Cottesloe Coastal Monitoring

Annual Summary Report – April 2016 to March 2017

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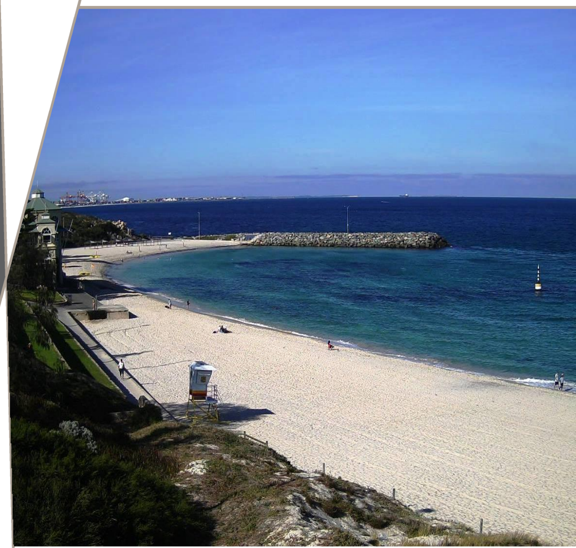

Prepared for
Town of Cottesloe

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Executive Summary

Cottesloe is one of the most iconic beachside suburbs in Australia and, as such, the land and infrastructure along its coastline holds significant financial and historical value. As for coastlines throughout the world, the effects of climate change and subsequent sea-level rise pose significant threat to beaches and adjoining land along Cottesloe's coastline.

The Town of Cottesloe (ToC) commenced a long-term monitoring program in 2014 to gain knowledge of the patterns in beach changes along its coastline and potentially identify longer-term trends in erosion and/or accretion. The program involves shoreline surveys undertaken approximately every 6 months, spread along the span of the Town's shoreline. Complementary to this, monitoring by remote camera units have provided images every hour of two key sections of the Town's coastline; Cottesloe Main Beach and North Cottesloe Beach. A third camera unit was also installed in June of 2016, to monitor a section of beach directly to the north of the Beach Street Groyne. Cardno has been commissioned to facilitate this photo monitoring since the end of 2015 and provides ongoing analysis and reporting of the captured imagery and survey data.

This report summarises an observation period of 1 year from the start of April 2016 to the end of March 2017 and includes an analysis of all captured imagery and surveyed profiles achieved during this time. The data has been assessed with respect to existing background information, including a coastal vulnerability assessment of the area (CZM & Damara 2008), geotechnical investigations (GBGMAPS 2010 & 2011) and the previous monitoring summary reports (BMT Oceanica 2015; Cardno, 2016). In addition to this, water level and wave data was obtained from the Department of Transport (DoT) and weather data from the Bureau of Meteorology (BoM) to provide context and explanation for the observations.

Hourly high resolution images of the shoreline at Cottesloe Main Beach, North Cottesloe Beach and the beach to the north of the Beach Street Groyne (commencing in June 2016) was visually inspected. This allowed identification of shoreline movement, which generally followed seasonal trends, and an approximation of the timing of the most receded and advanced shoreline positions at each beach section.

The photographic dataset also allowed the observation of the nearshore sea-state and shoreline behaviour as a result of winter storm events. Several significant storm events were observed including one event in May with notably high wave run-up. Supporting metocean and weather data indicated the impact was the result of the highest significant wave height recorded at Cottesloe, highest water level measured at Fremantle, very low atmospheric pressure and strong winds all occurring on the same day. An unseasonal summer storm was also observed in March, 2017, causing significant coastal impact and some apparent damage to access infrastructure.

Shoreline survey campaigns were undertaken during November 2016 and April 2017, to add to survey data collected bi-annually since November 2014. Comparisons of the surveys were made to assess changes in beach morphology over a two year period, at approximately the same times in the seasonal cycle (November 2014 vs November 2016 and April 2015 vs April 2017). Both of these comparisons show net overall loss of sediment from the beach within the study area, most prominently to the north of the Cottesloe Groyne. There are also areas that appear to have accreted over this period, predominantly to the south of the Cottesloe Groyne.

The November 2016 and April 2017 surveys were also compared, to assess changes in beach and nearshore morphology over the seasonal summer period. This was the first such comparison to incorporate data offshore to the depth of closure. There was generally a reduction in the volume of the beach to the north of the Cottesloe Groyne and an increase in beach volume to the south. The main exception to this was the area directly to the north of the Beach Street Groyne, which exhibited erosion. These changes were also apparent in areas monitored by remote imagery cameras. The comparison of areas offshore did not reveal any definitive patterns over the period. These patterns may become more apparent as more data is collected.

The monitoring program at present is relatively comprehensive given the Town's available resources. It is recommended the program is continued, in at least its current format, to gather a total dataset of 5-10 years before confident conclusions around trends in shoreline movement can be drawn. Some recommendations have been made that would complement or improve the monitoring program, such as minor adjustments to surveying, collection of sediment and current data, and analysis of historical meteorological data.

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1 Introduction

1.1 Study Site

The Town of Cottesloe (herein referred to as 'the Town') is situated about 12 km to the west of Perth's city centre in Western Australia (**Figure 1-1**). With approximately 4 km of highly developed Indian Ocean coastline, Cottesloe has earned a reputation as one of Australia's iconic beach destinations. Substantial public and private infrastructure lies adjacent to the Town's shoreline, holding significant value. This value takes various forms including: private and commercial property, commercial business through several bars, restaurants and shops, public amenity through the beach itself, adjoining walkways and parks, key infrastructure, such as roads, and touristic and historical value. Given the close proximity of infrastructure to the shoreline and the inherent value provided by the coast itself, potential changes to sea level and coastal processes in the area, as a result of climate change, pose management challenges for the Town.

1.2 Study Purpose

Beaches along the Town's coastline experience short-term, event based and seasonal erosion, as well as accretion of sediment in some areas. The overall coastline may also be exhibiting a trend of long-term erosion (CZM & Damara 2008). In November 2014 the Town commenced a monitoring program to gather ongoing data that will improve its understanding of patterns of shoreline change. This data will be used to develop an adequate basis for future planning; to mitigate potential coastal hazards through protective management and adaptation. The major threats to the coastline are those associated with climate change, including predicted sea level rise and potential changes to meteorological and hydrodynamic conditions at the site.

At present, the Town's ongoing monitoring program includes the regular capture of imagery of three key sections of coastline. In addition to this, surveys of 39 shoreline transects, at roughly 100m intervals along the Town's coastline are undertaken approximately every six months. Cardno was commissioned at the start of 2017 to maintain the cameras, to continue the capture of remote imagery for a further 12 months. Alongside this, Cardno are to provide summary reporting on data collected, noting relevant coastal changes and their possible causes. This work will be carried out in the context of previous studies and collected data at the site to build, in an ongoing manner, a baseline for coastal processes and shoreline behaviour.

The purpose of this report is to analyse new data attained after that analysed in the previous summary reports, (BMT Oceanica, 2015; Cardno, 2016). The period of data available for analysis in this report was from April 2016 to March 2017, which is herein also referred to as 'the observation period'.

Figure 1-1 Study Site location and Town of Cottesloe boundary (Image source: NearMap, 2016).

2 Methodology

2.1 Remote Imagery Capture and Analysis

Remote imagery units were installed by BMT Oceanica on the 19th of November 2014 at two locations that monitored two important sections of the Town's coastline; Cottesloe Main Beach and North Cottesloe Beach. These units remained in place until the 9th of December 2015. Cardno installed remote imagery units at the same two locations on the 23rd of December 2015 to capture the same approximate sections of coastline. **Figure 2-1** shows the camera locations and the approximate spans of shoreline that they monitor. A third camera unit was installed on the 28th of June 2016 (**Figure 2-2**). The camera units capture high resolution images hourly, between 05:00 hours and 19:00 each day. Shortly after its capture a low resolution sample of each of these photos is transmitted via mobile network, to a Cardno & Town email inbox for daily observation. The units can also be remotely prompted by the user to send a high resolution image at the next upcoming capture interval.

For this summary report Cardno reviewed 1 year of shoreline images from the 1st of April 2016 until the 31st of March 2017. The images were analysed to identify event based erosion or accretion events, such as those associated with storms and energetic wave conditions. Observations of seasonal trends in shoreline change were made and, given the availability of three full years of shoreline imagery, preliminary observations of potential medium-term trends could also be proposed.

2.2 Survey Profile Data Review and Analysis

The Town has commissioned and undertaken themselves shoreline transect surveying within the study area, which to date has been carried out in November of 2014, in April and September of 2015, in February/March (beach side in February and ocean side in March) and November of 2016, and in April of 2017. 39 transects are surveyed perpendicular to the shore, spanning the Town's coastline. Cardno reviewed the results of the most recent surveys collected in November 2016 and April 2017 with respect to the previous survey results. This involved an initial quality check of the data by ensuring the geographic positions of survey points were congruent with previous survey transects and that the surveyed heights were sensible. The locations of transects surveyed during the observation period are presented in **Figure 2-3**.

The survey elevation profiles were plotted for comparison with previous survey profiles for each transect. Profile comparisons were made between the November 2014 and November 2016 profiles to assess potential trends in change to beach morphology, around the end of the winter period. Comparisons were also made between the April 2015 and April 2017 profiles to assess potential trends in change to beach morphology, around the end of the summer period. Additionally, the April 2017 profiles were compared with the November 2016 profiles, to assess changes in beach morphology over the summer period. This is the first comparison that incorporates offshore profiling to the depth of closure, providing an idea of sediment movement in the full active coastal zone. Plots of surveyed profiles for each transect and survey program are provided in **Appendix A**.

Figure 2-1 Remote imagery camera locations (Cameras 1 and 2) and shoreline sections captured (Image source: NearMap, 2016).

