Rapid assessment and mitigation measures for watercourses on Erven 21028 and 21029, George

Prepared by Dr. Jackie Dabrowski of Confluent Environmental (Pty) Ltd

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DECLARATION OF CONSULTANTS INDEPENDANCE

This report was compiled by Jacqueline (Jackie) Dabrowski, the Director of Confluent Environmental (Pty) Ltd. Jackie holds a Ph.D. in Veterinary Science and her post-graduate studies were in the field of freshwater ecology. She has conducted research and published scientific articles on a range of topics including aquatic food webs, fish health, trends in water quality, branchiopod diversity, and land-use impacts on water quality. Her consulting work has focussed on a range of environmental assessments of dams, rivers, estuaries, ephemeral watercourses and wetlands at various locations in Namibia, Liberia and South Africa.

At the time of conducting this study, I declare that:

- I am an independent specialist consulting in the field of Aquatic Science;
- I do not have any financial interest in the undertaking of the activity, apart from remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- I do not have any vested interest in the proposed activity proceeding;
- I will not engage in any conflicting interests in the undertakings of the activity;
- I undertake to disclose to the competent authority any relevant information with the potential to influence the decision of the competent authority or the objectivity of the report; and,
- I will provide the competent authority with access to all information at my disposal regarding the application, whether this information is favourable to the applicant or not.

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1. INTRODUCTION

1.1 Background

Confluent Environmental (Pty) Ltd were appointed by Power Construction to delineate and assess watercourses on Erven 21028 and 21029 in George. Construction activities commenced at the site on Tuesday 25 May 2021, and on 27 May 2021 Power Construction were instructed to cease all listed activities at the site. These were identified according to the National Environmental Management Act (NEMA) as the following:

Table 1. Listed activities that have been undertaken at the site as identified in the Compliance Notice.

NEMA Activity	Description	Location on site
EIA Regulations Listing Notice 1 of 2014: Activity no. 19	*The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse*	This occurred when a depression wetland was filled in with soil from elsewhere on the site.
EIA Regulations Listing Notice 3 of 2014: Activity no. 12	*The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan*	This occurred in the depression wetland and a 2nd location towards the Camfersdrift Wetland area which is mapped as a wetland (NWM5) and as a Critical Biodiversity Area (CBA1: Aquatic)

Note

On subsequent assessment of this wetland, it should be classified as a **Wetland Flat** as opposed to a depression wetland according to Ollis *et al*. (2013), because of the lack of any significant contours surrounding it (Figure 1).

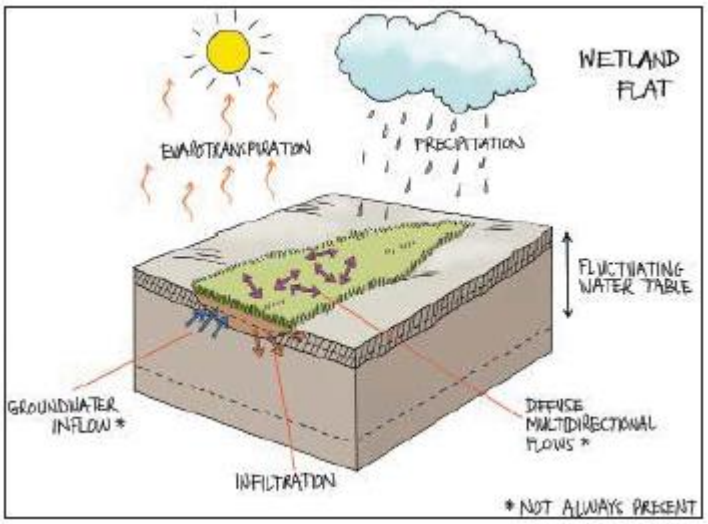

Figure 1. Schematic diagram of a wetland flat as classified by Ollis *et al* (2013).

1.2 Site visit

The site was visited on the afternoon of 28 May 2021 for a rapid assessment to determine the boundaries of wetland areas, buffer areas, and to establish whether any immediate mitigation measures were required to protect the environment from further degradation.

1.2.1 Wetland Flat

The wetland was demarcated by marking out 7 points along the circumference (edge; Figure 2). A 30 m measurement will be taken from these points outwards to mark out the buffer area by the contractor on Monday 31 May. One of the points (Pt2) did not save in the GPS and will be verified in the coming week. But there is good agreement between the points marked and the satellite imagery which still indicates the wetland (Figure 2).

