Appendix 7.2

Construction Run-off Management Plan

GLENLEE SUBSTATION EXTENSION

CONSTRUCTION RUNOFF MANAGEMENT PLAN - DRAFT

July 2019

Client

SP Energy Networks (SPEN)

Ochil House, 10 Technology avenue

Hamilton International Technology Park

Blantyre

G72 0HT

REV	CHECKED	APPROVED	DATE
	DAVID MILLER	DAVID MILLER	05/07/2019

CONTENTS

TABLE OF TABLES

1. INTRODUCTION

SP Energy Networks (SPEN) has contracted David R. Murray & Associates (through Kaya Consulting Ltd.) to provide professional services to support planning and permitting of the Glenlee Substation Extension at the South West of Scotland. The extension works has been proposed by SPEN. Information on the surface runoff rates and volumes in the construction site and the design characteristics of the proposed sustainable drainage system (SuDS) to control site discharges (quantity and quality) are required to inform Environmental Impact Assessment/Appropriate Assessment, satisfy the Scottish Environment Protection Agency (SEPA) license application requirements and determine if there will be significant downstream impacts beyond the legal boundaries of the site. The specific objectives of this report as follows:

- Estimate greenfield and construction runoff rates and volumes from catchment areas on the construction site.
- Assess the required attenuation storage to control construction site discharges to avoid downstream flood and erosion impacts.
- Assess the required treatment storage volumes to dilute and treat surface runoff from the construction site.
- Recommend additional mitigation measures.

2. CONSTRUCTION RUNOFF MANAGEMENT PLAN

SPEN has provided a drainage scheme for temporary work at the construction site (see Appendix A). Accordingly, the extension of Glenlee substation site has been divided in 9 different areas (See Appendix B) in order to carry out a construction runoff management assessment based on temporary works, existing drainage systems, a temporary drainage scheme and topography of the site.

Areas A, B and C are situated on the North-West side of the construction site. Topsoil storages from the construction compound will be placed at Areas A and C. Runoff from topsoil storages will be directed into cut-off ditches incorporating settlement ponds before discharging over ground via an anti-scour surface. Area B includes the construction compound and construction compound access road. Road surface runoff will be directed into adjacent

ditches and directed to anti-scour surface discharge points. Compound surface runoff will be directed onto adjacent ground.

The Southern part of the construction site is divided into areas D, E and F. Surface runoff of area D will be directed into existing cutoff ditches and temporary drainage. Area E includes a temporary construction vehicle holding area and topsoil storages. Surface runoff for area E will be directed into cut-off ditches incorporating settlement ponds before discharging over ground via an anti-scour surface. Finally, excavation of the substation extension will be carried out in Area F. Surface runoff of Area F will be directed into a temporary cut-off ditch with silt barriers; also, settlement ponds will be installed just outside the fence line of the existing substation. The treated discharge from the ditch will be directed into the existing culvert which discharges into the ditch on the far side of the public road.

Construction access (and future, permanent access road) will be placed in Area G. surface runoff of Area G will be included in this assessment if attenuation and treatment storage is needed, since the existing ditch is placed at the West side of Area G and the access road surface runoff will drain towards East side.

Area H has been included at the North side of the public road within the construction boundary for emergency treatment if any silt discharge escapes the main construction area. Greenfield runoff rates and volumes for Area H will be included in this assessment as a reference.

Finally, Area I includes the existing Glenlee substation. All surface runoff for this area is discharged into the existing drainage system. Greenfield runoff rate and volume of Area I will be included in this assessment as a reference, as well.

3. RUNOFF RATES AND VOLUMES

3.1 Greenfield Runoff

Surface runoff rates that drain in an undeveloped/undisturbed condition is known as Greenfield runoff. Greenfield runoff rates and volumes should be maintained during the construction period to minimize downstream risk of flooding and erosion (Environment Agency, 2013).

3.1.1 Greenfield Runoff Rates

IH 124 Method was employed to calculate greenfield runoff rates for each catchment area at Glenlee substation extension. The IH 124 Method estimates the mean annual flood for small catchments using equation 1:

$$Q_{bar} = 0.00108 * AREA^{0.89} * SAAR^{1.17} * SPR^{2.17} \text{ (Eq. 1)}$$

Where,

Q_{bar} = Mean annual flood in m^3/s (Approximately 2.3-year return period)
$AREA$ = Area of catchment in km^2
$SAAR$ = Standard Average Annual Rainfall for the period 1941 – 1971 in mm
SPR = Standard Percentage Runoff coefficient for the soil category

For development sites like Glenlee substation extension, which has less than 50 ha, an area of 50ha was used when applying the above formula. Subsequently, the resulting Q_{bar} was multiplied by the ratio of the site area to 50 ha.

