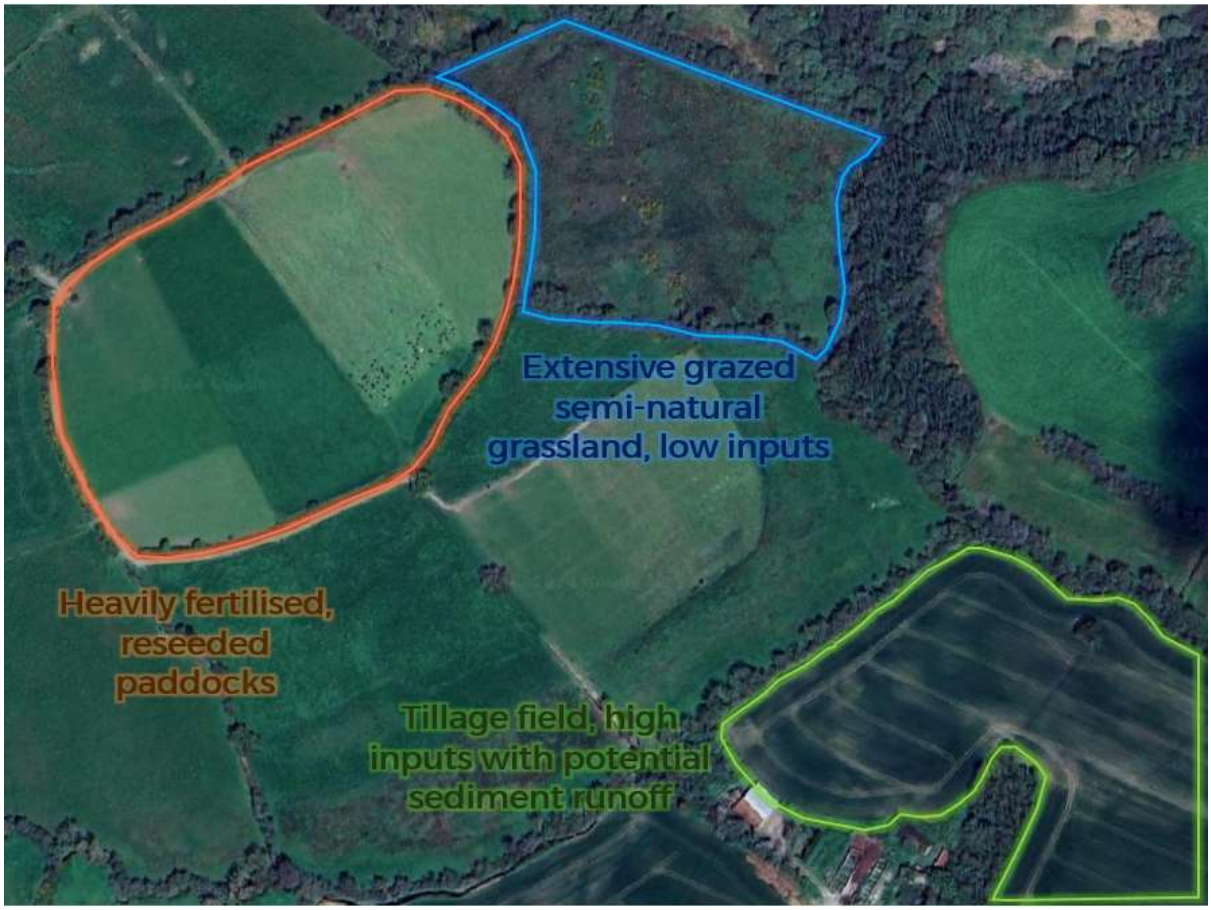

Fig 3: Aerial imagery showing various land management practices, and indications of different levels of fertiliser and pesticide usage, sediment loss etc.

Other water features:

The blue lines you see when you open the map are the official EPA river line. Other water features can be viewed by selecting the "Other Water Features" layer.

This gives very important information on drainage networks which is relevant to the RRA. Figure 4 shows the EPA river line and Figure 5 shows the same farm with the “Other Waters Features Layer” turned on.

Fig 4: EPA River Line

Fig 5: EPA River Line and Other Water Features

Scored areas:

Scored areas are the areas scored during the habitat assessments. Be aware that any action in these plots could also have an impact (nearly always positive) on the farmer’s habitat score and the value of future payments under the Waters of LIFE programme.

Pollution Impact Potential (PIP) maps for phosphate and nitrate:

PiP maps show the highest-risk farming areas for losses of phosphate (P) and Nitrate (N) to water at a regional level. They take the stocking rate of the whole farm and compare it to the underlying soil and geology to determine levels of risk. Risk is ranked from 1 (riskiest) to 7 (least risky).