Approximately one third of the wetland has been covered with a large quantity of earth fill from the other two thirds of the wetland which has been excavated. Fill was also obtained from the cleared vegetation area on Erf 21029. No evidence of the wetland remains, and the site is now highly disturbed (Figure 3). It will be more thoroughly assessed during subsequent site visits to determine the feasibility of rehabilitation.

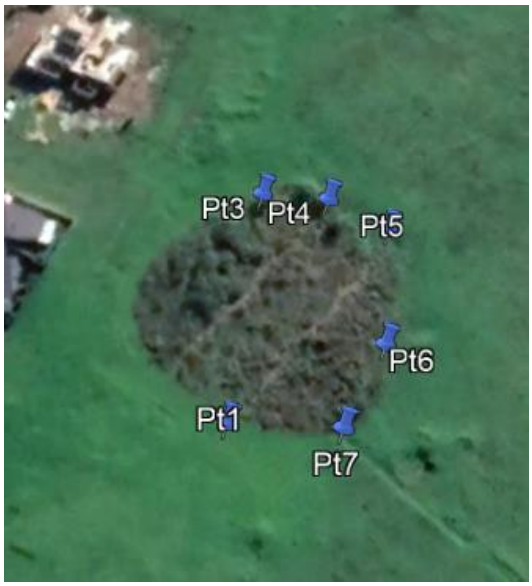

Figure 2. Satellite image of the wetland with marked points made on 28 May 2021.

Figure 3. Photo of the present state of the wetland roughly demarcated by shadecloth, showing infilled area to the right.

1.2.2 Camfersdrift wetland

The Camfersdrift River flows in a south-westerly direction towards the south-east of Erf 21029. At this point the river has a broad valley-bottom wetland area confined by relatively steep slopes on the western bank. The area of vegetation cleared on Erf 21029 was mapped using a GPS on site and measures **1 928 m^2** (Figure 4). The area was being cleared for construction of houses down the slope which were to be supported by a retaining wall towards the slope bottom.

The vegetation cleared served the important function of stabilising soil on the steep slopes and would be classified as riparian vegetation grading to wetland vegetation towards the bottom slope. Now it has been removed, and the soil disturbed, this creates a very high risk of soil erosion down the slope resulting in sedimentation of the Camfersdrift wetland (Figure 5). It is therefore recommended that urgent mitigation measures are taken to prevent further degradation of the environment.

Figure 4. Area of vegetation cleared adjacent to the Camfersdrift wetland.

Figure 5. Photo of the cleared vegetation showing the steep slope on Erf 21029.

2. URGENT MITIGATION MEASURES

2.1 Sloped area on Erf 21029

To protect the soil on the steep sloped area, the following mitigation measures are recommended (Figure 6). These must be implemented in a stepwise process as numbered

below. Careful attention must be taken to ensure correct implementation, or the measures will fail with resulting erosion which will require further rehabilitation.