The values for SAAR and SPR were obtained from HR Wallingford (HR Wallingford, 2019) ; for this site, the values for SAAR and SPR were 1584mm and 0.53, respectively. FSR regional growth curve factors used for 1, 5, 10 and 30-year return periods were 0.87, 1.11, 1.42 and 1.95, respectively. These figures were sourced from HR Wallingford (HR Wallingford, 2019).Using equation 1, the mean annual flood rates for each catchment area were calculated and are summarized in Table 1. Furthermore, Table 1 shows the greenfield runoff rates per catchment area for the 1 in 1-year, 1 in 5-year, 1 in 10-year and 1 in 30-year return periods.

Glenlee Substation Extension
Construction Runoff Management plan
July 2019

Table 1 Greenfield Runoff Rates per Catchment area

Catchment Area	Area (ha)	Q_{bar} (L/s)	1 in 1-year Runoff Rate (L/s)	1 in 5-year Runoff Rate (L/s)	1 in 10-year Runoff Rate (L/s)	1 in 30-year Runoff Rate (L/s)
A	0.10	1.59	1.38	1.76	2.26	3.10
B	2.39	38.91	33.86	43.19	55.26	75.88
C	0.12	2.01	1.75	2.23	2.85	3.92
D	1.86	30.30	26.36	33.63	43.03	59.08
E	0.69	11.29	9.82	12.53	16.03	22.01
F	0.72	11.78	10.25	13.07	16.72	22.97
G	0.15	2.38	2.07	2.64	3.38	4.64
H	0.93	15.20	13.22	16.87	21.58	29.64
I	0.48	7.78	6.77	8.63	11.04	15.17

3.1.2 Greenfield Runoff Volumes

The greenfield runoff volumes were calculated using equation 2 below.

$$VOL = SPR * 10 * AREA * RD \text{ (Eq. 2)}$$

Where,

VOL = Runoff volume for the 6-hr duration event in m^3
SPR = Standard Percentage Runoff coefficient for the soil category from FSR maps
$AREA$ = Catchment area in ha
RD = Rainfall depth for the designs storm duration in mm

For calculating greenfield runoff volume, the 6-hour duration event was selected based on the need to provide adequate protection for small to medium size water courses that tend to be most at risk from the effects of urbanization (Ballard, et al., 2015).

6-hour rainfall event depths for 1, 5, 10 and 30-year return periods were obtained from the Flood Estimation Handbook Web Service (CEH, 2019) and were 29.73mm, 42.01mm, 48.63mm, 60.03mm, respectively. Lastly, 0.53 was used for SPR. The greenfield runoff volumes for a 6-hour rainfall event for each catchment area are listed below in Table 2.

Table 2 Greenfield Runoff Volumes per Catchment Area

Catchment Area	Area (ha)	1-year 6-hr Runoff volume (cu.m)	5-year 6-hr Runoff volume (cu.m)	10-year 6-hr Runoff volume (cu.m)	30-year 6-hr Runoff volume (cu.m)
A	0.10	15.36	21.71	25.13	31.02
B	2.39	376.40	531.87	615.69	760.02
C	0.12	19.44	27.48	31.80	39.26
D	1.86	293.08	414.13	479.39	591.78
E	0.69	109.16	154.25	178.56	220.42
F	0.72	113.92	160.98	186.35	230.03
G	0.15	23.04	32.55	37.68	46.51
H	0.93	147.03	207.76	240.50	296.87
I	0.48	75.22	106.29	123.04	151.89

3.2 Construction Runoff Rates and Volumes

Once the construction works commence, the natural surface of the site will be altered, which means the runoff coefficient of the surface will change. For the purpose of this assessment, the runoff coefficient of exposed surfaces was assumed as 0.70. Moreover, drawing 1C2A-2-1000-D0-SPENEC-4009, provided from SPEN, was used to identify the exposed areas and topsoil storages during the construction period.

3.2.1 Construction Runoff Rates

Construction peak flow rates from each catchment area were calculated using the Modified Rational Method (Ballard, et al., 2015) according to the equation 3:

$$Q = 2.78 * C * i * A \text{ (Eq. 3)}$$

Where,

Q = Peak Runoff rate in L/s
C = Area-Weighted runoff coefficient for the catchment area, the proportion of rainfall that occurs as runoff

i = The rainfall intensity in mm/hr for the event return period and for a duration equal to the time of concentration of the catchment area being drained.