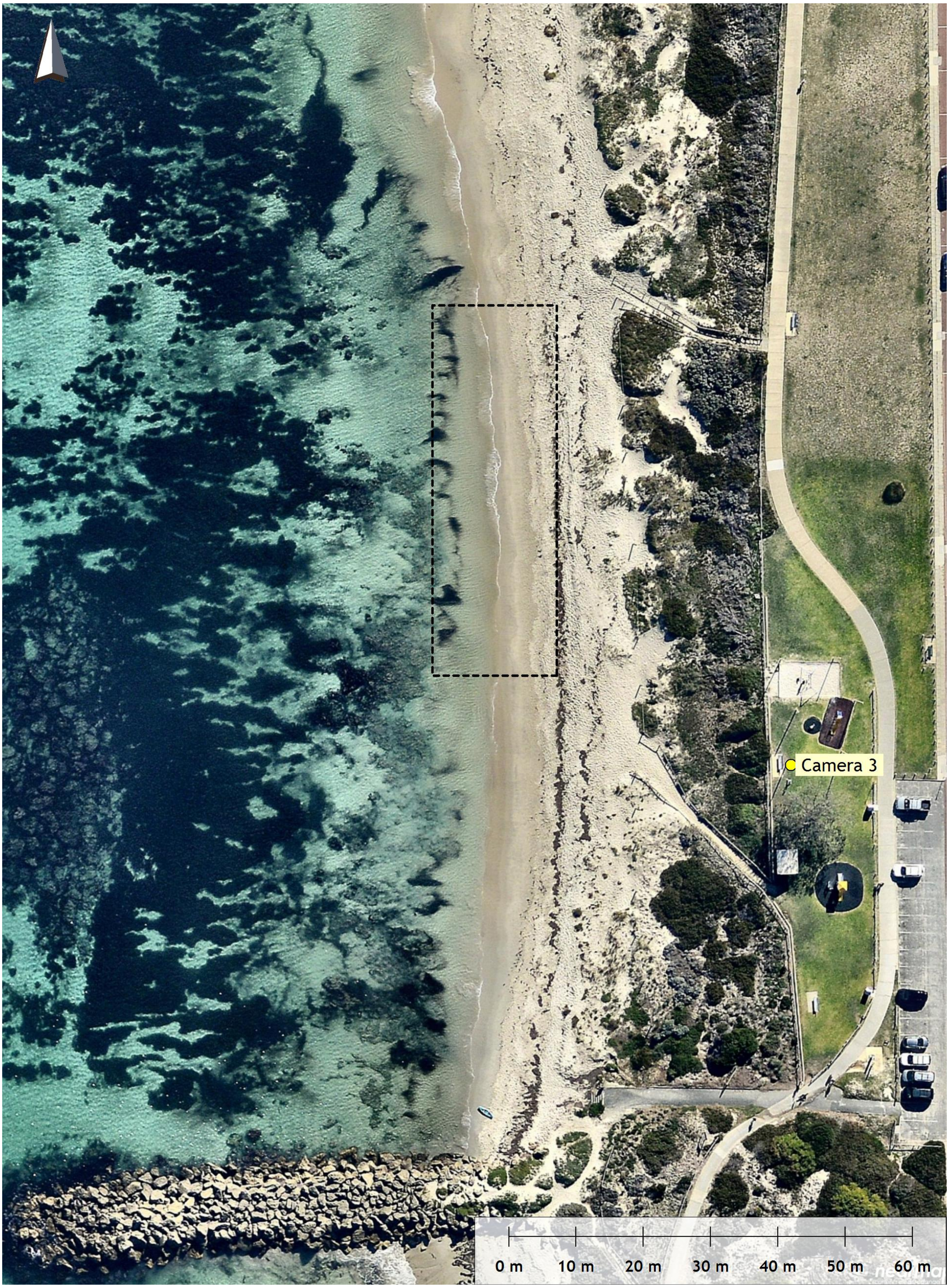

Figure 2-2 Remote imagery Camera 3 location and shoreline section captured (Image source: NearMap, 2016).

Figure 2-3 November 2016 and April 2017 beach profile survey transect locations (Image source: NearMap, 2016).

2.3 Metocean Data Analysis

Cardno acquired and analysed metocean data for a 12 month period from April 2016 to March 2017 to accompany observations of photographic and beach profile monitoring data. The datasets, their source and location (**Figure 2-3**) are as follows:

> Cottesloe Wave Buoy Data (DoT), Location: 31.978°S, 115.687°E, half hourly, directional wave statistics;

> Rottnest Wave Buoy Data (DoT), Location: 32.094°S, 115.408°E, half hourly, directional wave statistics;

> Fremantle Tide Gauge (DoT), Location: 32.066°S, 115.748°E, 5 minute water level data; and

> Swanbourne Weather Observations (BoM), Location: 31.96°S, 115.76°E, Daily observation of temperature, rainfall, wind speed and direction and mean sea level pressure (MSLP) (note pressure data reported for Swanbourne is measured at Perth Metropolitan Weather Station, Location: 31.92°S, 115.87°E).

The full metocean datasets are represented in **Appendices B to D**.

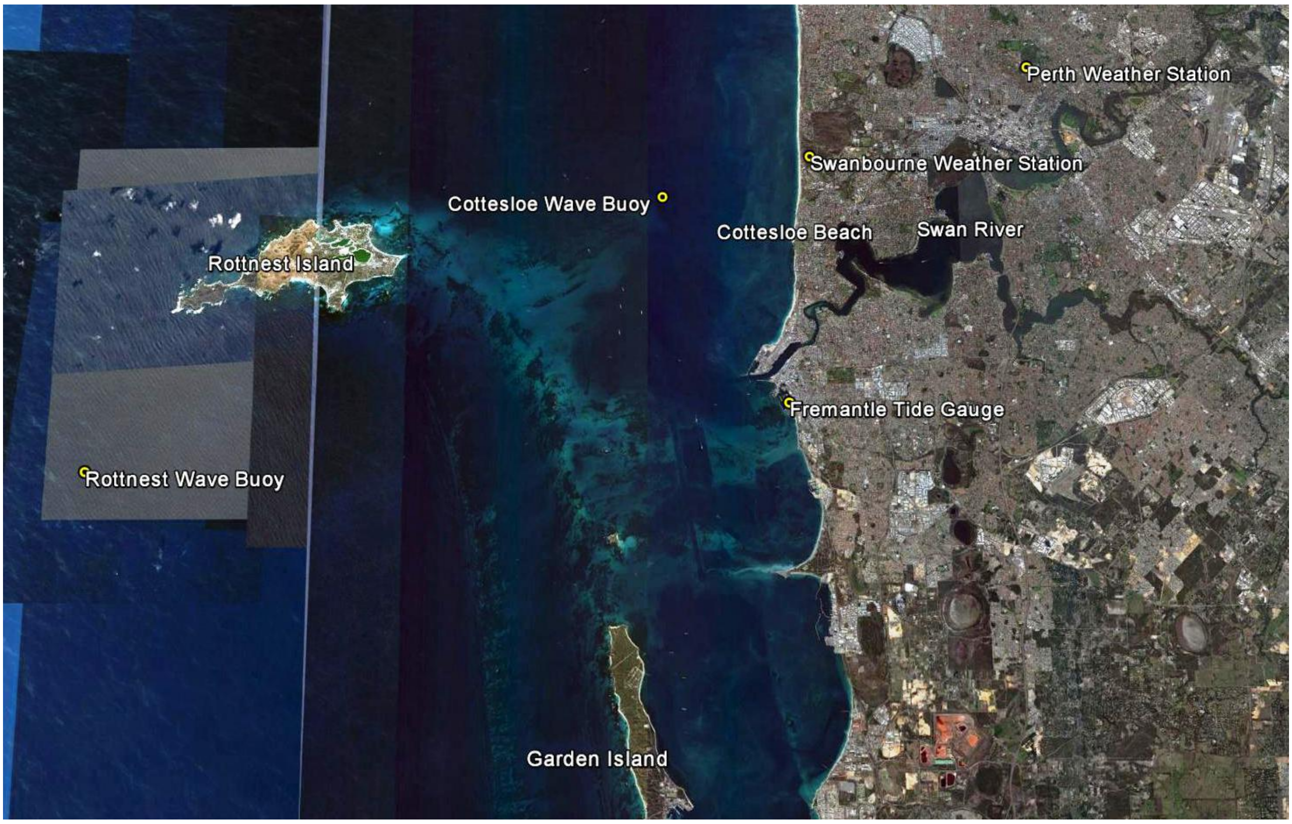

Figure 2-4 Data source locations (Image source: Google Earth, 2016).

3 Results

3.1 Relevant Background Information

3.1.1 Climate and Metocean Conditions

The study site is influenced by two dominant seasonal weather patterns. The summer period is characterised by south to south-westerly sea breezes that generally increase through the afternoon and can be very strong at times. The winter period is characterised by intermittent storms attributed to mid latitude low pressure systems, shifting the dominant wind direction to north-westerly.

The two seasonal weather modes dominate the local wave climate with locally generated seas from the south, south-west interrupting generally calm conditions during summer. Storms during winter lead to higher energy wave conditions and a greater presence of off-shore derived swell, which generally propagates from the south-west. Tropical cyclones that develop during the summer months off WA's north-west coast rarely track down to the Study Area's latitude, but have been recorded in the area and can cause significant damage to coastal infrastructure.

The Study Area is afforded protection from offshore wave conditions by Rottnest Island to the west and fringing limestone reef structures scattered adjacent to the coastline (visible in **Figure 2-4** above). Groynes constructed on the Town's coastline can provide local sheltering from inshore waves for some coastline sections, depending on the wave direction.

The Study Site experiences low tidal range from mixed but mainly diurnal tides. The tidal range varies from 0.3 m during neap tides to 0.7 m during springs. This small tidal movement allows wind to be the major driver of currents, particularly at the nearshore zone. Longshore currents correspond to seasonal wind and wave conditions, predominantly propagating northward during summer and to the south during winter. The interaction of these currents with shoreline features can form local eddy and rip currents, particularly when swell is present, driving substantial water movement perpendicular to the shore.

3.1.2 Sediment Dynamics

Shoreline sediments within the study area are primarily calcium carbonate sands, made up of biogenic material derived from offshore and eroded limestone material derived from the land (CZM & Damara 2008). Under the Department of Transport's sediment cell hierarchy, the Study Area lies within Primary Sediment Cell F - South Mole Fremantle to Pinaroo Point. Within this primary cell the Study Area is covered by two secondary sediment cells (25 and 26) and subsequently by two tertiary cells; 25b – Leighton salient to Mudurup Rocks and 26a – Mudurup Rocks to north Swanbourne pipe. The division of the Study Area into two secondary/tertiary sediment cells at Mudurup Rocks means different mechanisms of coastal change could be expected in the two cells over the short to medium term (i.e. interannual to decadal timescales).

Longshore sediment transport within the study area has been shown to be mainly northward from September to April, associated with prevailing currents over the summer period. A southward movement of sediment is usually observed during the winter months of June and July. The result is a net northward movement of material annually (CZM & Damara 2008). Nearshore structures can obstruct this sediment movement. The most notable example of this is the Cottesloe Groyne which exhibits accretion of sediment at its northern side in winter and alternatively erosion at the same site during summer.

Cross-shore sediment movement is also seasonal with sporadic periods of swell pushing sediment onto the shore, steepening the beach profile. Mid-year the beach is reformed by the energy of winter storms eroding the beach face and redepositing sediment to form sandbars just offshore. These formations become stable towards the end of winter and act as a buffer, preventing wave breaking at the shore and the substantial shifting of sediment it can cause.

3.1.3 Coastal Geology and Geomorphology

Cottesloe Main Beach is classified as a reef-protected, reflective sandy beach with strong currents, and North Cottesloe Beach is classified as a reflective (steep) beach (BMT Oceanica 2015). The stable component of the study area's geomorphology is the Tamala Limestone which underlies and backs the beaches and also forms headlands and offshore reefs.

The Town commissioned GPGMAPS to undertake geotechnical surveys in 2010 and 2011 to address the key knowledge gap in understanding the Study Area's local geology. Based on testing of a longshore segment between Curtin Avenue and North Street, the depth between ground level and bedrock ranged between approximately 5 metres and greater than 10 metres. Between just south of Curtin Avenue and Gibney Street this bedrock was mainly at or above mean sea level (MSL). Other sections of the survey showed that bedrock was below MSL, by greater than 2 metres in places. The compaction of beach sediment was found to be variable with depth along the tested segment, with generally poor compaction in the first 5 metres below the surface. Testing along a transect perpendicular to the shoreline revealed high variability in the depth from surface to bedrock; ranging from 2 metres to greater than 10 metres.