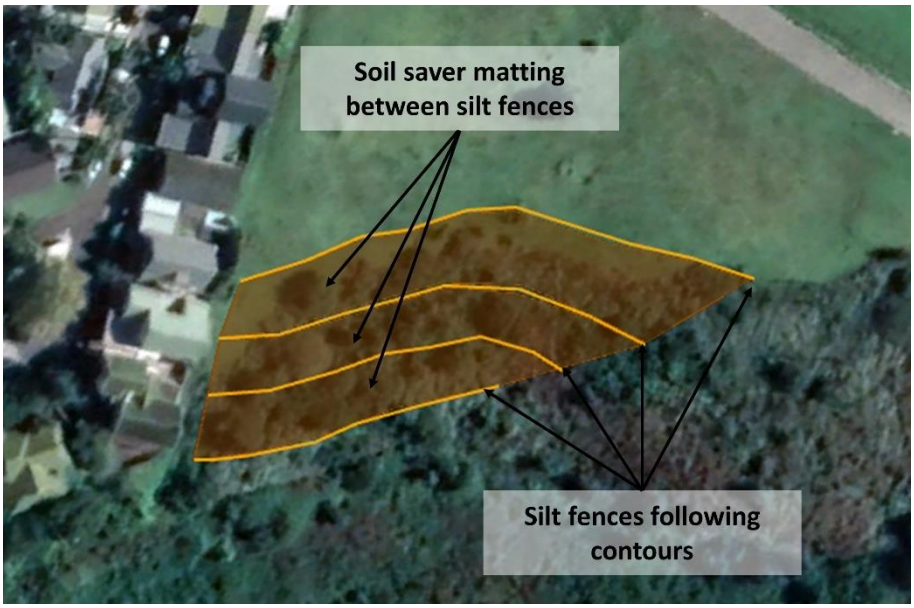

Figure 6. Annotated satellite image of the area of cleared vegetation on Erf 21029 showing the approximate location of urgent mitigation measures required to stabilise soil.

Step 1: Install at least 4 silt fences

Proper installation of soil erosion control fences is necessary for them to be effective. 4 silt fences must be installed along the contours as indicated in Figure 6. Images demonstrating the installation of erosion control fences are shown in Figure 7.The following guidelines must be followed:

- Geotextile fences must be installed perpendicular to the direction of water flow and along a line of uniform elevation or contour. In other words they should not waiver up and down the slope, but should be in a straight line across the slope. If this guideline is not followed, water will flow along the fence to the lowest point creating stress and potential collapse at this point;
- Use synthetic UV resistant geotextile fabric able to withstand at least 6 months of sun exposure. The product *Grassfence* (available from Kaytech) is specifically made for this application and is available in rolls 500mm and 700mm wide. The material must be able to allow water to move through it, so materials like bidim are not suitable, but shadecloth can be used if necessary;
- Silt fences can be staked using wooden stakes. Metal droppers are preferable but will be stolen. The stakes should be arranged in straight lines across the area to be rehabilitated, at most 3m apart and firmly driven into the ground. A steel wire along the top of the stakes and also along the ground must then be secured and to which the geotextile is fastened, top and bottom;
- A 250 to 350 cm wide and 10 cm deep trench must be dug upslope of the location of the fence and the bottom half of the geotextile then laid into the trench;
- The trench must be backfilled and the soil compacted over the geotextile;
- The height of the silt fence should be between 20 and 30 cm;

- The distance between silt fences should be 8-10m. This results in 4 silt fences at the site, with the lowest one following the line of the lowest uncleared vegetation;
- Geotextile should be in a continuous roll to avoid joins which weaken the structure. Where joins are unavoidable both fabric ends should be wound around stakes to prevent it from unravelling (See Figure 8);
- Terminal ends of the silt fence should run slightly uphill to prevent runoff from going around the ends of the fences.
- Silt fences will be removed once vegetation has established on exposed areas.

Figure 7. Installation of the soil erosion control fence. A: Installing the standards and wires and preparing the trench. B: Fitting the geotextile, tying it on with wire. C: Filling in the trench over the geotextile. D: Applying a mulch against the completed fence (Photos courtesy Ken Coetzee).