You can use this data to determine if your client’s farm is at risk to losses of P or N.

Be aware that PIP data takes stocking rates from 2018, and averages them across the whole farm. It does not take into account the fact that various fields will have different levels of fertiliser input.

If the farm is at risk of losses of P, it is likely that there will be surface water pathways on the farm and that they will be carrying higher levels of P. Pathway interception measures are often effective in this scenario. These measures can also be effective for sediment.

If the farm is at risk of losses of N, then there are likely issues with groundwater transportation and that reducing pollutants / N load at source should be addressed.

Soil types and groundwater vulnerability:

Different measures are more applicable to certain soil types than others. As such, you should be aware the soil type within the flow unit before assessment.

Poorly draining soils are more likely to have surface flow pathways, while free draining soils will require reduction of pollutants at source.

Peat soils are more susceptible to issues with drainage resulting in sediment, phosphate ad ammonium run off.

Main Soil Type Scenarios					
1	2	3	4	5	6
Poorly draining grassland soil	**Freely draining tillage soil**	**Poorly draining tillage soil**	**Freely draining grassland soil**	**High organic matter peat soil**	**Damaged Soil (Drought, Poached, Compacted, etc.**

- Soils 1, 3, 5 and 6 will become saturated quickly. Water then moves via the overland flow pathway and brings phosphorus and sediment with it. There is greater potential for sediment loss on tillage fields where no cover/catch crop is present.

- Soils 2 and 4 will allow water to move downwards through the soil profile. Nitrate is then lost via the sub surface pathway to groundwater. There is a greater potential for nitrate losses from tillage fields in autumn where no cover/catch crop is present.

Flow pathways and delivery points:

This is the most important of all the overview layers. Flow pathways and their associated delivery points to watercourses were mapped by the EPA in conjunction with the preparation of the PIP maps.

They show the likely flow of water over poorly draining land and rank the severity of the flow pathway from medium to very high.

All flow pathways should be assessed at a farm level. They should be intercepted using supporting actions if they are at risk of transporting pollutants to a stream / river. An example of a flow pathway map is shown in Fig 6.

The flow pathways and delivery points were generated using a digital elevation model. This means they do not take into account hedges or man-made mounds, ditches and drains.

These features may already intercept or redirect a flow pathway and aerial imagery should be used to verify if the flow pathway is accurate.

