Red: line number
Black: manhole number

Map labels and values:

Maple, Pine, Oak, Birch (street names on left)

Streets (top): 5th St., 4th St., 3rd St., 2nd St., 1st St.

G St. row: 106.75   106.60   106.56   106.56   106.59   106.68   106.78

106.62
106.57

F St. row: 106.51   106.45   106.47   106.51   106.54   106.60

106.54   5th St.

E St. row: 106.34   106.38   106.40   106.47   106.50   106.52

106.10

4th St.

106.40   106.32

D St. row: 106.23   106.30   106.39   106.42   106.42   106.42

106.25   3rd St.

106.20   106.13   106.25

106.23

C St. row: 106.14   106.10   106.11   106.15   106.20

106.20

106.00   106.08   106.10

B St. row: 106.15   106.08   106.02   106.18

105.95

A St. row: 106.14   106.08   106.01   106.00   106.14

Main

105.90

Scale: 0 — 250   Scale, m

Red line numbers: 1, 2, 3, 4, 5, 6, 7, 8

| | | vmin | 0.6m/s | assumed | | | | | | | | |
| | | vmax | 2.5m/s | assumed | | | | | | | | |

$$v = \frac{0.397}{n}(D)^{2/3} S^{1/2} \qquad Q = \frac{0.312}{n}(D)^{8/3} S^{1/2}$$

Using partial flow diagram

	Line	Left Invert Elevation	Right Invert Elevation	Line Length(m)	Slope(m)	Q (m3/s)[p] peak, given in question	Diameter(m)	Velocity(m/s)[f]	Qf(m3/s)	Q/Qf	V/Vf	Velocity (m/s)
0.0143	1	102.13	101.23	200	0.0045	0.0143	0.2	0.70	0.0220	0.65	0.92	0.64
0.0115	2	101.23	100.56	150	0.0045	0.0258	0.25	0.81	0.0399	0.65	0.92	0.75
0.0095	3	100.56	100.26	100	0.003	0.0353	0.3	0.75	0.0530	0.67	0.93	0.70
0.0083	4	100.26	99.87	130	0.003	0.0353	0.3	0.75	0.0530	0.67	0.93	0.70
0.0053	5	99.87	99.36	170	0.003	0.0353	0.3	0.75	0.0530	0.67	0.93	0.70
	6	99.36	98.66	250	0.0028	0.0436	0.3	0.72	0.05	0.85	0.97	0.70
	7	98.66	98.28	100	0.0038	0.0489	0.3	0.84	0.06	0.82	0.98	0.83

Sample Calculations

Line 4:-

$$\text{slope} = 0.003, \quad \phi \, 300mm$$

$$Q = 0.0353$$

$$V_f = \frac{0.397}{0.013}(0.3)^{2/3}\left(\frac{0.003}{0.003}\right)^{\frac{1}{2}}$$