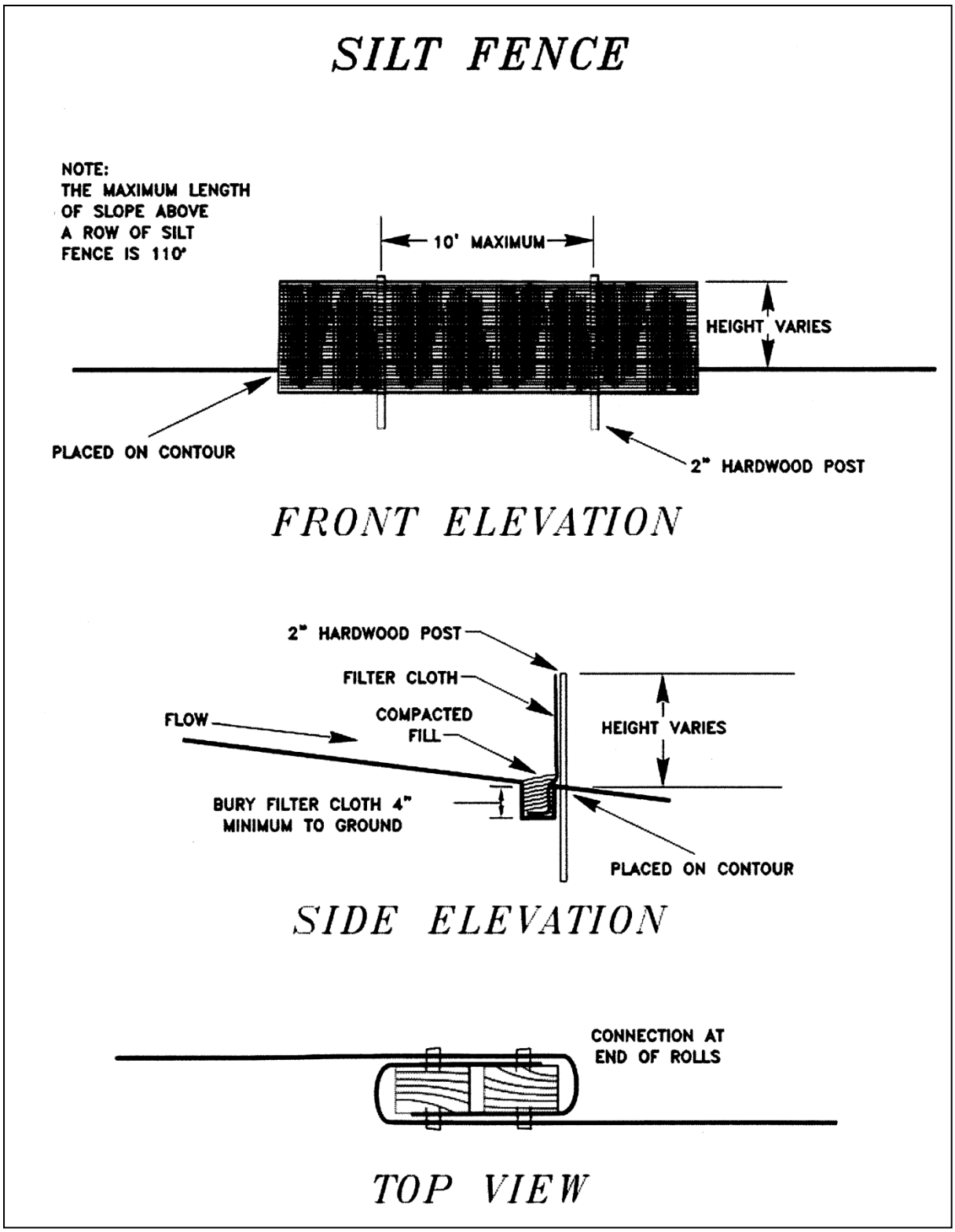

Figure 8. Example of methods recommended to install silt fencing (Measurements in inches; Source: Department of Environmental Protection, West Virginia)

STEP 2: Revegetation and soil saver matting

Between the silt fences, soil will still be vulnerable to erosion and must be stabilised. A combination of temporary vegetation cover and soil matting will be used. The following steps must be taken.

- Lightly rake over the soil to create a uniform surface.
- Seed the areas between silt fences with a light cover of weed-free **oats** purchased from a registered supplier (e.g. Agricol). Oats are an annual, non-invasive plant that will rapidly provide cover and stabilise the soil. The seeding rate should be 20 kg / ha, which is the equivalent of **4-5 kg of seed** for the entire area to be covered. Seed should be scattered as uniformly as possible to prevent clumping, and the silt fences should be avoided as seed will probably collect along these lines anyway.
- The seeded area must be covered in a **light mulch (1-2cm deep**). This can consist of shredded woody material but must not be wood chips. Suppliers such as Grow Green Organics can be contacted for options.
- Cover the seeded and mulched slops with a rolled erosion control product (such as jute, coir or straw matting). Preferably a natural (vs. man-made), bio-degradable product should be used. The use of a jute geotextile called *Soilsaver* is recommended. It is also available from Kaytech in Port Elizabeth and in Cape Town.

The role of the erosion control matting is not to provide long-term protection for slopes from erosion, but to protect the soil surface until vegetation can establish and become the permanent stabilising feature. The slope should be seeded and mulched, and then covered with erosion control matting which will remain in place until the vegetation has established. Matting should be overlapped by about 10cm and secured using wooden stakes along the edges. Terminal ends of the matting can also be staked or buried in an anchor trench.

Figure 9. Example of how Soilsaver is fitted to the soil surface (Photo courtesy Ken Coetzee). Note holes to accommodate indigenous vegetation.