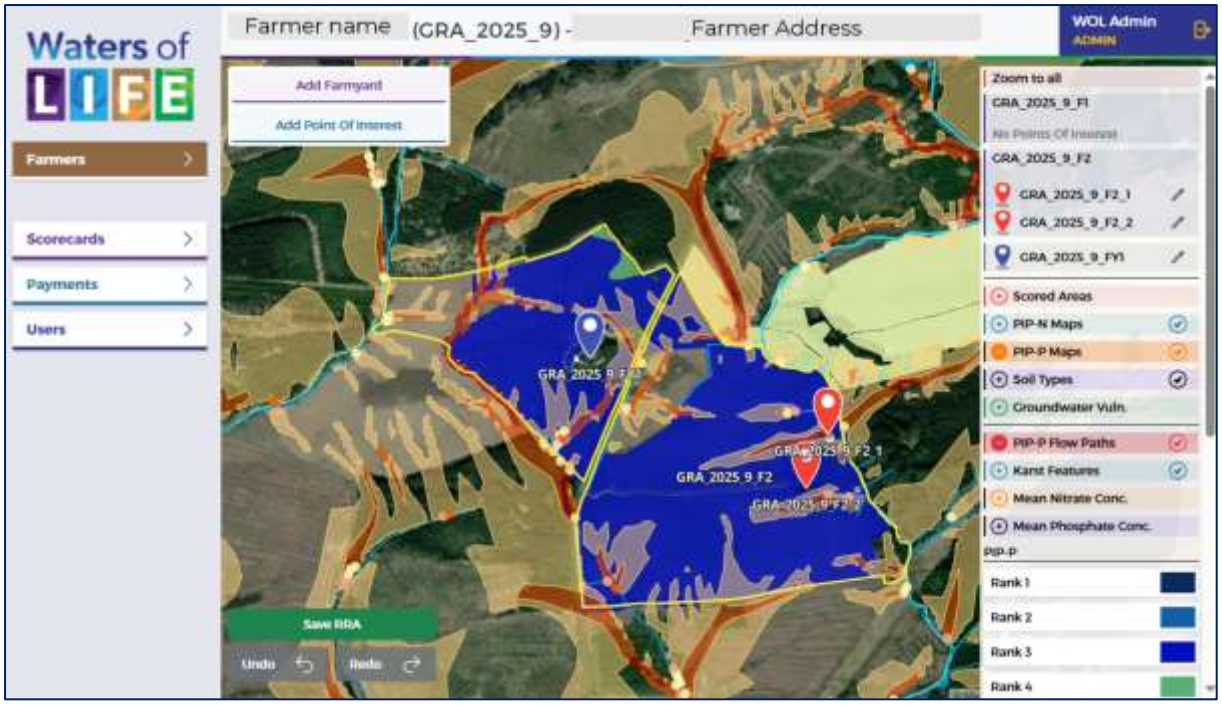

Fig 6: Flow Pathways and Delivery Points on an area of high risk for losses of P (PIP rank 1)

Final determinations:

Once all the available information has been considered, you should note POIs wherever required. It is important to have gathered an overall impression of the farm in advance of your farm visit.

You can track which layers have been considered. A tick mark will show up if the layer has been opened.

Once all POIs have been recorded and you are satisfied with your knowledge of the flow units to be assessed, you can save the RRA desktop assessment and leave the Waters of LIFE online portal.

Please note, if you do not complete this step and save the RRA you will not be able to access it through the app to complete your assessment on site.

Plan your visit

Having reviewed available information, you should plan your visit to make sure you can cover off all of the following:

- Assess every point of interest and potential threat/pressure to water quality
- Assess the farm yard(s)
- Assess every field mapped out in the Waters of LIFE App

Stage 2 of 3: Completing your farm visit for a runoff risk assessment

Make an appointment

Farm advisors should reach out to the farmer in advance of the visit to ensure the farmer is available.

Meet the farmer

An unfamiliar face entering a farm can sometimes be a stressful experience for the farmer, so it is important to:

- Put the farmer at ease
- Answer any questions they have in relation to the project
- Answer any other queries they have
- Remind the farm that Waters of LIFE advisors have no role in compliance inspections, enforcement, or regulations.

It is also important that the farmer understands how agriculture can impact on water quality. You have the opportunity to gauge the farmer's level of understanding on agriculture as a pressure on water quality and build their knowledge as needed throughout the assessment.

Quiz the farmer

- Be clear with the farmer what the purpose of the assessment is
- List the usual agricultural sources and pathways to the farmer:
    - Land management, including landspreading or reseeding
    - Farm roadways
    - Livestock access to waterways and overland flow
    - Farm drain network - in particular, the main drain(s) delivering nutrients with connectivity to the main channel causing the greatest impact
- Chat to the farmer about the points of interest that have already been identified during the desktop assessment
- Ask the farmer if there are points of interest that may have been missed - they are the experts of their own land
- Remind them that all actions are voluntary
- Remind them that all actions need to be agreed prior to submission
- Agree a plan to walk the farm together

Walk the farm – Farmland assessment sequence

1) Enter each flow unit in a sequence, taking time to note the overall land management practices.

2) Take time to talk to the farmer to highlight the **good** with the **bad**. Sometimes good practices/conditions are not always understood or valued and may be at risk of not being maintained.

3) Visit POIs that were previously recorded during the desktop assessment. While on route, keep an eye out for any other potential sources of pollutants, pressure points and damaging activities.

4) Turn on the flow pathway layer in your app and visit all potential pathways for pollutants. These include drainage ditches, farm trackways, and in-field flow pathways.

5) Get the farmer's opinion, even if there is no visible evidence of a flow pathway or delivery point. Farmer opinion is based on years of observation. A farmer's opinion about the location of delivery points should be viewed as evidence, even if no mapped or visual data is available.

Fig 7. Flow delivery pathway in a field

What to consider while assessing overland flow pathways

- Focus on the main, in-field flow pathways delivering nutrients with connectivity to the main channel causing the greatest impact.
- In tillage crops, overland flow pathways may only be observed between harvest and replanting, when soil structure is disturbed.
- Is the soil damaged? (poached, compacted, etc.)
- Intensive agricultural grassland/tillage with large, unimpeded flow pathways are the most risky sources of P and sediment losses. This is when compared to good quality semi-natural grasslands, scrub and woodland areas.
- Practices around farm inputs, weed control, MCPA products commonly used in rush control, fertilizer spreading and reseeding. These should be considered when assessing a farm's potential impact on water quality.
- Breaks in the bank (or perturbations) may indicate flow paths, breakthroughs and flow delivery points.
- Sediment deposition or discoloration is a potential indicator of a flow path, breakthrough and flow delivery point

Fig 8. A flow pathway entering a drain at a delivery point. The flow pathway may not be visible during periods of low rainfall, but the break in the bank of the ditch should still be identifiable. (Source: SMARTER_BufferZ)

Assessing Farm Drains

Drains/ditches in farms can act as a direct pathway for pollutants to enter a stream.