3.1.4 Engineered structures

Some manmade structures also play an important role in the local hydrodynamic and sediment regimes. The most notable structures are two groynes. One large groyne constructed at Mudurup Rocks (Cottesloe Groyne), forming the southern bound of Cottesloe's main beach, and a shorter groyne adjacent to Beach Street. A concrete seawall has also been constructed between Warnham Road and Cottesloe Surf Life Saving Club.

3.1.5 Coastal Vulnerability

CZM and Damara carried out a Coastal Vulnerability Investigation for the Town in 2008, which provided an assessment of areas at potential risk under various climate change scenarios in 2070. This assessment was restricted by a lack of geotechnical data at the time. BMT Oceanica reviewed this assessment in 2015, in light of the results of GPGMAPS's geotechnical investigations. Areas at high risk under likely 2070 climate change conditions were analysed against areas deemed to be at risk based on bedrock level relative to MSL. From this, the following sections of coastline were deemed to be most at risk of coastal impact:

- Between North Street and Grant Street
- South of Grant Street opposite Grant Marine Park
- Between Eric Street and Eileen Street
- Between Napier Street and Warnham Road
- Between Beach Street and Gibney Street

3.2 Photo Monitoring Results

Cameras 1 and 2 operated continuously throughout the observation period. Camera 3 was installed on the 28th of June 2016, and has operated continuously from this time. Data return of high-resolution images was 100% for all cameras during the period. Camera 1 exhibited some reduction in image quality during the summer months, believed to be associated with condensation on the camera lens. This effect was also observed at this camera location during the previous summer period and does not prevent observation of shoreline position.

3.2.1 Metocean Observation

Multiple significant storm events were observed in the imagery data from April to October 2016, as expected under typical winter conditions in the region. These were generally characterised by a disturbed sea-state, large wave conditions and substantial turbulence at the shoreline. Following these storms, changes to the beach form is often evident. Such storm events can lead to both erosion and accretion, containing adequate energy to shift sediment on- and offshore. The most notable storm events observed in the photo record occurred during the following periods:

> April 26-29, 2016

> May 21-29, 2016

> June 5-9, 2016

> July 7-10, 16-18 and 28-31, 2016

> August 5-9, 16-18 and 26-28, 2016

> September 6-8, 19 and 27, 2016

> October 1-2 and 14-15, 2016

The most significant storm conditions observed, in terms of wave run-up, were observed on May 21, 2016. The water-level reach up the beach face was the highest seen by both Cameras 1 and 2 for the observation period. The approximate peak of the storm, captured by the cameras, is displayed in **Figures 3-1** and **3-2** below. The metocean conditions recorded during this and other storm events are further discussed in **Section 3.4**. Camera 3 was not operational during this storm. The most significant storm conditions observed by Camera 3 occurred on July 31, 2016. A lower nearshore wave height, compared to the other camera locations, is notable at this location (see **Figure 3-3**). This is probably due to wave energy being dissipated by significant nearshore reef.

Observations of photographs from the summer period indicate typical seasonal conditions of a generally calm to mild sea-state, particularly in the morning. When waves were present they were generally local seas coinciding with afternoon south-westerly sea breezes. Some periods of disturbed sea-state were noted during the seasonal summer period, but were less severe in comparison to genuine winter events. These occurred on the following dates:

> December 24, 2016

> March 13-14, 2017

The storm event observed during March was unusual in the time of year it occurred, as well as its severity (see **Figure 3-4**). The storm also had a relatively long duration for a summer storm, with increased wave height and elevated water levels observed for over 2 days. It effected the Sculpture by the Sea Exhibit being held at the beach, with several sculptures requiring relocation. The occurrence of storms at that time of year has the potential to cause considerable erosion-based damage (including in comparison to large winter storms). This is because the shoreline is near its most receded position in some sections of the study area, such as the section of beach observed by Camera 1, due to the effects of the summer period (see **Section 3.2.2**).

Figure 3-1 Storm conditions at Cottesloe Main Beach on May 21, 2016.

Figure 3-2 Storm conditions at North Cottesloe Beach on May 21, 2016.

Figure 3-3 Storm conditions to the north of the Beach Street Groyne on July 31, 2016.

Figure 3-4 Storm conditions at Cottesloe Main Beach on March 14, 2017.

3.2.2 Beach Morphology Observations - Cottesloe Main Beach

An analysis of photographs taken of Cottesloe Main Beach showed a typical pattern of beach morphology change over the observation period. These observations were also consistent with the previous 1 year observation period. At the commencement of the observation period in April the shoreline was in a relatively receded position. This would be expected at the end of the seasonal summer period, where relatively strong northward currents combine with water level fluctuations to move sediment northward longshore. The Cottesloe Groyne traps the material to the south or diverts its transport offshore away from the Cottesloe Main Beach face.

The winter period saw this shoreline advance as material accreted on Cottesloe Main Beach. Winter wave conditions with significant offshore swell move sediment shoreward, feeding material to the nearshore zone and depositing it on the beach face at times. Storm events can drive erosion and accretion and lead to reshaping of beach form. The shift in longshore currents southward during this period means the Cottesloe Groyne can now act as a sediment trap to its northern side, aiding retention of material. The most advanced shoreline position appeared to occur after the winter period, around the start of November. **Figure 3-5** below gives an example of this position.

The most recent summer period (2016/17) showed a steady recession of the shoreline that had been established during the winter period. It was at its most receded position during March. **Figure 3-6** below shows this recent, receded shoreline position. Scarping was evident alongside shoreline recession in the southern portion of the beach section, as was observed during the previous summer period.

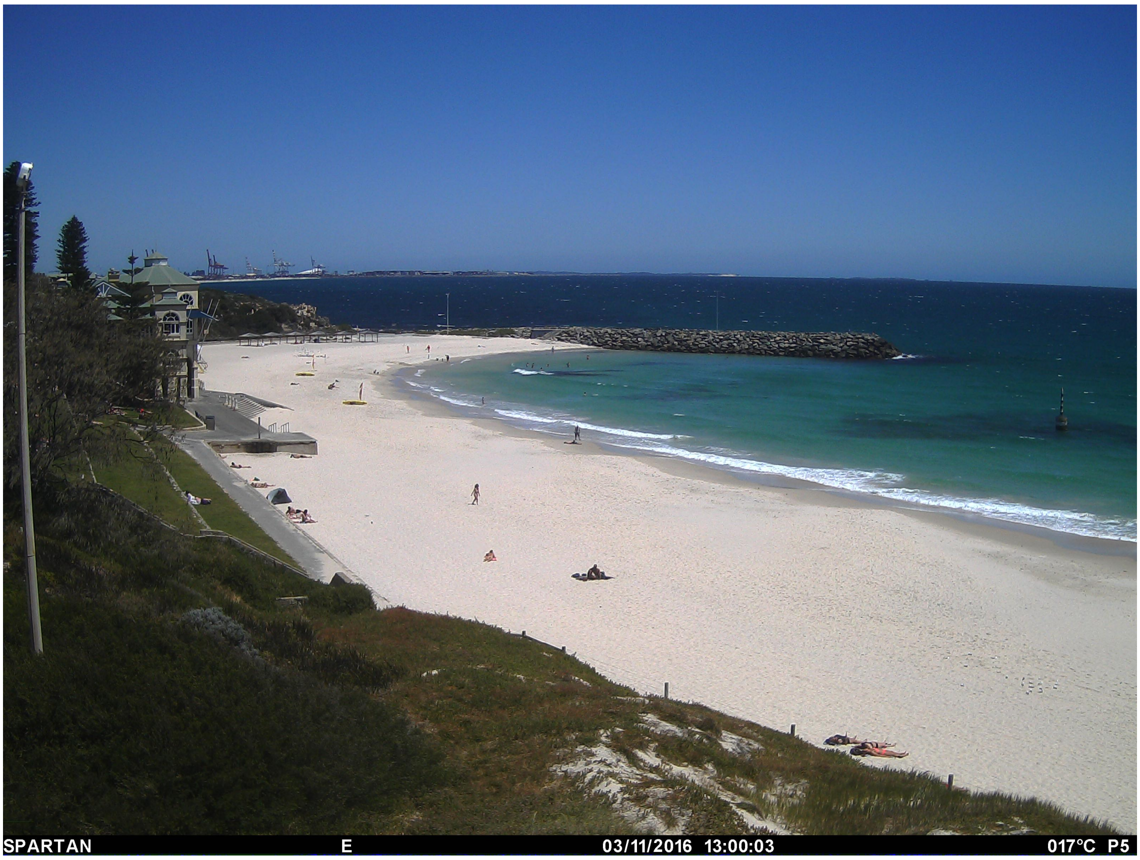

Figure 3-5 Example of an advanced shoreline position at Cottesloe Main Beach on November 3, 2016, following the effects of seasonal winter conditions.

Figure 3-6 Example of a receded shoreline position at Cottesloe Main Beach on March 17, 2017, following the effects of seasonal summer conditions.

3.2.3 Beach Morphology Observations - North Cottesloe Beach

As was observed during the previous 1 year observation period (Cardno, 2016), the shoreline position at North Cottesloe Beach appears to be dynamically stable. Although the beach section is exposed to coastal processes and can be substantially reshaped by storm events, the shoreline does not appear to shift significantly overall with seasonal conditions, as is the case for the other observation areas. The distance northward of this beach section from the Cottesloe Groyne means it should not be as strongly influenced, in terms of sedimentation, as Cottesloe Main Beach.

There appears to be a slight recession of the shoreline during the summer season, likely due to the northward movement of sediment and effect of the groyne inhibiting replenishment. The shoreline then appears to advance slightly during the winter season, as storms bring material onshore and longshore currents shift southwards briefly. The subtle rocky headland at the north of this beach section also probably traps some northward moving sediment, helping to stabilise the shoreline position to its south. **Figures 3-7** and **3-8** provide a comparison of the shoreline position towards the end of the seasonal winter and summer periods, respectively.

Significant beach cusps are often present along this beach section. These are formed as circulation patterns are setup to allow the return flow of water, pushed onshore by wave action. Their presence on this beach section is an indicator of its exposure to wave action.

3.2.4 Beach Morphology Observations - North of Beach Street Groyne

A full 1 year observation period was not achieved for the beach section monitored by Camera 3. Patterns of shoreline movement, however, appear to be similar to Cottesloe Main Beach, which also lies directly to the north of a groyne. The shoreline advanced over the 2016 winter period, as material was brought onshore by winter storms. The Beach Street Groyne likely helped to trap and retain sediment on the beach, as longshore sediment transport shifted southwards during this time. An example of the advanced shoreline position at the end of the winter period is shown in **Figure 3-9** below.

Over the 2016/17 summer period the shoreline receded steadily. This was probably due to the northward, longshore currents removing sediment from the beach section and the groyne directly to the south preventing replacement of the material. An example of the receded shoreline position, towards the end of summer, is shown in **Figure 3-10**.

Figure 3-7 Example of the shoreline position at North Cottesloe Beach towards the end of the winter season on October 16, 2016.