Two runoff coefficients were used in the calculation; 0.70 for the exposed areas and 0.53 for undisturbed areas (a value equal to the SPR). Time of concentration (*i*) was 15 minutes in order to obtain rainfall intensity.

Rainfall intensity for a 0.25-hr rainfall event for the 1, 5, 10 and 30-year return periods were 24.92mm/hr, 44.24mm/hr, 55.28mm/hr, 74.52mm/hr, respectively. These figures were obtained from Flood Estimation Handbook Web Service (CEH, 2019). The construction runoff rates for each catchment area for the 1, 5, 10 and 30-year rainfall events are listed in Table 3.

Table 3 Construction Runoff rates per Catchment Areas

Catchment Area	Area (ha)	Proportion of Ground Exposed (%)	1 in 1-year Runoff Rate (L/s)	1 in 5-year Runoff Rate (L/s)	1 in 10-year Runoff Rate (L/s)	1 in 30-year Runoff Rate (L/s)
A	0.10	53.00%	4.19	7.44	9.29	12.53
B	2.39	29.00%	95.87	170.19	212.67	286.68
C	0.12	100.00%	5.98	10.62	13.27	17.89
D	1.86	0.00%	68.29	121.24	151.50	204.22
E	0.69	59.00%	30.25	53.71	67.11	90.46
F	0.72	88.00%	34.04	60.43	75.51	101.79
G	0.15	44.00%	6.13	10.87	13.59	18.32
H	0.93	0.00%	34.26	60.82	76.00	102.45
I	0.48	0.00%	17.53	31.12	38.88	52.42

3.2.2 Construction Runoff Volumes

Extra runoff volume from the construction site compared to the greenfield equivalent were estimated through equation 4 (Ballard, et al., 2015):

$$VOL_{XTRA} = RD * AREA * 10 * \left[\frac{PIMP}{100} * C + \left(1 - \frac{PIMP}{100}\right) * SPR - SPR\right] \text{ (Eq. 4)}$$

Where,

VOL_{XTRA} = Extra runoff volume from construction site over greenfield runoff volume in m^3

RD = Rainfall depth for the return period and 6-hour event in mm
$AREA$ = Catchment area in ha
$PIMP$ = Exposed area as a percentage of the total area
C = Runoff coefficient for exposed area.
SPR = Standard Percentage Runoff coefficient for the soil category from FSR maps

6-hour rainfall event depths (RD) for 1, 5, 10 and 30-year return periods were 29.73mm, 42.01mm, 48.63mm, 60.03mm, respectively (CEH, 2019). A runoff coefficient of 0.7 for exposed areas and 0.53 for SPR were used. Construction Runoff Volumes per catchment area can be seen in Table 4.

Table 4 Construction Runoff Volumes per Catchment Area

Catchment Area	Area (ha)	Proportion of Ground Exposed PIMP (%)	1 in 1-year Runoff Rate (cu.m)	1 in 5-year Runoff Rate (cu.m)	1 in 10-year Runoff Rate (cu.m)	1 in 30-year Runoff Rate (cu.m)
A	0.10	53.00	17.97	25.40	29.40	36.29
B	2.39	29.00	411.41	581.35	672.96	830.71
C	0.12	100.00	25.68	36.29	42.01	51.85
D	1.86	0.00	293.08	414.13	479.39	591.78
E	0.69	59.00	129.82	183.45	212.35	262.13
F	0.72	88.00	146.08	206.42	238.94	294.96
G	0.15	44.00	26.29	37.15	43.00	53.08
H	0.93	0.00	147.03	207.76	240.50	296.87
I	0.48	0.00	75.22	106.29	123.04	151.89

The construction runoff volume for each catchment area for each return period is the result of adding the greenfield runoff volume and the extra runoff volume calculated through equation 4.

4. POND DESIGN CHARACTERISTICS

4.1 General

Pollution prevention guidelines “Working at Construction and Demolition Sites: PPG6” (Evironmnetal Agency, 2012) describes the design of SuDs for the construction phase to control surface water runoff (quantity and quality) as a legal requirement in Scotland. Furthermore, according to “Guidance for Pollution Prevention, Works and Maintenance in or

Near water: GPP5” (SEPA, et al., 2017) contaminated runoff must not be allowed to flow directly or indirectly into the water environment without treatment, and SuDs are require to allow adequate settlement and biological action to take place before water is discharged from the construction site.