$$= 0.75 \, m/s$$

$$Q_f = \frac{0.312}{0.013}(0.3)^{8/3}(0.003)^{1/2}$$

$$= 0.053 \, m^3/s$$

$$\frac{Q}{Q_f} = \frac{0.0353}{0.053} = 0.67$$

$$V/V_f \, (fig \, 19.9) = 0.93$$

$$V = 0.7 \, m/s$$

Ground Elevation
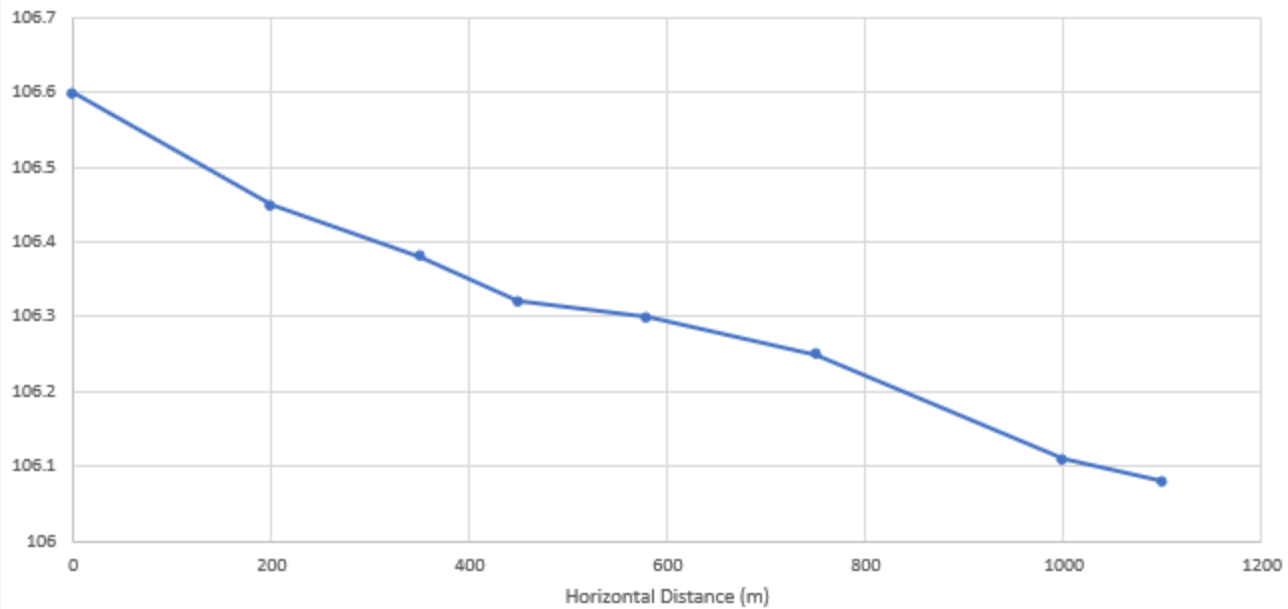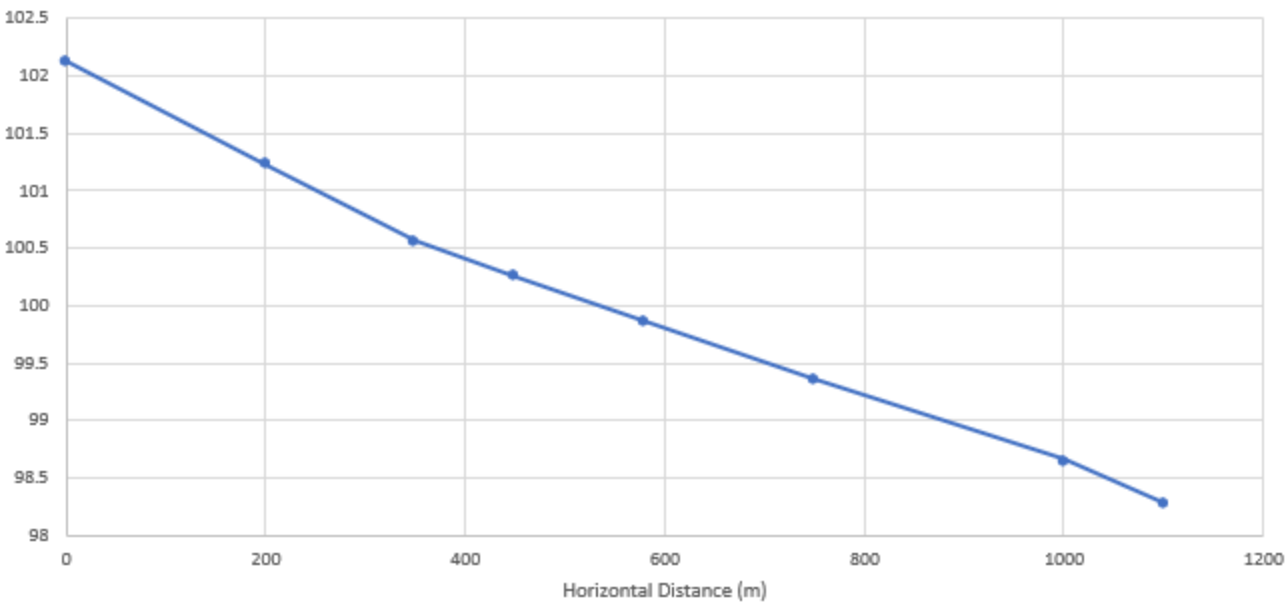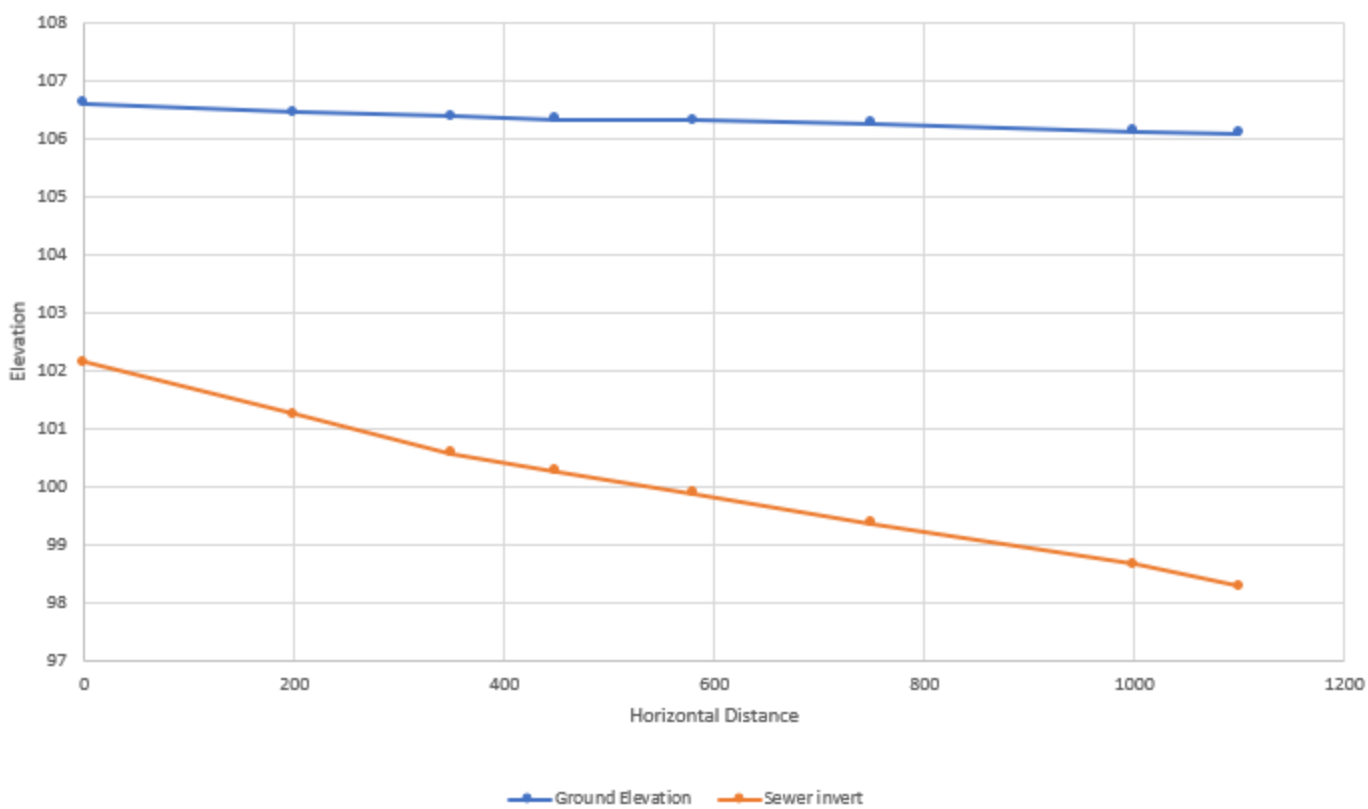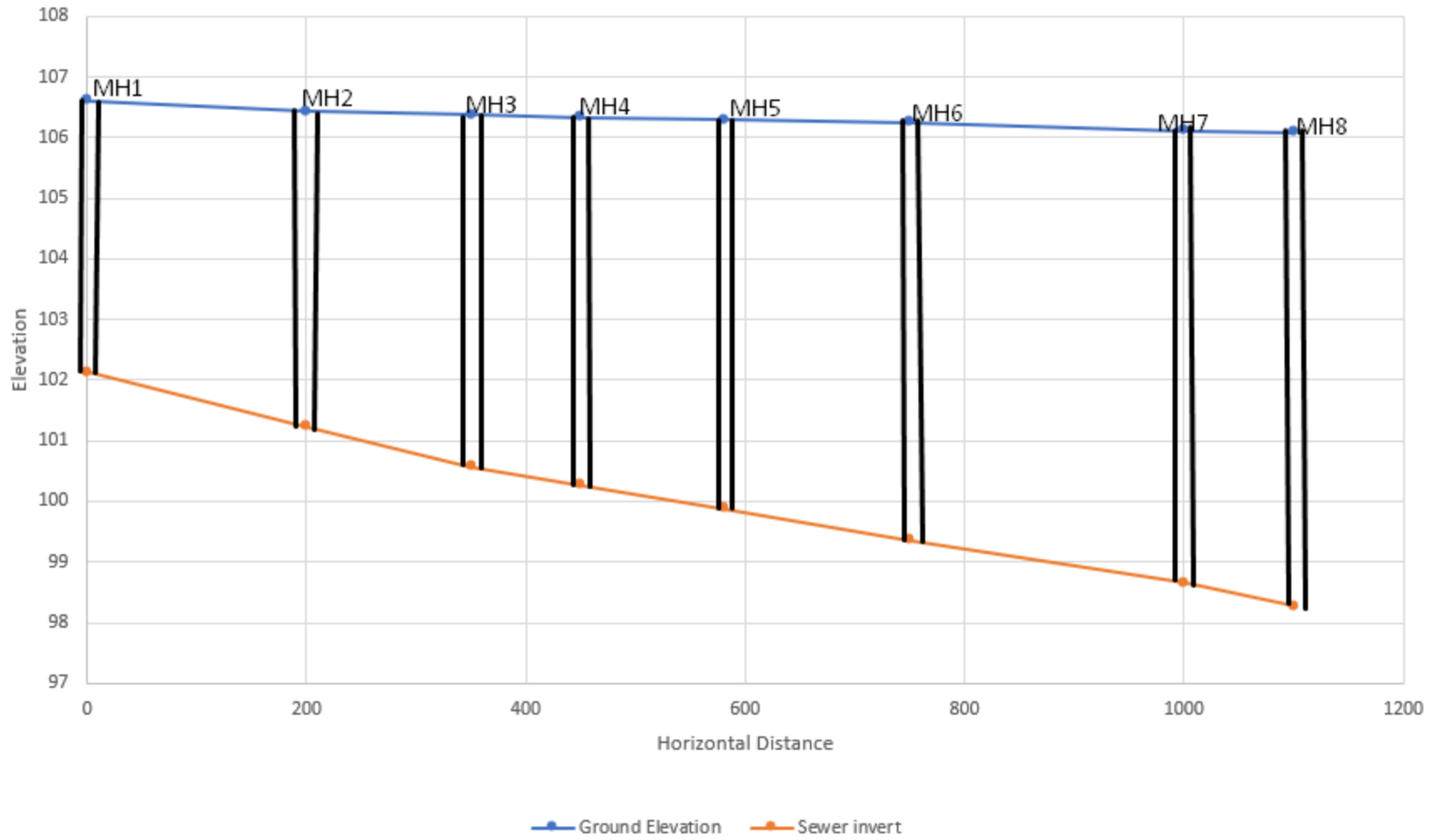
Sewer invert