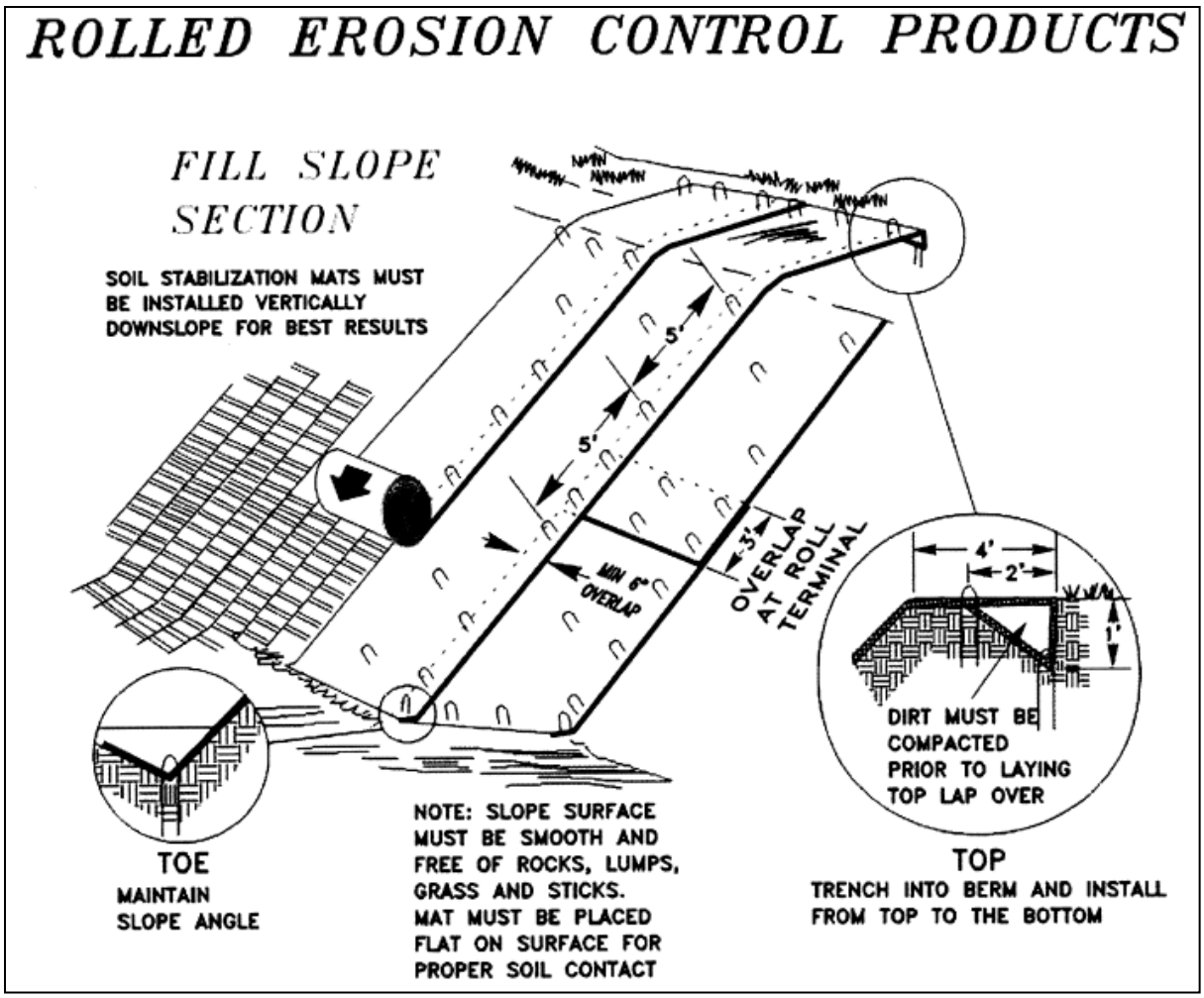

Figure 10. Example of methods recommended to install erosion control matting on sloping areas such as the dam wall embankment that require revegetation (Source: Department of Environmental Protection, West Virginia)

2.2 Wetland Flat

On Monday 31 May 2021, the site was visited again to determine whether removal of the portion of fill that was placed over the wetland is a feasible option for rehabilitation. Two areas of fill were removed to the previous level of the wetland using the excavator on site. Roots of *Typha capensis* were still present that had not yet decomposed, although the leaves had already browned off. However, *T. capensis* is a resilient plant, and is known to be difficult to remove. It is the opinion of the author that if the fill is removed from the filled in area that many of the reeds will regrow creating the opportunity for rehabilitation. The rapid removal of fill from the wetland area with subsequent monitoring of re-establishment of the wetland vegetation is therefore recommended before the roots decompose and seedbank is lost.

