SOAKAGE PIT SIZING DESIGN GUIDELINES:

DESIGN CRITERIA:

- SOAK PITS TO BE USED ONLY WHERE CATCHMENT HAS NOT POSITIVE OUTFALL
- THE TOTAL VOLUME OF RUNOFF FROM THE CATCHMENT AREA TO THE SOAKAGE PIT SHOULD BE CALCULATED USING A 1 IN 5 YEAR 12 HOUR DURATION ARI DESIGN STORM.
- RUNOFF VOLUME TO BE DETERMINED BY APPLYING COMBINED EQUIVALENT CATCHMENT AREA WITH DESIGN RAINFALL DEPTH (SEE TABLE BELOW).
- THE ENGINEER SHALL DETERMINE APPROPRIATE PROPORTIONS CONTRIBUTING IMPERVIOUS AND PERVIOUS AREAS.
- THE SOAKAGE PIT IS REQUIRED TO EMPTY FROM FULL LESS THAN 50% VOLUME WITHIN 24 HOURS OF THE STORM EVENT.
- NO SURFACE WATTER IS TO RESULT FROM A 1 IN 5 YEAR 12 HOUR ARI STORM EVENT (IE. CONTAINED WITHIN SOAKAGE PIT).
- MAXIMUM ROADWAY FLOODING IS 150mm DEPTH AND IS TO BE CONTAINED WITHIN THE ROAD KERB AND CHANNEL FOR A 1 IN 10 YEAR 24 HOUR ARI STORM EVENT.
- NO ENCROACHMENT WITHIN 300mm OF ANY HABITABLE OR NON HABITABLE FLOOR LEVEL RESULTING FROM THE INUNDATION BY A 1 IN 100 YEAR 24 HOUR ARI STORM EVENT.

EQUATIONS: $I = (\text{Equiv. } A_I + \text{Equiv. } A_P)R$, $O = a_{50}\,fD$, $S = I - O$, $t_{50} = \dfrac{0.5S}{a_{50}\,f}$

WHERE:
- I = INFLOW DRAINED TO SOAKAGE PIT FROM STORM EVENT (m^3),
- A_I = IMPERVIOUS AREA (m^2),
- A_P = PERVIOUS AREA (m^2),
- R = DESIGN RAINFALL DEPTH OBTAINED FROM THE TABLE BELOW (m),
- O = OUTFLOW FROM INFILTRATION INTO THE SOIL DURING STORM EVENT (m^3),
- a_{50} = 50% OF TOTAL AVAILABLE INTERNAL WALL AREA (m^2),
- L & W = LENGTH AND WIDTH OF OVERALL SOAKAGE PIT (m),
- h = OVERALL HEIGHT OF SOAKAGE PIT (m),
- f = SOIL INFILTRATION RATE (m/s),
- D = STORM DURATION (sec),
- S = STORAGE VOLUME OF SOAKAGE PIT AND TURKEYS NEST (IF REQUIRED). (m^3),
- t_{50} = TIME FOR SOAKAGE PIT TO DRAIN TO 50% VOLUME (sec).

DESIGN RAINFALL DEPTH:

ARI	DESIGN RAINFALL DEPTH (mm)
1 IN 5	53.14
1 IN 10	60.54
1 IN 100	96.58

NOTES:

1. FOR USE WITHIN THE CITY OF GREATER DANDENONG ONLY. THE ENGINEER IS RESPONSIBLE FOR THE SIZING OF THE SOAKAGE PIT AND WHILST THESE GUIDELINES REPRESENT BEST PRACTICE, THE ENGINEER SHOULD TAKE INTO CONSIDERATION THE SPECIFIC LOCAL SITE CONDITIONS WHEN SIZING THE SOAKAGE PIT.
2. SEE SHEET 1 FOR SOAKAGE PIT INSTALLATION DETAILS.

EXAMPLE CALCULATION:

DESIGN DATA:

- ASSUME THAT THE TOTAL CATCHMENT IS 0.34 Ha (3,400 m^2), THAT THE IMPERVIOUS AREA IS 0.09 Ha (900 m^2) AND THE PERVIOUS AREA IS 0.25 Ha (2,500 m^2).
- ASSUME THAT 90% OF IMPERVIOUS AND 30% PERVIOUS AREA CONTRIBUTE AS RUNOFF.
- ASSUME OVERALL HEIGHT OF SOAKAGE PIT (h) TO BE 0.903 m.
- USING A 1 IN 5 YEAR 12 HOUR ARI DESIGN STORM, THE RAINFALL DEPTH (R) IS 53.14 mm.
- FROM A SOIL TEST THE INFILTRATION RATE (f) WAS DETERMINED TO BE 1.15 x 10^{-4} m/s.

INFLOW VOLUME TO SOAKAGE PIT CALCULATION:

$I = (\text{Equiv. } A_I + \text{Equiv. } A_P)R$

$I = (900 \times 0.9 + 2{,}500 \times 0.3) \times 0.05314 = \underline{82.90\ m^3}$

SOAKAGE PIT SIZING:

- OUTFLOW FROM SOAKAGE PIT:

  $O = a_{50}\,fD$ & $a_{50} = 2 \times [(L \times 0.5h) + (W \times 0.5h)] = 1.806L$ (ASSUMING $L = W$)

  $O = 1.806L \times 0.000115 \times (12 \times 60 \times 60) = \underline{8.972L}$

- STORAGE VOLUME OF SOAKAGE PIT:

  $S = L \times W \times 0.903 = \underline{0.903L^2}$ (ASSUMING $L = W$) & $S = I - O$, THEREFORE

  $0.903L^2 + 8.972L - 82.90 = 0$,

  SOLVING, $L = \underline{5.825\ m}$ & $S = \underline{30.637\ m^3}$

- THEREFORE ADOPT:

  $L = \underline{6.0\ m}$ & $W = \underline{5.7\ m}$,

  ACTUAL $S = 0.903 \times 6.0 \times 5.7 = \underline{30.88\ m^3}$

CHECK TIME FOR EMPTYING:

ACTUAL $a_{50} = 2 \times [(6.0 \times 0.5 \times 0.903) + (5.7 \times 0.5 \times 0.903)] = \underline{10.565 m^2}$

$t_{50} = \dfrac{0.5S}{a_{50}\,f}$

$t_{50} = \dfrac{0.5 \times 30.88}{10.565 \times 0.000115} = 12709$ sec (JUST UNDER 3 HOURS & 32 MINUTES)

LESS THAN 24 HOURS, THEREFORE OK

GREATER DANDENONG

SOAKAGE PIT

SHEET 2 OF 2 SHEETS

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INFRASTRUCTURE PLANNING

SD 221–2–A