mh	Distance	Ground Elevation	Sewer invert
1	0	106.6	102.13
2	200	106.45	101.23
3	350	106.38	100.56
4	450	106.32	100.26
5	580	106.3	99.87
6	750	106.25	99.36
7	1000	106.11	98.66
8	1100	106.08	98.28

| BOQ			
Width of trench			
Diameter	Width	Line length	depth of excavation (an
0.2	0.7	200	4.85
0.25	0.75	150	5.52
0.3	0.8	750	6.74
Amount of Excavation = Width * Length *			
For 0.2:	679	m3	
For 0.25:	621	m3	
For 0.3:	4044	m3	
Pipes:	length needed (m)		
200mm	200		
250mm	150		
300mm	750		
Manhole covers:	8	manhole covers	

Where inverted siphon in a sewer system is commonly used and what is its principal design.

An inverted siphon is used to carry wastewater (or stormwater) through a depression, be it a body of water or a highway or some other obstacle.

In the siphon, the pipe falls below the energy line, and thus is filled completely with water/wastewater and flows under pressure rather than gravity.
This illustration shows its principal design:

Energy line
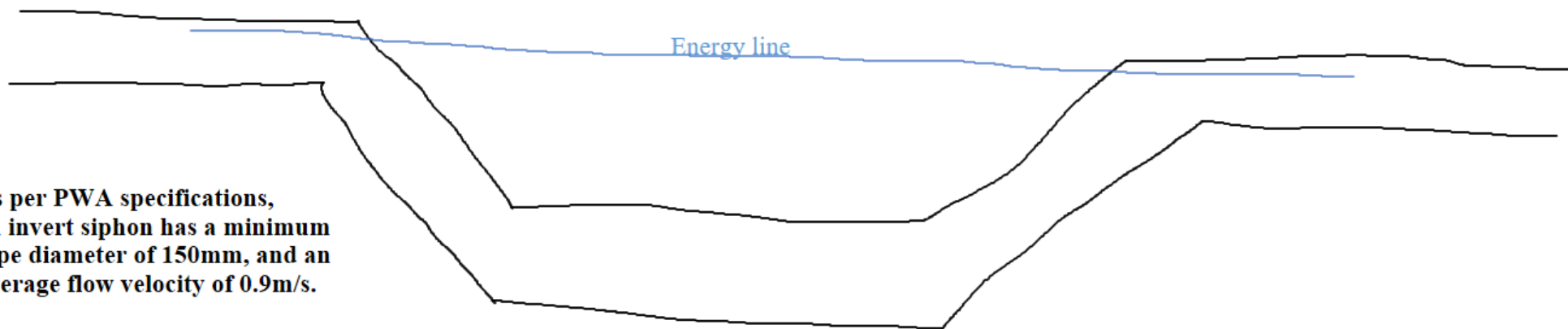
As per PWA specifications, an invert siphon has a minimum pipe diameter of 150mm, and an average flow velocity of 0.9m/s.

What are the main inspection activities in the sewer network.

Recording of deficiencies, identification of problem areas (broken pipes/leakage etc)

Preparation of a repair and replacement schedule for sewer pipes, manhole covers, etc spanning 5-25 years.

Preparation of a sewer cleaning schedule.

Preparation of an inspection schedule.