Figure 3-8 Example of the shoreline position at North Cottesloe Beach towards the end of the summer season on March 29, 2017.

Figure 3-9 Example of an advanced shoreline position to the north of the Beach Street Groyne on October 19, 2016, following the effects of seasonal winter conditions.

Figure 3-10 Example of a receded shoreline position to the north of the Beach Street Groyne on March 17, 2017, following the effects of seasonal summer conditions.

3.3 Surveyed Beach Profiles

The beach profile surveys undertaken in November 2016 were compared with surveys carried out in November 2014 to assess potential longer term trends in beach change. This was also done by comparing the April 2017 surveys with those from April 2015. By comparing profiles from the same time of year, the potential for inter-annual variability to bias the analysis is minimised. This is important because the inter-annual variability in beach morphology is known to be considerable within the study area (Cardno, 2016). These comparisons can only be made for the beach face, due to the limited extent offshore of the 2014 and 2015 surveys.

Recent surveys undertaken (starting from February/March 2016) extend further offshore than previous surveys, for each transect. This additional surveying is being undertaken to capture changes up to the depth of closure of the study area's beaches. Future comparisons will, therefore, be able to assess longer term trends in sedimentation in the full active coastal zone. The April 2017 profiles were compared with the November 2016 profiles, to assess changes in beach morphology over the summer period. These profiles extend to the depth of closure, so allow comparison of inter-annual changes in beach morphology throughout the full active coastal zone.

The analysis uses a similar segmentation of beaches within the study area to that performed by BMT Oceanica, using shoreline features and perpendicular road alignments for reference. These segments and their corresponding beach descriptions (BMT Oceanica 2015) are as follows:

> North Street to Napier Street – *Sandy beach backed by dunes and calcarenite cliff, with some rock outcrops and areas fronted by discontinuous intertidal rock platform. Unconfined to the north.*

> Napier Street to Mudurup Rocks – *Sandy beach backed by concrete seawall and artificial lawned terraces. Confined by Cottesloe Groyne to the south.*

> Mudurup Rocks to Beach Street Groyne – *Perched sandy beach backed by dunes and calcarenite cliffs and fronted in places by discontinuous intertidal rock platform. Confined by rocky outcrops and Cottesloe Groyne to the north and Beach Street Groyne to the south.*

> South of Beach Street Groyne – *Sandy beach, confined by Beach Street Groyne to the north and partially confined by rocky outcrops to the south.*

3.3.1 November 2014 to November 2016

A comparison of survey profiles undertaken in November 2016 has been made with profiles undertaken in November 2014. This has allowed an assessment of potential medium term trends by looking at beach morphology during the same seasonal period (end of winter/start of summer), 2 years apart. General patterns of change for the period, at each profile, are described in **Table 3-1**. Elevation surfaces for each set of surveys have also been created, by interpolating between profiles for continuous and relatively consistent sections of beach. These surfaces have been compared and the difference in elevation between the two surfaces (November 2016 minus November 2014) has been depicted in **Figure 3-11** below.

The comparison shows general loss of beach volume to the north of the Cottesloe Groyne and stable beach morphology, with intermittent beach loss and gain, to the south. Overall, the span and extent of beach reduction is greater than beach gain. This suggests that there was an overall trend of erosion within the study area, over the two year period.

Table 3-1 Noted changes and general patterns of change for surveyed beach profiles between November 2014 and November 2016.

Beach Section	Profile(s)	Noted Change	General Pattern
North Street to Napier Street	1-4	▪ Erosion; ▪ Decreased beach width and receded shoreline by ≈ 5 to 10m.	Erosion
	5-6	▪ No significant change	Stable
	7-11	▪ Erosion, ≈ 0.5 to 2m decrease in beach height; and ▪ Decreased beach width and receded shoreline by ≈ 10 to 15m.	Erosion
	12	▪ No significant change	Stable
	13-14	▪ Erosion, ≈ 0.5 to 1.5m decrease in beach height; and ▪ Decreased beach width and receded shoreline by up to ≈ 10m.	Erosion
Napier Street to Mudurup Rocks	15-17	▪ Erosion, ≈ 0.5 to 2m decrease in beach height; and ▪ Decreased beach width and receded shoreline by ≈ 5 to 10m.	Erosion
	18	▪ Significant Erosion, ≈ 3m decrease in beach height; and ▪ Decreased beach width and receded shoreline by up to ≈ 30m.	Significant Erosion
Mudurup Rocks to Beach Street Groyne	19-20	▪ No overlap of profiles	NA
	21-24	▪ Accretion, up to ≈ 2m increase in beach height; and ▪ Increased beach width and advanced shoreline by up to ≈ 5m.	Accretion
	25-27	▪ No significant change	Stable
	28-29	▪ Slight Erosion, ≈ 0.5 to 1m decrease in beach height; and ▪ Decreased beach width and receded shoreline by a few metres.	Slight Erosion
South of Beach Street Groyne	30	▪ Erosion, up to ≈ 1m reduction in beach height	Erosion
	31-32	▪ No significant change	Stable
	33	▪ Profiles don't overlap	NA
	34-35	▪ Accretion, ≈ 0.5 to 1m increase in beach height; and ▪ Increased beach width and advanced shoreline by up to ≈ 10m.	Accretion
	36	▪ No significant change	Stable
	37	▪ Erosion, up to ≈ 1m decrease in beach height	Erosion
	38	▪ No significant change	Stable
	39	▪ Slight reshaping of beach face. Near vertical face ≈ 1m high moved lower down profile	Reshaped

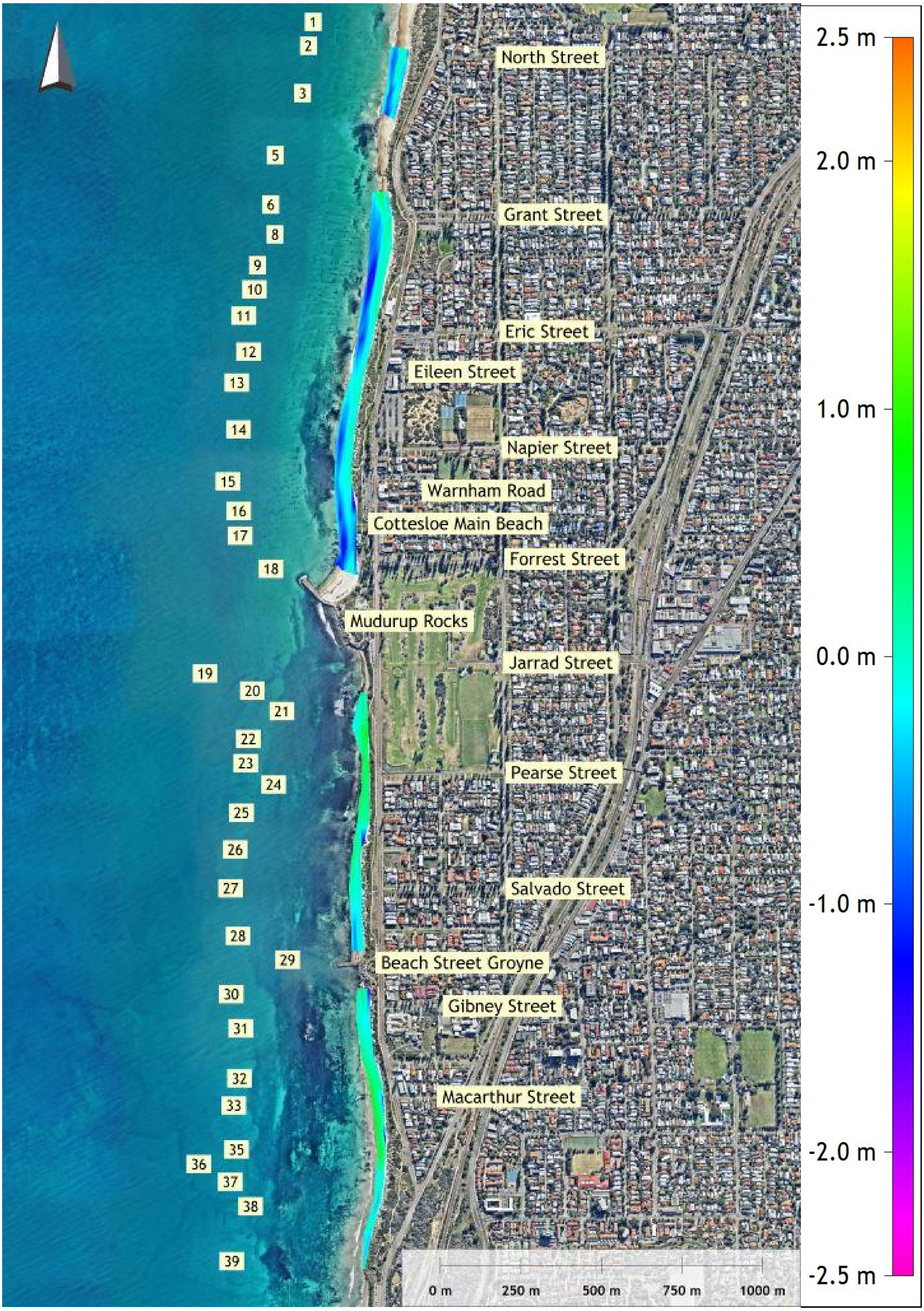

Figure 3-11 Comparison of elevation between November 2014 and November 2016, for surfaces interpolated from survey profiles (Image source: NearMap, 2016).

3.3.2 April 2015 to April 2017

A comparison of survey profiles undertaken in April 2017 has been made with profiles undertaken in April 2015. This has allowed an assessment of potential medium term trends by looking at beach morphology during the same seasonal period (end of summer/start of winter), 2 years apart. General patterns of change for the period, for each profile, are described in **Table 3-2**. Elevation surfaces for each set of surveys have also been created, by interpolating between profiles for continuous and relatively consistent sections of beach. These surfaces have been compared and the difference in elevation between the two surfaces (April 2017 minus April 2015) has been depicted in **Figure 3-12** below.

The comparison shows general loss of beach volume to the north of the Cottesloe Groyne and stable beach morphology, with intermittent beach loss and gain, to the south. Overall, the span and extent of beach reduction is greater than beach gain. The changes noted are consistent with those for the comparison between November 2014 and November 2016. This further supports the notion that there has been an overall trend of erosion within the study area, over the past two to three years.

Table 3-2 Noted changes and general patterns of change for surveyed beach profiles between April 2015 and April 2017.