When they have exposed soil, they can act as a source of pollutants such as fine sediment, phosphorous and ammonium (Fig 9) when they have exposed soil.

You can also tell if there are issues with nutrient rich runoff if a drain is dominated by nutrient hungry plant species. They include fools watercress, duckweed, nettles etc.

The extent of which a drain is vegetated has an impact on how well it filters/holds back pollutants before they reach a receptor (watercourse).

Recently cleared and created drains do not contribute to this function while vegetated drains with a slow flow do retain water and contribute to reducing pollutants.

The nature of the drains in a plot can also impact on the overall habitat score of a plot, so it is within the farmer's best interest to allow them to revegetate.

Assessing farm Roadways

Farm roadways act as pathways delivering sediment and P into waterways.

Look out for their position and management. Focus on the main farm roadways with potential connectivity to the main channel causing the greatest impact.

Evidence of excessive rutting or channelling from water run off can show where potential pollutants are entering a stream (Fig.10)

Fig 9: Recently cleared drainage ditch with exposed soil

Fig 10: Evidence of channelling along a farm roadway

Karst features

Some of the Water of LIFE sub-catchments are located in areas with limestone bedrock, which can contain karst features.

These features are created when soft limestone rock is dissolved by water, resulting in channels and free flowing conduits under the ground.

Examples of these features include sink holes (also called dolines, sluggers etc.) which act as direct routes for pollutants down into the groundwater (Fig 11) and from there back up into surface water.

These features should be treated as receptors in their own right when doing the RRA. Direct discharge to them should be intercepted or diverted.

While these features are common throughout Ireland, they are only present in two Waters of LIFE demonstration sub-catchments - The Awbeg (Kilbrin) and, to a lesser extent, the Islands.