According to SPEN temporary drainage scheme, during the construction period settling ponds will be installed in areas A, C, E and F to control site discharges to the natural streams or water courses. The ponds are included to avoid downstream flood and erosion impacts from runoff leaving the construction site and to prevent sedimentation on the adjacent property. As such, the ponds must provide an attenuation storage volume to restrict construction runoff rates to equal the greenfield runoff rates. Also, a treatment storage pond should be included in which dilution and partial treatment (through settling) of runoff can occur. The attenuation storage volume is filled during rainfall events, whereas the treatment storage volume is a permanent pool that remains in the pond during dry weather periods and between rainfall events. The total pond volume that must be provided is the sum of the attenuation storage volume and the treatment storage volume.

4.2 Attenuation Storage

The pond volumes were designed to attenuate the extra runoff due to the exposed surfaces during the construction period and to match the predevelopment conditions, or greenfield runoff conditions. The criteria adopted for this assessment consisted of restricting discharges to the natural streams during rainfall event up to 1 in 30-year to 1 in 1-year. Equation 5 was used to calculate the required attenuation storage volume.

$$S = I - O \text{ (Eq. 5)}$$

$$I = 10.008 * C * i * AREA * T_D$$

$$O = 3.6 * Q_{OUT} * \left(\frac{T_D + T_C}{2}\right)$$

Where,

S = Required attenuation volume in m^3
I = inflow volume draining to the pond in m^3
O = Outflow volume being released from the pond in m^3
C = Area-weighted runoff coefficient for the catchment areas draining to the pond

i = Rainfall intensity in mm/hr for the critical storm duration for the design return period event
$AREA$ = Area draining to the pond in ha
T_D = Critical storm duration in hr (storm duration which provides the largest storage volume)
Q_{OUT} = Allowable peak outflow rate in L/s (1 in 1-year greenfield runoff rate from the applicable catchment area)
T_c= Time of concentration of the pond catchment area in hrs

The critical storm duration is unknown; therefore, the largest required attenuation storage volume was found by trial and error. Different rainfall events for 1 in 5-year, 1 in 10-year and 1 in 30-year return period were calculated until the largest storage volume required for each return period was found. Local rainfall depth-duration-frequency data was sourced from CEH (CEH, 2019).

The runoff coefficient used for exposed areas was 0.70 and the runoff coefficient used for undisturbed areas was 0.53 (equal to SPR). Lastly, a time of concentration of 15 minutes was assumed. The required attenuation storage volumes for a 1 in 5-year, 1 in 10-year and 1 in 30-year rainfall events at Glenlee substation extension can be seen in Table 5.

Table 5 Required Attenuation Storage Volume for 1 in 5-year, 1 in 10-year and 1 in 30-year Rainfall Events

Pond Loc.	Drainage Area (ha)	Proportion of ground exposed (%)	Area Weighted Runoff Coefficient (C)	1-5yr i - T_D (mm/hr - hr)	1-10yr i - T_D (mm/hr - hr)	1-30yr i-T_D (mm/hr - hr)	Required Attenuation Storage Volume (cu.m)		
							1 in 5-year (cu.m)	1 in 10-year (cu.m)	1 in 30-year (cu.m)
A	0.10	53%	0.62	11 - 3	13 - 3	13 - 4	11.37	15.01	21.59
C	0.12	100%	0.70	9 - 4	11 - 4	11 - 5	17.70	23.11	32.60
E	0.69	59%	0.63	11 - 3	11 - 4	13 - 4	83.06	109.35	157.16
F	0.72	88%	0.68	9 - 4	11 - 4	13 - 4	98.39	129.18	182.97

As seen in Table 5, seven (4) storage volumes were estimated. Ponds A and C correspond to the topsoil storages at the Northern side of the construction site. The pond at location E will store runoff volumes from the temporary construction vehicle holding area and topsoil storages. Lastly, Pond F will be placed at the boundary within the existing substation and will receive runoff volumes from substation extension works.

4.3 Treatment Storage

(Ballard, et al., 2015) provides an equation (see equation 6) to estimate the treatment storage volume required for a Scottish site.

$$V_T = 9 * D\left[\frac{SPR}{2} + PIMP * \left(1 - \frac{SPR}{2}\right)\right] \quad (6)$$

Where,

V_T = Water quality treatment volume in m^3/ha
SPR = Standard Percentage Runoff coefficient for the soil category found from FSR maps
$PIMP$ = Fraction of exposed area
D = M5-60 rainfall depth event in mm (1 in 5-year return period 60-minute duration rainfall depth)

The M5-60 rainfall depth event used for this calculation was 20.87mm and was sourced from (CEH, 2019). The required treatment storage volumes are listed in Table 6.