Update

The fill placed in the wetland flat (described above) was subsequently removed from the area on 15 June 2021.

3. REVISION OF BUFFERS

Sensitive vegetation and wetlands on Erven 21028 and 21029 have been previously assessed. Ractliffe (2014) and Vlok (2014) provided specialist inputs on aquatic and botanical aspets of the site respectively. Ractliffe (2014) identified the wetland flat (depression wetland), a connecting channel, and hillslope seep adjacent to the Camphersdrift wetland. Buffers were recommended for these areas as indicated in Figure 11. Wetland buffers were 30 m and the interconnecting channel was 25 m.

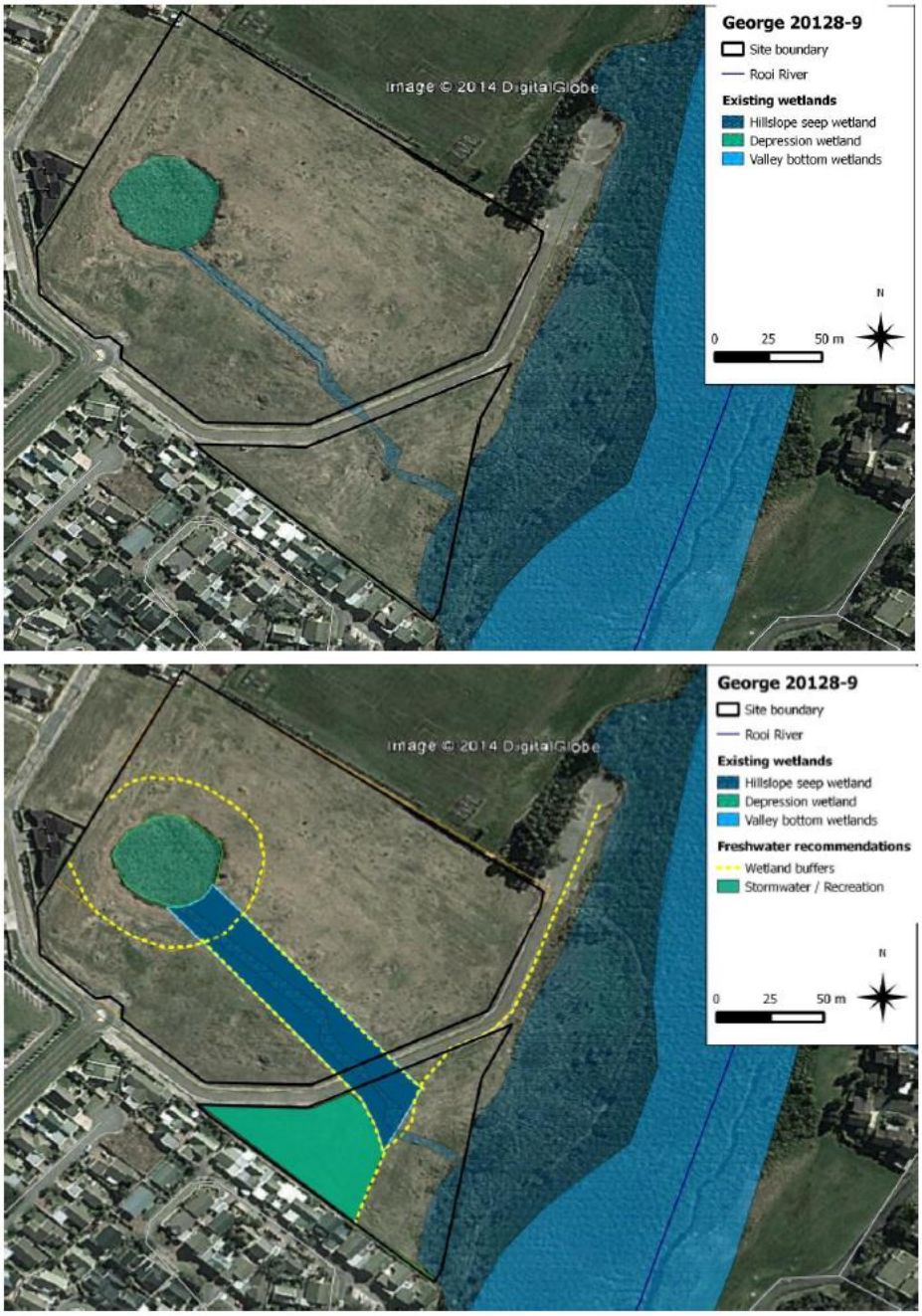

Figure 11. Wetlands identified on Erven 21028 and 21029 (above) and buffer recommendations (below) from Ractliffe (2014).

Through discussion with Ractliffe (*pers. comm.* 21/06/2021) the following issues pertaining to the buffers identified in Figure 11 were identified:

1. The Ractliffe assessment was meant as a scan of sensitive aquatic habitat on the site, and not a complete and thorough assessment.
2. The recommended buffers were based on commonly applied distances at the time, and were not determined using the subsequently developed tool for determining buffers for wetlands and rivers (Macfarlane & Bredin, 2017).
3. Both wetland areas were not delineated in detail using methods developed for this purpose (DWAF, 2005). Soil augering was conducted in the middle of each wetland to confirm wetland conditions only.
4. The linear channel leading from the wetland flat (depression) visible in various historical images is entirely artificial and had no features of a watercourse. It appears to have been dug at some point in an attempt to drain water from the wetland.

As a result of the above points, it is proposed that the buffer areas for the wetland flat and Camphersdrift wetland be revised using the detailed site-based model developed by Macfarlane & Bredin (2017). The buffers should then be mapped from the edge of the delineated wetland area (DWAF, 2005). It is furthermore proposed that the linear channel be discarded from buffered areas as it is not a natural watercourse and has no function as such. Recommended buffer zones for both wetland areas were determined using the site-based buffer zone tool developed by Macfarlane and Bredin for rivers and wetlands (2017), which is the more detailed of the two available models. The recommended buffers were determined as follows:

Wetland Flat Buffer: 19 m

Camphersdrift Wetland Buffer: 19 m