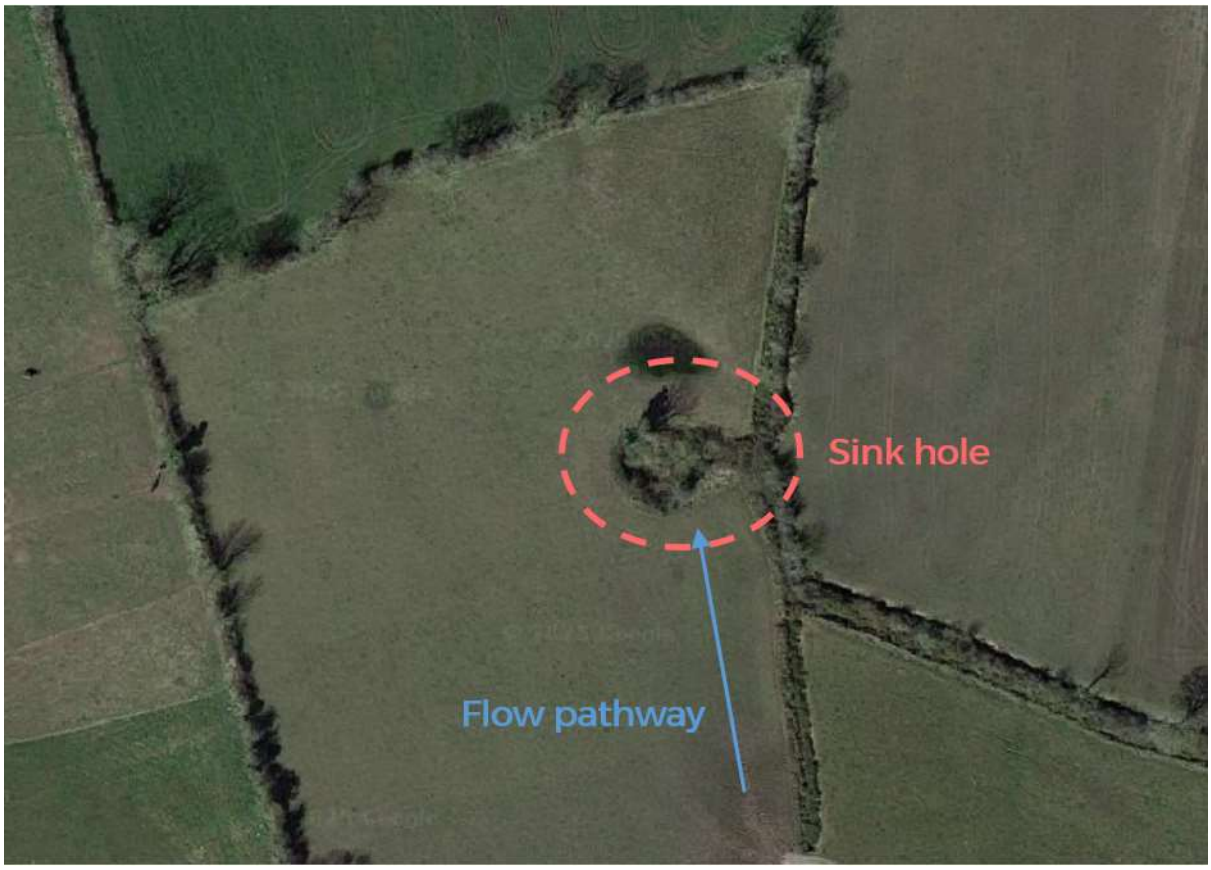

Fig. 11: Example of a sinkhole found in a field within the Awbeg (Kilbrin) sub-catchment.

Fig. 12: Sinkhole in a field, they are often overgrown with trees/shrubs. Image Credit: GSI

See a pressure – map it

When you have identified a pressure, you must map it.

All potential pressures are mapped from a centre-point, even if the source is a spread over a large area. If there are multiple centre-points for various sources of the same time (e.g. multiple instances of erosion), they should all be mapped separately.

Once you have selected the centre point of the pressure, you need to map its course along a pathway until it reaches a mapped watercourse. This may be a mapped overland flow path or a drain or it may just follow the slope of the land.

You will be prompted to enter the type of pressure.

There are six categories of pressure:

1. In-field flow pathway
2. Land drainage
3. Livestock access
4. Bare soil
5. Karst feature
6. Other

You are then asked if the pressure is an Observed or Potential Risk.

Observed Risks:

In the case of observed risk, a source and pathway are observed, i.e. you can see both a source and an unobstructed pathway to the receptor are present.

Examples of observed sources include:

- Extensive bare soil
- Damage (livestock trampling or vehicle) to river bank / lake edge / flood zone
- High levels of applied nutrients, pesticides, abundant dung
- Presence of other pollutants
- Recently installed or cleared out drains
- Recent modification of watercourse channel

Examples of observed pathways include:

- Sources present along waterbody margin or flood zone
- Free flowing drain between source and water body
- Obvious evidence of overland flow via notable gradient

Examples of observed risks:

- Large area that is heavily poached at drinking point access to a river
- Large area of riparian habitat that was removed and replaced with bare earth
- Large network of land drains excavated with no mitigation actions in place
- Sediment discharging directly into the main river channel

Potential Risks:

In the case of potential risk, a source and pathway are likely, i.e. where a source or pathway is not evident on the day but could be present under different climatic or seasonal influences. Potential risks occur when landspreading activities could lead to runoff where an obvious pathway exists, or where seasonal poaching could occur on a pathway.

Examples of potential sources include:

- Isolated areas of bare soil
- Isolated trampling at river bank / lake edge / flood zone
- Low levels of applied nutrients, pesticides
- Recently maintained / cleared drains
- Planned reseeding or landspreading
- Planned outwintering

Examples of potential flow pathways include:

- Where flow within drains between source and receptor is impeded
- No obvious overland flow paths
- Overland flow is impeded by well vegetated surface and other obstacles, and uneven surfaces.
- Flow path is currently dry but could activate under wet conditions

Examples of potential risks:

- Flow path in a field leading to a watercourse that currently poses no risk (e.g., dry with high grass cover), but may change with different management practices in the field (e.g. spreading of slurry during wet weather in the same field).

- Risk mitigation may need upgrading. A roadway water bar does not stretch long enough into the field to direct sufficient amount of water of the roadway.

- A livestock drinker on a well-vegetated flow pathway that connects to a watercourse. A small area of poaching is currently present around the water drinker, but could get worse in other conditions

Take a photo

Take a picture of the pressure. Include the source and the direction in which the pollutant travels towards a receiving waterbody.

Find supporting actions to suit

Supporting actions can be chosen to reduce the risk to water quality, depending on the nature of the risk observed. Waters of LIFE funds a wide rate of actions suitable for most of the issues likely to be encountered.

It's important to agree actions while in the field. This is because certain actions only work in certain habitats, so the best place to make that decision is while you're looking at it. It also has to be agreed with the farmer. It's their farm. It's their farm plan.