Beach Section	Profile(s)	Noted Change	General Pattern
North Street to Napier Street	1-4	▪ Erosion, up to ≈ 2m reduction in beach height; and ▪ Decreased beach width and receded shoreline by up to ≈ 10m. ▪ April 2015 profile contains questionable hole in beach profile	Erosion
	5	▪ No significant change.	Stable
	6	▪ Reshaped profile, accretion on upper beach face and erosion on lower beach face.	Reshaped
	7-8	▪ Erosion, up to ≈ 1m reduction in beach height; and ▪ Decreased beach width and receded shoreline by up to ≈ 5m.	Erosion
	9-11	▪ No significant change.	Stable
	12-14	▪ Erosion, up to ≈ 2m reduction in beach height; and ▪ Decreased beach width and receded shoreline by up to ≈ 15m.	Erosion
Napier Street to Mudurup Rocks	15-18	▪ Erosion, up to ≈ 1.5m reduction in beach height; and ▪ Decreased beach width and receded shoreline by ≈ 5m.	Erosion
Mudurup Rocks to Beach Street Groyne	19	▪ Profile don't overlap	NA
	20	▪ Slight Erosion, up to ≈ 0.5m reduction in beach height; and ▪ Decreased beach width and receded shoreline by ≈ 5m.	Erosion
	21-22	▪ Accretion, up to ≈ 0.5m increase in beach height; and ▪ Increased beach width and enhanced shoreline by up to ≈ 5m.	Accretion
	23-27	▪ Profiles 23-25 unchanged; ▪ Profiles 26-27 reshaped with erosion of upper beach face and accretion of lower beach face	Stable/Reshaped
	28	▪ Erosion, up to ≈ 1m decrease in beach height; and ▪ Decreased beach width and receded shoreline by a few metres.	Erosion
	29	▪ Generally unchanged profile except for some erosion of step on upper beach face	Stable
South of Beach Street Groyne	30	▪ Erosion, up to ≈ 1m reduction in beach height; and ▪ Decreased beach width and receded shoreline by ≈ 10m.	Erosion
	31-32	▪ No significant change.	Stable
	33-35	▪ Accretion, up to ≈ 1m increase in beach height; and ▪ Increased beach width and enhanced shoreline by up to ≈ 15m.	Accretion
	36-37	▪ No significant change.	Stable
	38-39	▪ Erosion, up to ≈ 1m reduction in beach height; and ▪ Decreased beach width and receded shoreline by ≈ 5m.	Erosion

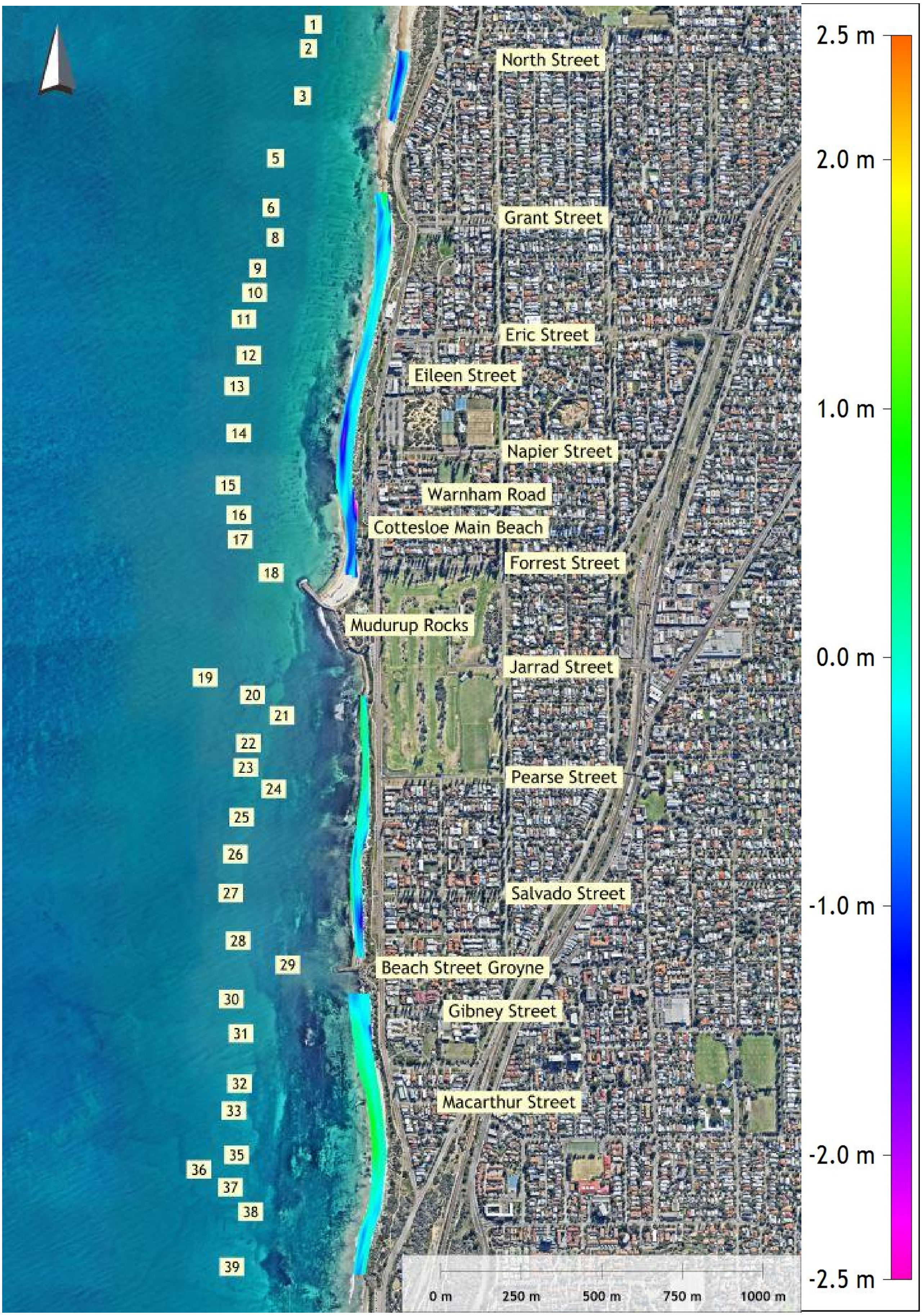

Figure 3-12 Comparison of elevation between April 2015 and April 2017, for surfaces interpolated from survey profiles (Image source: NearMap, 2016).

3.3.3 November 2016 to April 2017

A comparison of survey profiles undertaken in April 2017 has been made with profiles undertaken in November 2016. This has allowed an assessment of changes in coastal morphology over the seasonal summer period. This is the first comparison of surveys offshore to the depth of closure, allowing identification of changes in morphology in the nearshore zone as well as on the beach face. General patterns of change for the period, for each profile, are described in **Table 3-3**. Elevation surfaces for each set of surveys have also been created, by interpolating between profiles for continuous and relatively consistent sections of coast. These surfaces have been compared and the difference in elevation between the two surfaces (April 2017 minus November 2016) has been depicted in **Figure 3-13** below.

The comparison over the 2016/17 summer period shows a typical pattern of beach change, which was consistent with previous observations of the summer season. There was generally a reduction in the volume of the beach to the north of the Cottesloe Groyne and an increase in beach volume to the south. The main exception to this was the area directly to the north of the Beach Street Groyne (spanning approximately 250m along shore) which exhibited substantial erosion. Substantial erosion also occurred directly to the north of the Cottesloe Groyne and to the north of the natural headland between North Street and Grant Street. The observed patterns of sedimentation and erosion are typical of shoreline features interacting with a net northward movement of sediment, driven by summer sea breezes.

Observations of changes in the nearshore area (i.e. between the shoreline and depth of closure) are initial at this stage, with no existing background data for comparison. Poor survey resolution directly offshore (i.e. the 'break zone') for some profiles also lowers the confidence in comparing interpolated surfaces in these areas. There is a mixture of accretion and erosion in the nearshore zone, possibly due to the removal and formation of sand bar features due to cross-shore sediment movement.

Table 3-3 Noted changes and general patterns of overall change for surveyed beach profiles between November 2016 and April 2017.

Beach Section	Profile(s)	Noted Change	General Pattern
North Street to Napier Street	1-4	▪ Erosion; ▪ Decreased beach width and receded shoreline by ≈ 5 to 15m; and ▪ Increase in beach slope (i.e. steepening of beach profile).	Erosion
	5	▪ No significant change.	Stable
	6-9	▪ Erosion; ▪ Descreased beach width and receded shoreline by ≈ 5 to 10m.	Erosion
	10-13	▪ No significant change.	Stable
	14	▪ Erosion; ▪ Decreased beach width and receded shoreline by ≈ 10m; and ▪ Increase in beach slope (i.e. steepening of beach profile).	Erosion
Napier Street to Mudurup Rocks	15	▪ No significant change.	Stable
	16-18	▪ Erosion, up to ≈ 2m decrease in beach height; and ▪ Decreased beach width and receded shoreline by ≈ 15 to 20m.	Erosion
Mudurup Rocks to Beach Street Groyne	19-20	▪ Only profiled below -2 mAHD in November 2016 ▪ Minimal change	Stable
	21	▪ Accretion; ▪ Increased beach width and advanced shoreline by ≈ 10m; and ▪ Scarping and formation of step feature at 0 mAHD.	Accretion
	22-26	▪ No significant change.	Stable
	27-29	▪ Erosion, up to ≈ 2m decrease in beach height; and ▪ Decreased beach width and receded shoreline by ≈ 10m. ▪ Some evidence of flattening of offshore sand bars	Erosion
South of Beach Street Groyne	30-32	▪ Accretion; ▪ Increased beach width and advanced shoreline ranging from ≈ 15m to 20m; ▪ Nov 2016 profile 32 incomplete	Accretion
	33	▪ November 2016 profile incomplete, minimal change on common profile area offshore	Stable
	34-39	▪ Accretion; ▪ Increased beach width and advanced shoreline ranging from ≈ 5 to 20m.	Accretion