Table 6 Required Attenuation Storage Volume

Pond Location	Drainage Area (ha)	Proportion of ground exposed (%)	Treatment Storage Volume (cu.m/ha)	Treatment Storage Volume (cu.m)
A	0.10	53%	122.94	11.99
C	0.12	100%	187.83	23.18
E	0.69	59%	131.23	90.91
F	0.72	88%	171.26	123.82

4.4 Settling Calculations

4.4.1 Design Particle Size and Settling Velocity

Sediment ponds can perform consistently and predictably to remove particles over 10 microns in size from runoff. Generally, the smallest suspended solid that can be removed by plain sedimentation is 5 microns in size (Ministry of Environment - British Columbia, 2015). The settleability of finer particles depends on the characteristics of the suspended sediment, such as, it's organic carbon content, the specific gravity and the charges on the particle surface. Finer particles may require the addition of flocculant to aid settlement.

For this assessment particles of 5 microns or larger will be removed from runoff during rainfall events up to the 1 in 10-year return period. The settling velocity for a particle of 5 microns was estimated using Stokes Law (see equation 7):

$$v_s = \frac{g * (\rho_s - \rho) * d^2}{18 * \mu}$$

(Eq.7)

Where,

v_s= Settling Velocity in m/s
g = Acceleration due gravity, 9.81 m/s^2
ρ_s =Particle density in kg/m^3, 2650 kg/m^3 was assumed for this assessment
ρ = Density of water, 999.7 kg/m^3 at 10°C
d =Particle size in mm
μ = Absolute viscosity of water, 1.306x10^{-3} at 10°C

The settling velocity of the design particle size was 1.72E-05 m/s

4.4.2 Required Detention Time

The required detention time to settle the design particles of 5 microns (or larger) was determined using equation 9. The detention time is proportional to the water depth in the pond.

$$T_D = \frac{D}{3600 * v_s}$$

(Eq. 8)

Where,

T_D = Detention time in hrs
D = Detention storage depth in m
v_s = Settling velocity in m/s

The detention time to settle a 5-micron particle in water with depths of 1.0m, 1.5m and 2.0m were 16hrs, 24hrs and 32hrs, respectively.

4.5 Summary of Required Pond Design Characteristics

The required storage volumes for the ponds in Glenlee substation extension are summarised in Table 7.

Table 7 Required Pond Storage Volumes for 1in 5-year, 1 in 10-year and 1 in 30-year Events

Pond Loc.	Drainage Area (ha)	Required treatment storage volume (cu.m)	Required attenuation storage Volume (cu.m)			Required total storage volume (cu.m)		
			1 in 5-yr	1 in 10-yr	1 in 30-yr	1 in 5-yr	1 in 10-yr	1 in 30-yr
A	0.10	11.99	11.37	15.01	21.59	23.36	26.99	33.58
C	0.12	23.18	17.70	23.11	32.60	40.88	46.29	55.78
E	0.69	90.91	83.06	109.35	157.16	173.98	200.27	248.08
F	0.72	123.82	98.39	129.18	182.97	222.22	253.00	306.80

The require pond surface areas are listed on table 8 based on required total storage volume shown in table 7.

Table 8 Pond Surface Area for 1 in 5-year, 1 in 10-year and 1 in 30-year events

Pond Location	1 in 5-year Pond Surface area			1 in 10-year Pond Surface area			1 in 30-year Pond Surface area		
	1 m Depth	1.5 m Depth	2 m Depth	1 m Depth	1.5 m Depth	2 m Depth	1 m Depth	1.5 m Depth	2 m Depth
A	23.36	15.57	11.68	26.99	18.00	13.50	33.58	22.38	16.79
C	40.88	27.25	20.44	46.29	30.86	23.14	55.78	37.19	27.89
E	173.98	115.98	86.99	200.27	133.51	100.13	248.08	165.39	124.04
F	222.22	148.15	111.11	253.00	168.67	126.50	306.80	204.53	153.40

In addition to the considerations and calculations carried out in the previous sections, the following design criteria from Scottish Water (2015) should be considered:

- Provide two or three ponds in a series rather than one large pond
- Provide a sediment forebay at the start of the pond series
- The minimum ratio between the pond's length/width should be between 3 and 5

- Utilise a permanent pool depth between 1.2m and 2.0m

Comparing results from greenfield Runoff volumes (section 3.1.2) and Construction runoff volumes (3.2.2) for area G, cutoff ditches should be provided during construction works at the east side of area G to avoid the surface runoff drains outside the construction site boundary.