You can select from the list of supporting actions available on the phone app. They can be placed as a point, line or shape depending on the type of supporting action.

The full list of supporting actions is included in Appendix 2, and are available with details in the supporting actions specifications document at www.watersoflife.ie/resources.

Stack multiple supporting actions where you can

Some actions are complimentary. Multiple actions along a pathway or at source can combine to have the greatest possible impact on water quality.

Coming up with bespoke actions is encouraged, so get creative!

Remember, the location of the supporting action and the threat/pressure may not be the same.

Once a supporting action is agreed with the farmer, comments on the action can be made and the action can be submitted to the Waters of LIFE team for screening assessment.

Assess the overall risk of each flow unit

The app will ask you to assess the overall risk of a flow unit, before you move on to the next one. This is simply a summary of the risks to water quality found within the flow unit.

There are three categories:

- Observed risk(s) present;
- Potential risk(s) present or
- No risk(s) to surface waters detected.

The overall category should be selected based on the highest category of risk found within the flow unit, i.e. if there are both observed and potential risks, the overall risk category should be “observed risk(s) present”

Farmyard assessment

There are two elements to the farmyard assessment.

1. **Compliance checking:**

Under the Good Agricultural Practice (GAP) regulations, farmyards must meet minimum standards for:

- Separation of clean water
- Containment of pollutants such as soiled water, dairy washings, slurry and silage effluent.

Compliance with these standards is referred to as basic conditionality. Farmers cannot receive Waters of LIFE funding to meet these standards.

However, it is very much in a farmer’s best interests to have any deficiencies in this regard brought to their attention. Potential solutions should be discussed.

The outcome does not have to be reported through the Waters of LIFE app. It is a matter for the farmer and their advisor. The advisor must just confirm that this assessment has been completed. The provision of this confidential service to the farmer is considered to be included in the advisor payment.

2. **Mapping flow paths:**

Map any flow paths onto, within or coming off the farmyard to identify areas where:

- Clean water may be entering the yard (possibly from upslope) and making management more difficult. Diverting the water around the yard could be funded through the project.

- Drainage paths within the yard may be picking up minor pollutants from what are considered to be clean yards. For example, soil/sediment from trafficked yards but where there is no soiling by animals.

- Drainage may be leaving the yard and bringing contamination from minor sources into open drains or watercourses. If there is evidence of contamination, measures can filter out contaminants before they reach a stream or river. Supporting actions include bunded drains, sediment ponds and willow filter beds.

All of the above should mapped and appropriate supporting actions proposed.

In all cases, take your time to observe how the farmyard is used and how this might change through the seasons.

Stage 3 of 3: Review and submission

You can't submit your assessment on the app itself. This is done on the web portal when you get back to the office. This is to give you the chance to review the information.

This is the 10 minutes that will make the most of your farm visit and help ensure it results in a clear and actionable management plan for your client.

It is just a way of making sure your farm visit went according to plan.

You may need to correct something – maybe your finger slipped!

You may have forgotten to put something in you had planned to add.

It may be possible to add a proposed action without a photo, but please remember – photos are an invaluable piece of information for the farm plan. They also help verify the runoff risk assessment was carried out in the right way.

Review checklist

- Go through each flow unit and farmyard individually and check that the comments and overall risk category are as you described them in the field.
- Review each potential pressure point and the supporting actions that have been suggested to address the issue.
- Ask yourself if you have provided enough information to justify the placement of these supporting actions.
- Have you missed any opportunities to avail of supporting actions? If so, they can be added now. Upon reflection, are these supporting actions **the right measures, for the right reason in the right place?**

Hit send! What happens next?

Once you have reviewed and submitted the runoff risk assessment with proposed supporting actions, a farm plan will be generated and sent to the Waters of LIFE for screening assessment.

Each of the supporting actions will be screened to ensure they are appropriate and will not impact on any sensitive receptors (protected sites, species, archaeology etc.).

The Waters of LIFE team will screen and return a list of approved supporting. No work should take place until approval has been received.

Once approval has been given the farmer can go ahead and complete the supporting actions. Actions cannot be paid for if not approved.

Verification and compensation for the supporting actions will follow geotagged photos and/or receipts as described in the supporting actions specification document.

All approved supporting actions are mapped on a farm plan and can be found in the app/web portal/

Additional Supports

The following supports are available to assist with the runoff risk assessment

Online Tutorial:
An online tutorial will be provided on how to conduct a Runoff Risk Assessment.

Worked example:

A worked example with screenshots of the desktop assessment and in field assessment will be provided.