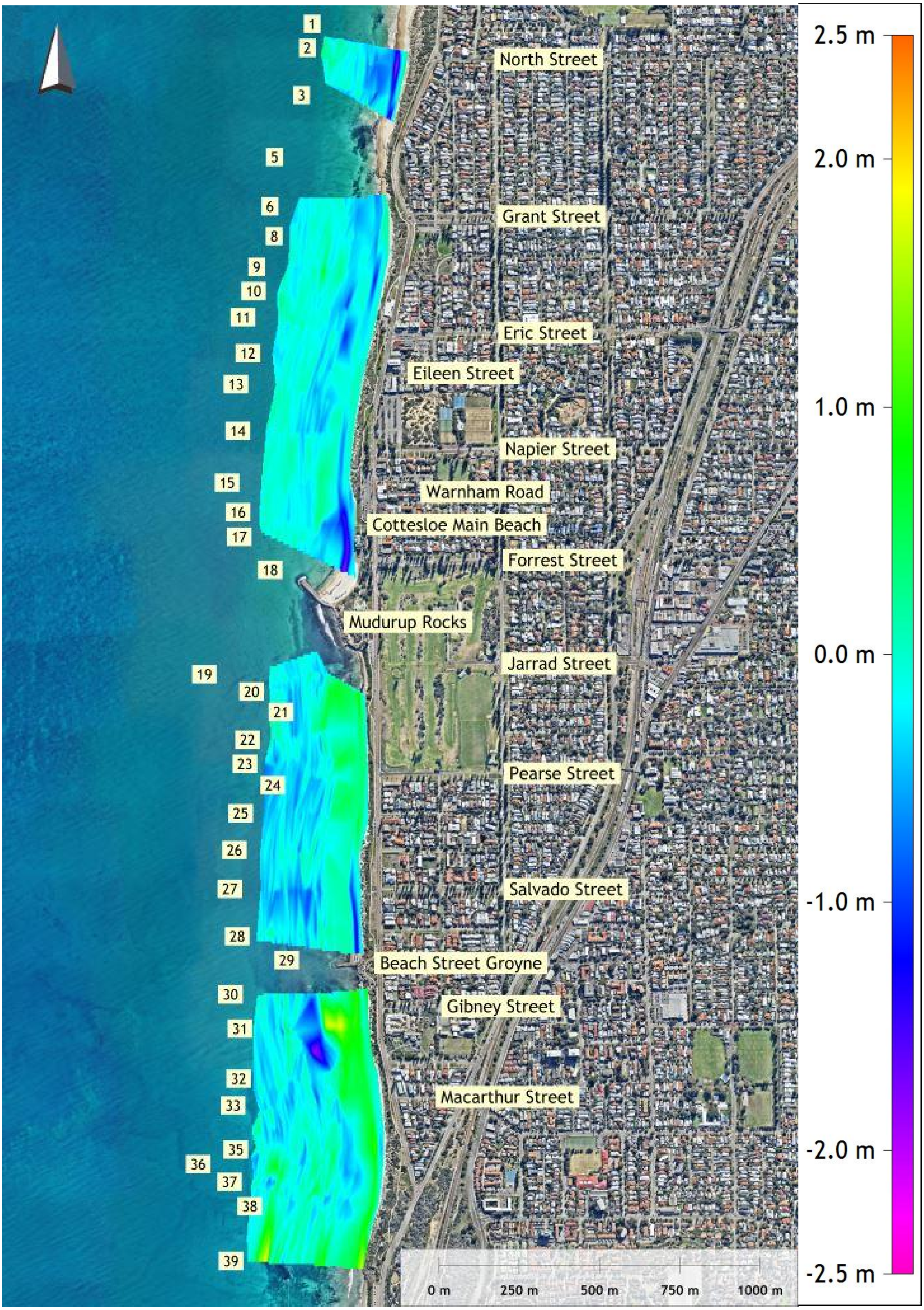

Figure 3-13 Comparison of elevation between November 2016 and April 2017, for surfaces interpolated from survey profiles (Image source: NearMap, 2016).

3.4 Metocean Conditions

Wave statistics were examined for the Rottnest and Cottesloe wave buoys for the observation period. **Figures 3-18** and **3-19** below display directional wave roses for the separated swell and sea components at Rottnest and Cottesloe, respectively, during winter and summer.

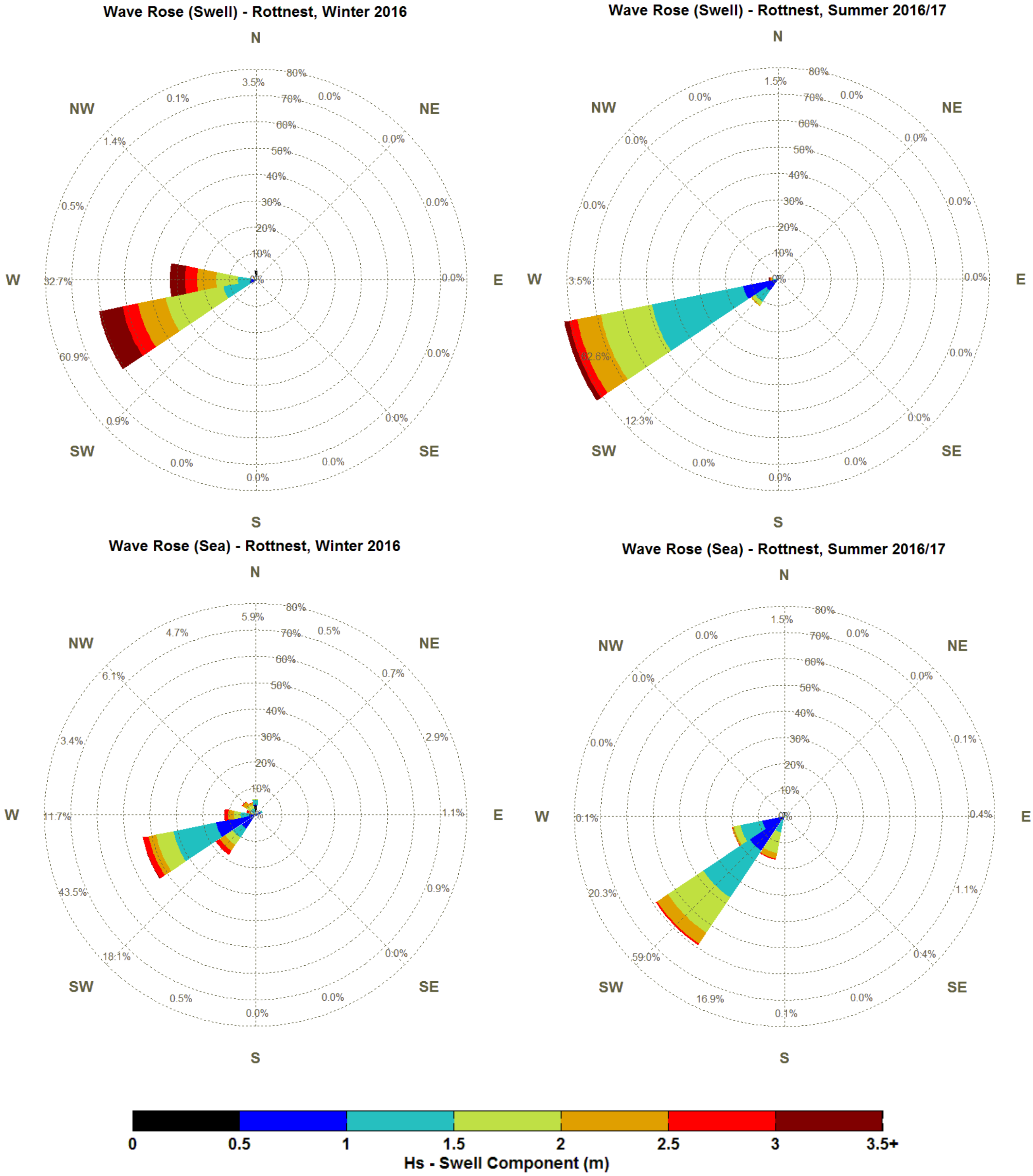

Figure 3-14 Rottnest wave height vs direction (coming from) rose plots for (clockwise from top left): winter swell component, summer swell component, summer sea component and winter sea component.

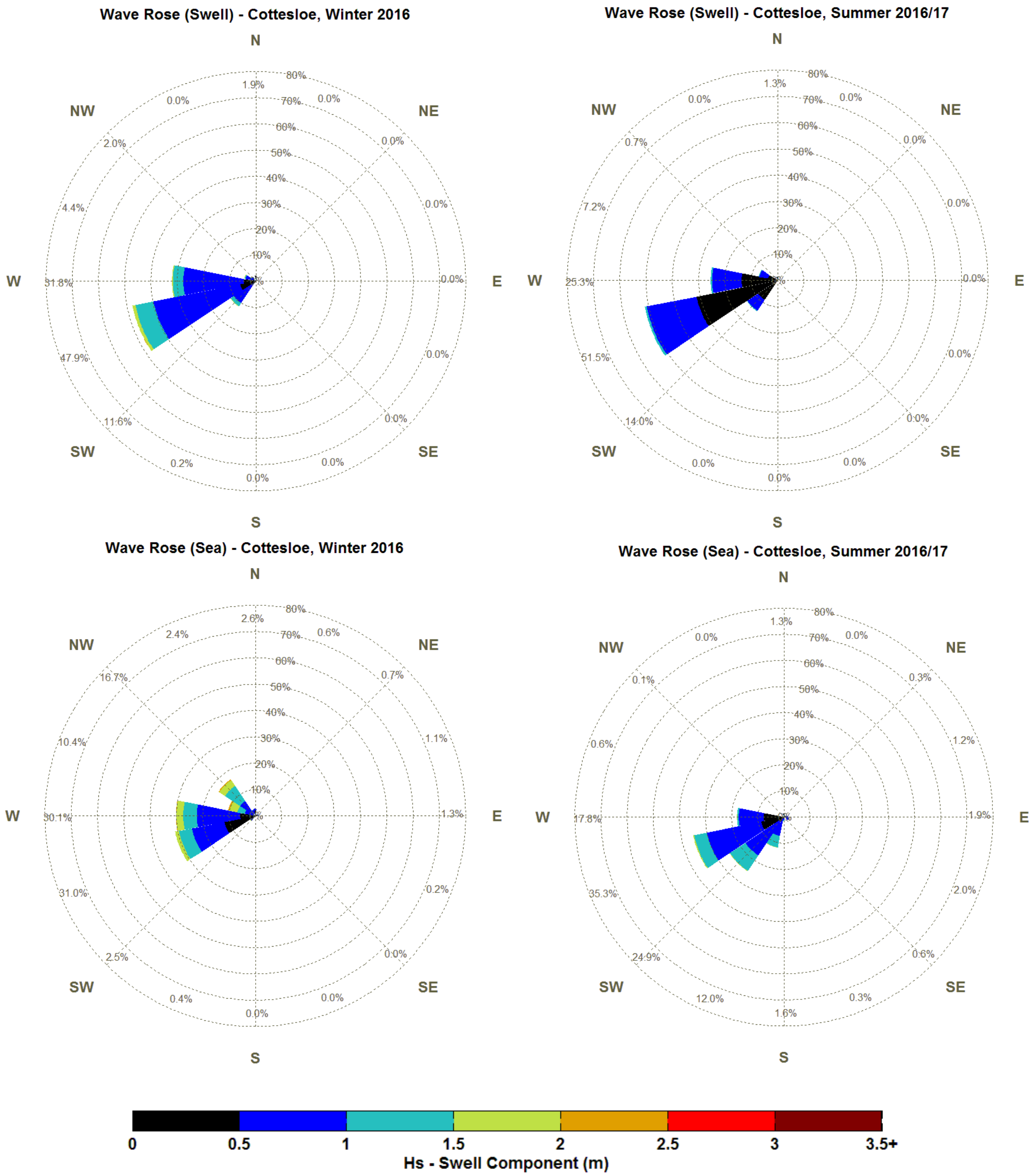

Figure 3-15 Cottesloe wave height vs direction (coming from) rose plots for (clockwise from top left): winter swell component, summer swell component, summer sea component and winter sea component.

The wave conditions recorded at the Rottnest wave buoy were generally typical of historical conditions in the region (**Figure 3-14**). Higher and more frequent swell conditions are recorded during winter, compared to summer, generally associated with storm conditions. This observation period had notably higher swell conditions at Rottnest, compared to the previous observation period, with a stronger westerly component. This is important because the study area is more exposed to waves from the west, compared to from the south west, where it is afforded some protection from offshore reefs and Rottnest Island. Higher swell conditions were also observed during summer, compared to the previous observation period. Greater swell during summer is likely to lead to increased erosion, as swell has the ability to suspend sediment and northward propagating currents, which drive longshore sediment transport, are at their strongest during this period. These offshore swell conditions generally transfer to lower and slightly more westerly (due to wave refraction) wave conditions inshore at the Cottesloe wave buoy (**Figure 3-15**). This is the first full observation period in which directional wave data has been available at Cottesloe, so comparisons to previous periods cannot be properly made in this regard.