5. MITIGATION MEASURES

Soil stripping and vegetation removal, stockpiles, plant and wheel washing, and site roads as potential sources of silt on construction sites. Therefore, following mitigation measures are recommended to minimise the impacts of these activities:

Soil stripping and vegetation removal:

- Minimise the amount of time stripped ground and soil stockpiles are exposed.
- Use geotextile silt fencing at the toe of slopes.
- Divert clean water away from the area of construction.

Stockpile

- Dampen down stockpile
- Seed or cover Stockpiles
- Use geotextile silt fencing at the slope toe
- Divert clean water away from the area of construction

Site Roads

- Use small dams or silt fencing in roadside ditches
- Consider applying binder to road surfaces. It will also help to reduce dust pollution during dry weather (SEPA, 2009)
- Prevent excess runoff along the road by installing small earth bunds or cut-off ditches at regular spacing to direct water into roadside ditches (SEPA, 2009)

Furthermore, SuDS component that can be provided to control site discharges includes:

- Swales: These are grassed wide shallow depressions which convey water from a drained surface into a storage or discharge system

- Filter strips: vegetated sections of land designed to accept runoff as overland sheet flow. Filter strips are effective at removing excess solids and pollutants in runoff before discharge to downstream SuDS features (pre-treatment

- Filtration tanks: tanks filled with filter material (5 mm – 10 mm aggregates, geotextiles or straw bales wrapped in geotextiles) and may be used when there is not enough space for settling/runoff treatment ponds. Filtration tanks are suitable for removing coarse silt only. Discharge should be to land or surface water drains

6. CONCLUSIONS

David R. Murray & Associates has completed an assessment for the surface runoff rates and volumes from Glenlee extension construction site. Furthermore, design characteristics of the proposed SuDS to control site discharges has been provided (quantity and quality) to inform Environmental Impact Assessment/Appropriate Assessment and satisfy SEPA license application requirements, and to determine if there will be significant downstream impacts beyond the legal boundaries of the site.

The following design criteria was proposed to control surface water runoff (quantity and quality) from the construction site:

- Restricting discharges during rainfall events up to the 1 in 30-year event to the 1 in 1-year greenfield runoff rate, to ensure that downstream risks of flooding and erosion will not be increased by discharges during the construction period.

- Providing one treatment storage volume calculated as defined for Scotland in Woods Ballard *et al.* (2015) in which dilution and partial treatment (through settling) of runoff can occur
- Removing particles of size 5 microns or larger from surface runoff in the ponds. Finer particles may require the addition of flocculant to aid settlement.

The required ponds storages volumes and surface areas have been determined to satisfy the above design criteria and based on temporary works, existing drainage systems, a temporary drainage scheme and topography of the site.

Lastly, mitigation measures were identified to minimise the impacts of potential sources of silt on construction sites. SuDS components that can be provided in addition to settling/runoff treatment ponds to control site discharges were also described.

REFERENCES

Ballard, B. W., Wilson, S., Udale-Clarke, H. & Scott, T., 2015. *The SuDS Manual,* London: ciria.
CEH, 2019. *Flood Stimation Handbook Web Service.* [Online]
Available at: https://fehweb.ceh.ac.uk/GB/map
[Accessed 13 June 2019].

Environment Agency, 2013. *Rainfall Runoff Management for Developement,* Bristol: Environment Agency.

Evironmnetal Agency, S. N. I. E. A., 2012. *Working at the Construction and Demolition Sites: PPG6,* Bristol: Environmental Agency.

HR Wallingford, 2019. *Surface water storage volume estimation tool.* [Online]
Available at:
http://geoservergisweb2.hrwallingford.co.uk/uksd/alt/tools/surfacewaterstorage.html

Ministry of Environment - British Columbia, 2015. *Assessing the Design, Size, and Operation of Sediment Ponds Used in Mining,* s.l.: Ministry of Environment - British Columbia.

SEPA, 2009. *Temporary Construction Method ,* s.l.: s.n.

SEPA, Agency, N. I. E. & Wales, N. r., 2017. *Works and maintenance in or near water: GPP 5,* s.l.: s.n.

APPENDIX A
GLENLEE EXTENSION – ENABLING WORKS
TEMPORARY WORKS LAYOUT
(Drawing provided by SPEN)