Catchment scientists:

Waters of LIFE catchment scientists are available to provide insight on the runoff risk assessment, and have local insight to their individual catchment.

We encourage advisors to reach out them and lean on them for support.

Avonmore, Co. Wicklow – Mark Desmond: +353861986343

Awbeg, Co. Cork – Diarmuid McSweeney: +353873419907

Graney, Co. Clare/ Co. Galway – Ruth Bennett Coady: +353868181461

Islands, Co. Galway / Co. Roscommon – John Kelly: +353862013578

Shournagh, Co. Cork – Diarmuid McSweeney: +353873419907

Appendix 1 – Common Pollutants and their Sources

See below common agricultural pollutant sources, pathways and receptors.

Source (Pollutant)	Pathway	Receptor
Sediment Phosphorus Nitrogen* Ammonia Pesticides Other pollutants	Farm drains Overland flow Groundwater pathways, well-drained land* Farm roadways	Rivers Streams Lakes Groundwater* Coastal waters
**groundwater n leaching issue not covered here.*		

Where all three above are linked, then a potential risk to water quality is present.

Phosphate

Impact:

Phosphate impact is identified by excessive growth of macrophytes (river plants) in the main channel of the waterway. If you see large coverage of the plant, it's usually an indication that phosphate impact is excessive. For example, you may not be able to see the main channel of water if looking from a bridge. This is most obvious in the summer time.

Fig 13. View of excessive macrophyte growth in Waters of LIFE sub-catchment.

Source of Phosphate	Phosphate Pathway
Nutrient surplus	Overland, direct – after heavy rainfall event, or in a scenario where soils have high index P
Organic manure application (specially timing of)	Overland, indirect – organic manure is transported by water and runoff to a field drain that leads to a waterway.
Soiled water (from yards)	Drainage pipe from a yard leading directly to waterway
Peat soils (when disturbed)	Direct, in-situ - Activity that significantly disturbs the soil or exposes the soil will release sediments that hold phosphate. A peat soil cannot hold onto phosphate due to a lack of Iron and Aluminium which binds P to soil particles.
Wastewater treatment plants (WWTPS) – chemicals used in treatment, or untreated discharge (organic wastes)	Direct – pipe discharge
Domestic wastewater treatment systems (DWWTS) – malfunctioning or damaged septic tanks, or septic tanks in a poorly drained soil i.e. no percolation	Overland, indirect – surface pooling of waste and runoff to a drain or to a waterway

Nitrate

Impact:

Nitrate impact is identified by excessive algal or macrophyte (river plants) growth at the estuary of a waterbody.

This is also identified as “sea lettuce” which consistently covers a significantly large area of a coastal area like a beach.

Fig 14. Sea lettuce

Source of Nitrate	Nitrate Pathway
Grazing animals – urine patches specifically due to the high nitrate loading of urine carried by the water and dropped in a concentrated area. This nitrate is well beyond the capacity of the plant root system to absorb so it is by-passed.	Downward leaching – nitrate that moves beyond the root zone of a plant is lost to subsurface pathways. If it is a short sub-subsurface pathway, it will reach the nearest stream or river. If it is a long sub-surface pathway, it will reach the groundwater and water table.
Nutrient surplus – where nitrogen application is above the capacity of a plant to absorb and use for growth, the nitrogen will by-pass the root system.	
Leguminous plants - (clover fixing plants such as clover)	
Ploughing – inverting the soil releases nitrate. This due to the plants’ root system being disconnected from the soil or from the absence of a live plant system. With nothing alive to hold onto the nitrate, it will move downward.	

Ammonium

Impact:

Ammonium is toxic to fish and other aquatic organisms. They will be absent from the waterway where high levels of ammonium is present.

Source of Ammonium	Ammonium Pathway
Wastewater treatment plants (WWTPS) – untreated discharge (organic wastes).	Direct – pipe discharge directly or indirectly, overland.
Domestic wastewater treatment systems (DWWTS) – malfunctioning or damaged septic tanks, or septic tanks in a poorly drained soil i.e. no percolation	
Organic manure application (specially timing of)	Overland, indirect & direct – organic manure is transported by water and runoff to a field drain that leads to a waterway. It can also enter a waterway where no buffer is in place
Soiled water (from yards)	Drainage pipe from a yard leading directly to waterway
Peat soils (when disturbed)	Direct, in-situ - Activity that significantly disturbs the soil or exposes the soil will release ammonium. Ammonium may “seep” out from peats when soil is exposed from disturbance of any kind

Sediment

Impact:

Sediment can deplete oxygen in waterways. This affects early life stage invertebrate species, particularly spawning gravels where the sediment is suspended and organic rich.

