1	i	970 [m]	4	M3 for attempt at trap rule ½×10×(28+22+2[19+14+11+12+16]) M2 with 1 error, M1 with 2 errors. Or M3 for 6 correct trapezia, M2 for 4 correct trapezia, M1 for 2 correct trapezia.	4
	ii	concave curve or line of traps is above curve	1	Accept suitable sketch	
		$(19+14+11+11+12+16) \times 10$	M1	M1 for 3 or more rectangles with values from curve.	3
		830 to 880 incl.[m]	A1		
	iii	$t = 10$, $v_{model} = 19.5$	B1		
		difference = 0.5 compared with 3% of 19 = 0.57	B1f.t.	or $\dfrac{0.5}{19} \times 100 \approx 2.6$	2
	iv	$28t - \frac{1}{2} t^2 + 0.005t^3$ o.e.	M1	2 terms correct, ignore + c	
		value at 60 [− value at 0]	M1	ft from integrated attempt with 3 terms	
		960	A1		3

2	½ × 1.5 × (0.6 + 0.7 + 2(2.3+3.1+2.8+1.8))	M2	M1 if one error or M2 for sum of 5 unsimplified individual trapezia: 2.175, 4.05, 4.425, 3.45, 1.875	basic shape of formula must be correct. Must be 5 strips. M0 if pair of brackets omitted or h = 7.5 or 1. allow recovery of brackets omitted to obtain correct answer. M0 for other than 5 trapezia
	= 15.975 rounded to 2 s.f. or more	A1		isw only if 15.975 clearly identified as cross-sectional area

3	(i)	47.625 [m²] to 3 sf or more, with correct method shown	4	M3 for $\frac{1.5}{2} \times (2.3 + 2 + 2[2.7 + 3.3 + 4 + 4.8 + 5.2 + 5.2 + 4.4])$	4
	(ii)	43.05	2	M1 for $1.5 \times (2.3+2.7+3.3+4+4.8+5.2+4.4+2)$	2
	(iii)	$-0.013x^4/4 + 0.16x^3/3 - 0.082x^2/2 + 2.4x$ o.c. their integral evaluated at x 12 (and 0) only 47.6 to 47.7	M2 M1 A1	M1 for three terms correct dep on integration attempted	4
	(iv)	5.30.. found compared with 5.2 s.o.i.	1 D1		2

4	95.25, 95.3 or 95	4	M3 ½×5×(4.3+0+2[4.9+4.6+3.9+2.3+1.2]) M2 with 1 error, M1 with 2 errors. Or M3 for 6 correct trapezia.	4

5	i	$7 - 2x$ $x = 2$, gradient $= 3$ $x = 2$, $y = 4$ $y - $ their 4 $=$ their grad $(x - 2)$ subst $y = 0$ in their linear eqn completion to $x = \frac{2}{3}$ (ans given)	M1 A1 B1 M1 M1 A1	 differentiation must be used or use of $y = $ their $mx + c$ and subst (2, their 4), dependent on diffn seen seen	6
	ii	f(1) = 0 or factorising to $(x - 1)(6 - x)$ or $(x - 1)(x - 6)$ 6 www	1 1	or using quadratic formula correctly to obtain $x = 1$	2
	iii	$\frac{7}{2}x^2 - \frac{1}{3}x^3 - 6x$ value at 2 − value at 1 $2\frac{1}{6}$ or 2.16 to 2.17 $\frac{1}{2} \times \frac{4}{3} \times 4 - $ their integral 0.5 o.e.	M1 M1 A1 M1 A1	for two terms correct; ignore $+c$ ft attempt at integration only	5