A strong presence of seas is seen during the summer period, associated with afternoon sea breezes. These wave conditions are a good indicator of the driver of longshore sediment transport during summer; a northward propagating current driven by afternoon southerly winds. Sea conditions at Rottnest appear to be similar for this observation period, compared to the previous observation period (**Figure 3-14**).

The major feature of both wave buoy datasets, and a key influence on beach morphology, were large wave heights recorded in association with winter storms. The majority of winter storm events noted in **Section 3.2.1** during examination of imagery showed significant wave height (H_s) values in excess of 2m at the Cottesloe Buoy. These storm periods can be identified by the wave height peaks in **Figure 3-16** below. Observation of the swell record alongside these events generally reveals a strong swell component. This is also supported by generally high peak period values, which are shown in **Figure 3-17** below. This is important because swell has a greater ability to drive sediment suspension than local seas of similar wave height. In general this observation saw more frequent and higher wave conditions, particularly at the Cottesloe wave buoy location, in comparison to the previous observation period. Plots of the full time-series datasets for relevant wave statistics for each buoy are provided in **Appendix B**.

The most significant observed storm event, referred to in **Section 3.2.1**, occurred during May 2016. The intensity of this event was confirmed by the wave record which showed H_s of 3.13m on May 21 at 11:24 AM (**Figure 3-18**), the highest value for the observation period, and much higher than the maximum H_s of 2.5m recorded during the previous observation period.

The unseasonal summer storm, also noted in **Section 3.2.1**, had a peak H_s of 2.18m at 4:11 PM on March 14, 2017 at the Cottesloe Wave Buoy. Waves during the storm were generally propagating from the west, meaning Cottesloe Beach was fully exposed to the storm surge. Water levels for Fremantle were also elevated at over 1 metre for much of the storm period.

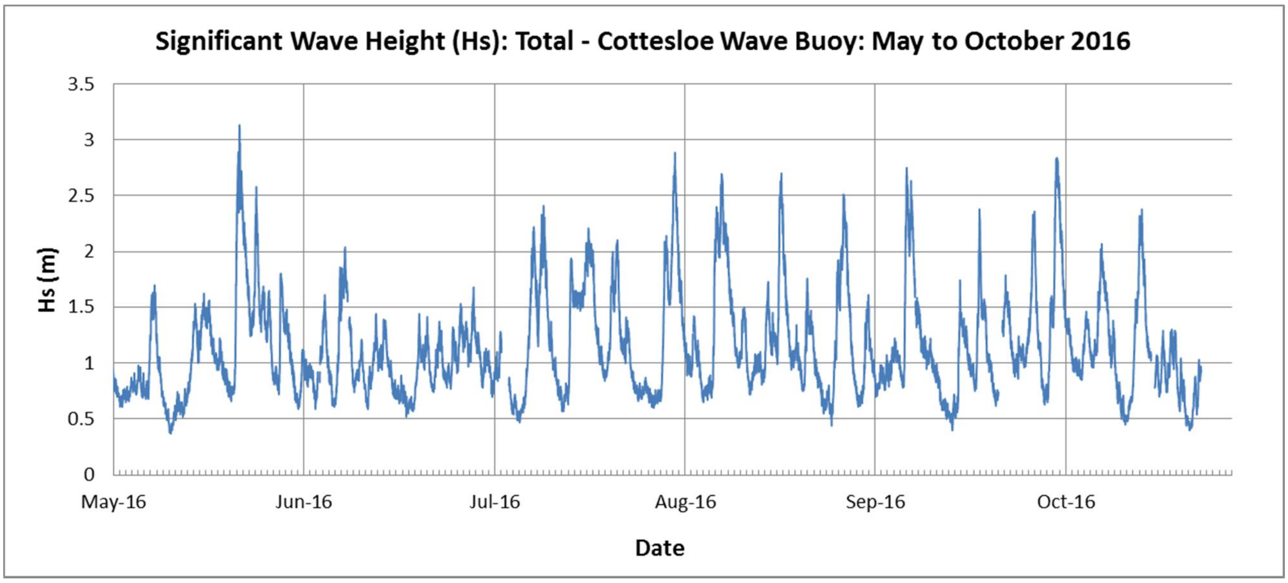

Figure 3-16 Significant wave height at the Cottesloe Wave Buoy over the 2016 seasonal winter period (Data source: DoT 2017).

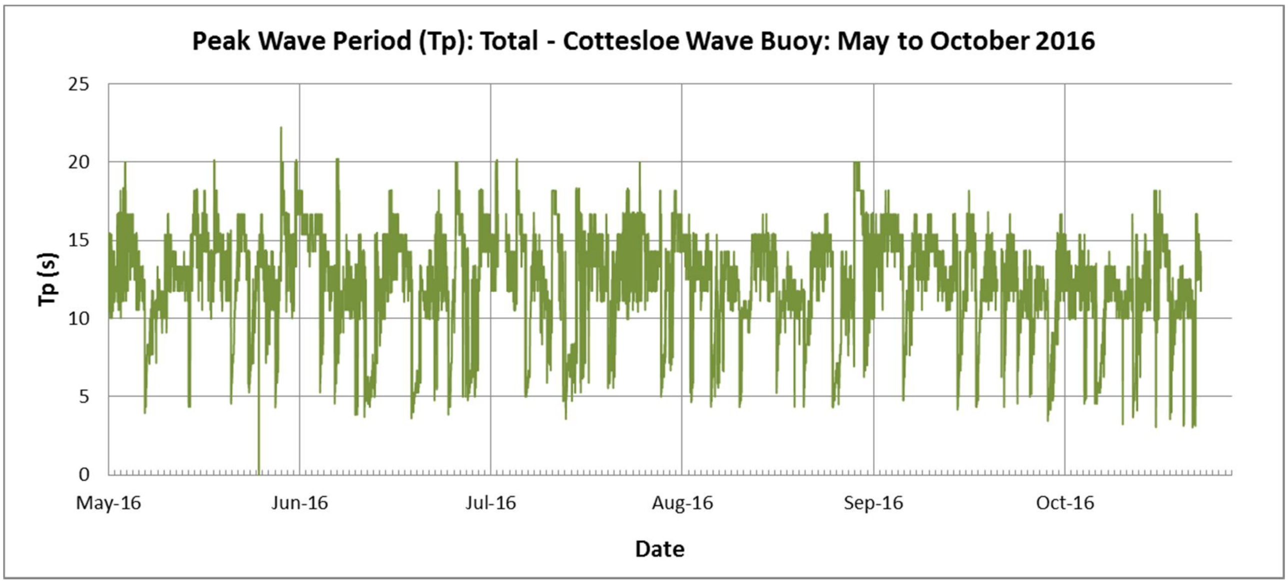

Figure 3-17 Peak wave period at the Cottesloe Wave Buoy over the 2016 seasonal winter period (Data source: DoT 2017).

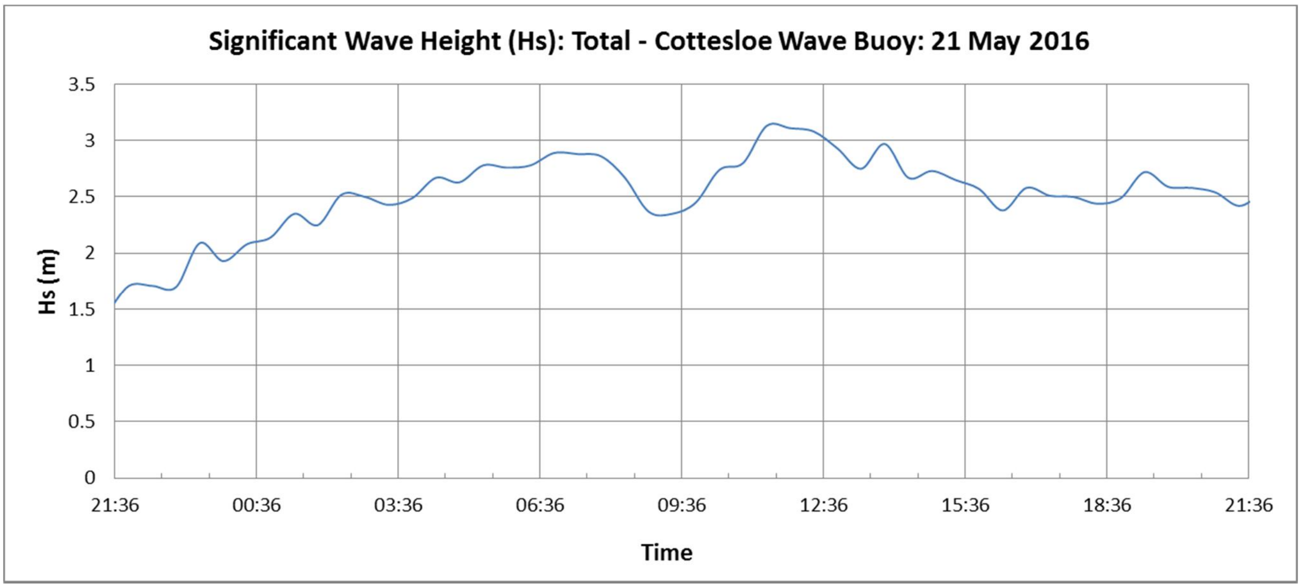

Figure 3-18 Significant wave height at the Cottesloe Wave Buoy on May 21, 2016 (Data source: DoT 2017).

An examination of raw water level measurements from Fremantle shows the peak water level for the year, 1.89 m above the historical low water mark (LWM), occurred on May 21, 2016 at around 6:35 AM (**Figure 3-19**). This corresponds with the peak of observations of coastal impact from remote imagery (see also **Figures 3-1** and **3-2**). Although this time was around high tide, other influences were also involved to enhance this peak. A review of MSLP from the BoM daily weather observations at Swanbourne (pressure recorded at Perth Metro Station) showed MSLP was 996.4 hPa at 9:00 AM and 1001.9 hPa at 3:00 PM on this day. These values were the lowest and second lowest recorded, for their respective times, during the observation period.