Fig 15. View of excessive sediment in Waters of LIFE sub-catchment.

Sediment Source	Sediment Pathway
Poaching/bare soil	Overland, direct – after heavy rainfall event
Forestry (specifically clear felling)	Drainage pipe from a yard leading directly to waterway
Peat extraction (when disturbed)	Direct, in-situ - Activity that significantly disturbs the soil or exposes the soil will release sediments.

Hydrology & Hydromorphology

Impact:

Hydrology & hydromorphology impacts the natural flow rate, direction, and so the "energy" of the waterway. Good hydromorphological conditions are required to create and maintain diverse aquatic habitat for invertebrates, fish and plants. These in turn support healthy aquatic ecosystems and good ecological status.

Sources & pathways:

Human activities that impact on the hydromorphological condition of waters, for example:

- Channelization and straightening of rivers
- Installation of weirs or other instream barriers, culverting or otherwise
- Installing hard engineering works
- Removal of natural features such as sand and gravel banks and riparian vegetation.

Pesticide – MCPA

Impact:

MCPA decimates river ecology – particularly invertebrate species. Where MCPA or other pesticides enter a stream it can be detected in surface water (drinking water abstraction point) a long way from where it was applied, >30km.

Sources & pathways:

Agricultural and domestic use of pesticides. Direct – not following protocol for spraying i.e. too close to waterway. Indirect – spraying near or in channels/drains where water will flow.

MCPA is more mobile than Glyphosate, and more persistent too, particularly on wetter soil types

Biological Oxygen Demand (BOD)

Impact:

Measurement of the oxygen levels in the waterway – it represents how much oxygen is needed to breakdown organic matter, it is a key indicator of organic pollution.

Sources & pathways:

All of the above relating to organic matter – human and animal waste from malfunctioning treatment systems and entering waterways directly or indirectly.

Appendix 2: Supporting Actions

Waters of LIFE Supporting Actions and Payment Rates					
Ref	**Action Name**	**Min**	**Max**	**Unit**	**Payment Rate**
Farm Infrastructure					
01	Permanent Single Strand Electric	5	2000	/m	€2.77
02	Sheep Fence	5	2000	/m	€6.75
03	Sheep Fence Mountain Rate	5	2000	/m	€11.25
04	Barb Wire Fence	5	2000	/m	€4.50
05	Deer Fence	5	2000	/m	€22.50
06	Solar Powered Electric Fencer	1	2	/unit	€634
07	Gateway Measures	1	10	/unit	€360
08	Waters Bars	1	10	/unit	€213
Nature Based Solutions					
09	Vegetated Bunded Drain	1	3	/unit/yr	€1000
10	Earth Bund	1	5	25mx0.5m	€300
11	Sediment Trap	1	3	/unit/yr	€120
12	Hedgerow Establishment Cross-slope on Earth Bund	10	250	/m	€24.37
13	Grassland Buffer Cross-slope	10	100	/m	€5.45
14A	Spatially Targeted Riparian Buffer 0.01-0.04ha	1	5	/unit	€400 / €228*
14B	Spatially Targeted Riparian Buffer 0.05-0.1ha	1	5	/unit	€915/€418*
14C	Spatially Targeted Riparian buffer 0.11 to 0.2ha	1	5	/unit	€1,656/787*
15	Tree Planting	5	100	/whip	€16
16	Willow Beds	30	200	/m	€34
17	Small Scale Wetland Pond	1	3	/unit	€800 / €627
Watercourse Crossing					
18	Culvert	1	5	/unit	€500
19	River, Stream Crossing/Bridge	1	1	50% of cost	Max €5000
Water Provision					
20	Solar Pump	1	2	/unit	€2500
21	Water Storage Tank	1	2	/unit	€400
22	Pasture Pump	1	5	/unit	€400
23	Water Trough	1	5	/unit	€300
Invasive Species					
24	Non Native Invasive Species	Case by case basis			
25	Conifers (high cover)			/ha	€1,481.00
26	Conifers (medium cover			/ha	€740.60
27	Conifers (low cover)			/ha	€359.10
28	Conifers (sparse cover)			/ha	€66.70
Other Supporting Actions					
29	Water Table Management on Peat soils	Direct payment by project			
30	Green Hay	1	5	/ha	€250
31	Contractor Mobilisation Fee	1	1	/applicant	€200
32	Bespoke Measures	Case by case basis			
33	Host Farmer Payment	1	5	/event	€180

*Reduced payment rate for ACRES