The resulting buffer was the same for both wetlands. The buffer areas would be completely out of bounds during the Section 24g process, and while any other environmental processes are initiated and authorised (e.g. Water Use License). The buffer areas would also need to be maintained and / or rehabilitated to provide sustained support to the watercourse. A point worth noting about watercourse buffers is that they primarily protect watercourses from diffuse sources of pollution, as opposed to point sources. Housing developments do not produce large amounts of diffuse pollution, unlike other land uses such as a feedlot for instance. Greater risks are posed by point sources such as stormwater outlets, which buffers are not able to mitigate. Buffers are also meant to conserve biodiversity, migration corridors, and reduce collective risks to the watercourse. These factors are accounted for in the buffer calculation.

3.1 Wetland delineation

The wetland flat is easily delineated using historical imagery and by referring to Ractliffe (2014) and Vlok (2014) reports on vegetation and wetland characteristics. It is roughly circular and is defined by wetland vegetation which distinctly differs from the surrounding kikuyu grass.

As vegetation was recently cleared on the slope above the Camphersdrift wetland, soil indicators were used to delineate the wetland in this area. A series of four transects perpendicular to the Camphersdrift wetland were augered up the slope where vegetation was

cleared. Augering was conducted approximately every 2 – 3 m along the transect. Soils were augered to a depth of 50 cm to search for evidence of permanent, seasonal or temporary wetness. The delineated edge of the wetland was determined as the line between auger points indicating temporary wetness and no wetness (Figure 12). Delineated wetland areas in the vicinity of the two erven to be developed are presented along with the revised buffer recommendation in Figure 13.

Figure 12. Example of augered soil down the slope towards Camphersdrift wetland showing soil with no wetland indicators (left) compared to soils with indicators of temporary wetness (right).

Figure 13. Delineated wetland areas and recommended buffers for Erven 21028 and 21029.

The revised aquatic buffers will need to be overlaid with more detailed botanical specialist inputs. The updated buffers and sensitive areas can then be considered in possible revisions of the planned layout of the residential development.

4. REFERENCES

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