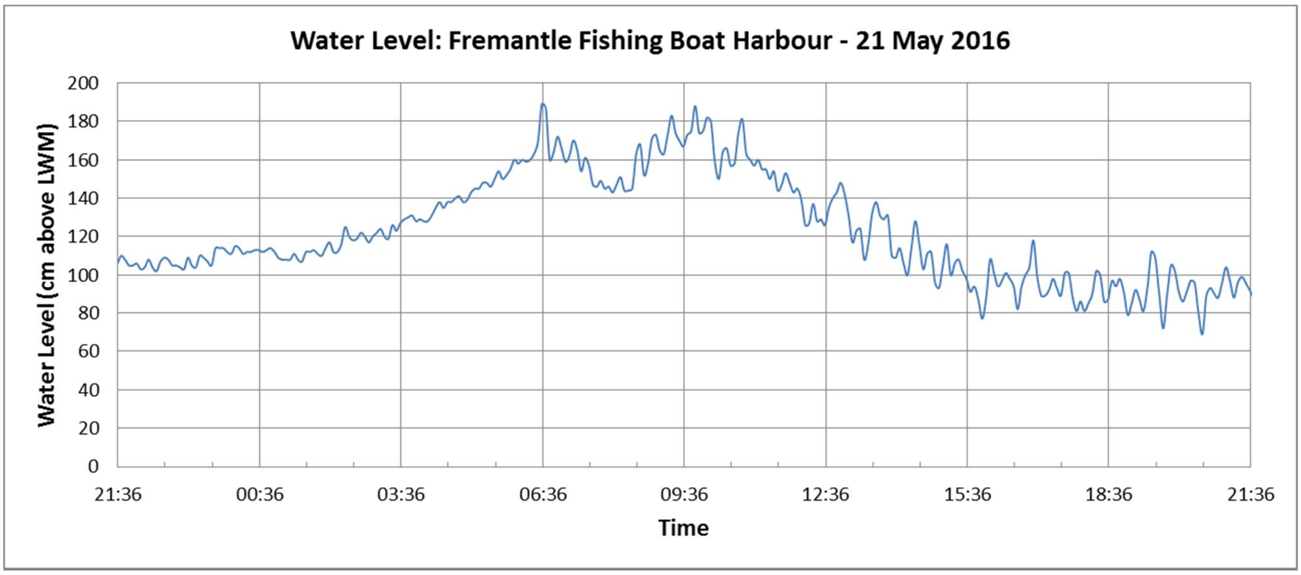

Figure 3-19 Raw water level measurements above LWM at Fremantle on May 21, 2016 (Data source: DoT 2017).

Wind speed at 9:00 AM was also the strongest recorded for the observation period on May 21 at 96 km/h from the west south-west. The more westerly direction of this storm (compared to traditional south south-westerly winter storms) meant Cottesloe received less protection from offshore reef and Rottnest Island. This notion is supported by the fact that, although this event caused the largest wave conditions at Cottesloe for the observation period, they were not the largest wave conditions recorded at the Rottnest Wave Buoy (7.24m on 31 July, 2016). This event was similar to the most significant observed storm during the previous observation period, in that it occurred early in the year (also May) and had a more westerly direction than true winter storms. The coincidence of storm events with an elevated water level, due to tide and other atmospheric phenomena, is a key determinant of coastal impact.

Water-level data was obtained from the Department of Transport and the National Tide Centre for Fremantle from 1966 to 2016 inclusive. Extremal analysis of the data set was undertaken to determine a range of Average Recurrence Interval (ARI) events. A Weibull fit was selected as the most appropriate method of determination. The peak water level observed during the observation period (1.89 m LWM) corresponds to approximately a 10 year ARI event. A range of water level ARI events are presented in **Table 3-4** to allow future reference.

Table 3-4 Fremantle water levels for various ARIs

ARI (year)	Water Level (m LWM)
5	1.1
10	1.9
20	1.9
50	2.0
100	2.1

4 Discussion

The monitoring period was generally successful with both photographic monitoring and surveying achieving good quality datasets for analysis. Visual assessment of captured imagery provided good supporting evidence for the changes in beach profile, quantified by comparison of shoreline surveys. As the ongoing monitoring program is in its early stages, there is still insufficient data to draw conclusions about medium to long-term trends in erosion or accretion. The observed changes, and potential trends they indicate, for the data collected so far (approximately 2.5 year duration) are discussed. Based on the inter-annual variability of weather and metocean conditions in the region, as well as the presence of longer-term influences such as El Niño/La Niña (ranging from 2 to 7 year cycle), the program would require at least 5 to 10 years of continuous data before persistent trends could be proposed with some confidence.

Analysis of remote imagery and survey profiles during the observation period suggests typical patterns of seasonal sedimentation and erosion were present. Specifically, the interaction of alongshore currents, and the sediment they transport, with shoreline structures is the major determinant of accretion and erosion. During summer this generally results in accretion of sediment to the south of significant shoreline features and erosion to their north. Generally the reverse of this occurs during winter when longshore currents turn southward briefly. The key shoreline features affecting this process are the Cottesloe Groyne, the Beach Street Groyne and the headland between North Street and Grant Street.

Comparison of surveys at similar times in the annual cycle, two years apart, shows net overall loss of sediment from the beach within the study area, most prominently to the north of the Cottesloe Groyne. There are also areas that appear to have accreted over this period, predominantly to the south of the Cottesloe Groyne. The two comparisons, one at the end of the summer period and one at the end of winter, show very similar results, providing some confidence that the trend has not been heavily influenced by seasonal variability (although they may have both been heavily influenced by a single season). The patterns of erosion and sedimentation are similar to those observed over a summer season, where net sediment transport is to the north. This suggests that the changes observed over these periods could be attributed to stronger than average summer sediment transport processes or weaker than average winter sediment transport processes, or a combination of the two. During the previous observation period, similar comparisons were made with only 1 year between profiles, taken at similar times during the year. The results of this comparison showed the overall shoreline to be relatively consistent over the 1 year period. This suggests that the majority of the net erosion observed may have occurred in the second half of these 2 year comparison periods (i.e. in the past 1-1.5 years).

In general, the observation period exhibited relatively stormy conditions, compared to recent observation periods. This included several large winter storms, the largest of which (May 21, 2016) had a much higher wave height and water level than the largest storm observed in the previous observation period. Storms appeared to generally have a higher wave height in this observation period, compared to the previous. There was also a significant summer storm (March 14, 2017) observed, which caused considerable coastal impact. This storm occurred at a time when the shoreline is generally close to its most receded position, making infrastructure behind more vulnerable to impact. It is believed that erosion resulting from this storm undercut and damaged a concrete access ramp near the base of the Cottesloe Groyne (see **Figure 4-1** below). The town should investigate the damage to this infrastructure and implement controls to prevent further damage and safety hazards in the future.

Data collected during this, and previous, observation periods have confirmed the key drivers of sedimentation and erosion within the study area. Predominantly these are: the frequency, energy and duration of wave conditions; and the strength and direction of longshore currents. However, the induvial influence of these components and how they interact is not yet clearly defined. This is due to low temporal resolution of survey data and a lack of quantitative data being derived from shoreline imagery, as well as the short overall duration of the monitoring program to date. The inputs of sediment to the study area, likely to be mainly longshore transport from the south and cross-shore supply from offshore sources, are also yet to be properly quantified. As the monitoring program continues and additional data collection exercises are included, such as the storm monitoring to be carried out in winter 2017, these key drivers and influences will be better defined. This information will be highly valuable in preparing Cottesloe to adapt to the changes anticipated with a changing climate.

Figure 4-1 Beach erosion that has undercut and caused damage to an access ramp near the base of the Cottesloe Groyne (Image captured 26/04/2017).

5 Recommendations

The current monitoring program is relatively comprehensive and well-targeted given the resources available to the Town. Some monitoring of storm events during 2017 will add valuable information around Cottesloe Beach's vulnerability to short-term, storm-based erosion. The following recommendations are suggested to improve or compliment the current monitoring program, as it continues into the future:

> The program should continue, in at least its current format, for a period of time sufficient to account for inter-annual variability in weather and metocean conditions as well as longer term cycles such as El Niño/La Niña weather patterns (2-7 year cycle). It is recommended a dataset of at least a 5-10 year duration be collected to define trends in shoreline movement with some confidence.

> Survey campaigns should be carried out as close as possible to the middle of the transition periods between winter and summer each year. This is generally around April/May and October/November. This will allow better segmentation of the two seasonal periods for analysis of beach profile change. It will also lead to greater confidence in the identification of potential long-term trends. Survey campaigns were well timed during this observation period.

> Where practicable, survey profiles should extend landward to the crest of the first dune or the seaward limit of hard infrastructure (paths, steps etc.). While these areas may be beyond the reach of coastal impact at present, they may become vulnerable in the future, making the survey data useful for reference.

> Areas of rock, such as the shoreline for survey profile 19, should be surveyed during each survey campaign where possible. Although this rock will generally be unchanging, the surveying may capture rock falls or corrosion of the rock over time. This information will be useful, as there is considerable uncertainty around the ability of coastal limestone in the area to act as a barrier against coastal hazards into the future.

> It is recommended that an additional survey profile be added to the program, passing across the shoreline approximately 10m to the north of the Cottesloe Groyne. This will allow a greater area of Cottesloe Beach to be assessed by interpolation of survey data. It will also provide more relevant beach profile information alongside the groyne, where erosion appears to have caused damage to infrastructure during the observation period (see **Section 4** and **Figure 4-1**).

> It is recommended that methods be investigated to improve the survey resolution in the nearshore zone (i.e. between beach survey points and offshore survey points), to prevent data gaps which can confound data interpolation and estimation of sedimentation and erosion volumes. These gaps are evident in **Figure 2-3**. The morphology in this area is also an important component of the overall shoreline profile, often containing features such as sand bars and gutters. If the Town has limited resources to obtain survey information, this area should be prioritised over deeper offshore areas for data collection.

> Sediment sampling would provide useful information regarding the particle size and potential source of sediment accumulating and being lost from beaches within the study area. This information would be useful in determining the key mechanisms of sediment movement, with swell waves (e.g. during winter) generally having the ability to suspend and shift larger particles than the combination of water levels and currents (e.g. during summer). The information would also inform renourishment programs should these be required in the future. Some sediment data will be collected as part of targeted storm monitoring in 2017, but this will be spatially and temporally isolated.

> Measurement of nearshore currents would provide data on a major component of the sedimentation regime within the study area. Ideally, 1 year of current data would be captured to assess the respective spans of northward flows during the summer and southward flows during the winter, and characterise flow in the transition periods between the seasons. However, monitoring programs could be tailored to achieve useful data within required limitations. Acoustic current measurement instruments also provide measurements of backscatter, which can be used as a proxy for suspended sediment. This would allow estimates of sediment flux in the nearshore zone to be calculated.

> An analysis of long-term, historical metocean and meteorological conditions could be undertaken to provide context for each observation period being assessed. The results of this analysis would be used to

assess how typical the observation period was in comparison to the long-term average. The key aspects relevant to this program would include: wind speed, direction and consistency (with the absence of current data), and wave conditions (height, period, direction and sea/swell split). Noting that an assessment of long-term, historical wave conditions will be carried out as part of the storm monitoring being undertaken in winter 2017.

> Following completion of year 5 of monitoring, the data should be analysed for medium term trends, as well as for input into coastal management (such as a Coastal Hazard Risk Management and Adaptation Plan (CHRMAP)). For example, if medium term erosion trends were observed at a specific location, more detailed investigation could assist with management measures at that site. Data collection should still be ongoing, during and following this analysis.

> Given the loss of sediment observed in some key areas over the monitoring program to date, the Town should investigate the possible requirement for sand nourishment. This might involve sand bypassing or back passing, along the Town's shoreline, or importing sand from an outside source. The Town should make some preliminary estimations of required volumes and the potential cost or sourcing and placing sediment, to be prepared should the recent trends in longshore sediment transport continue.

6 References

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7 Appendices

7.1 Appendix A – Survey Profile Data: November 2014 to April 2017

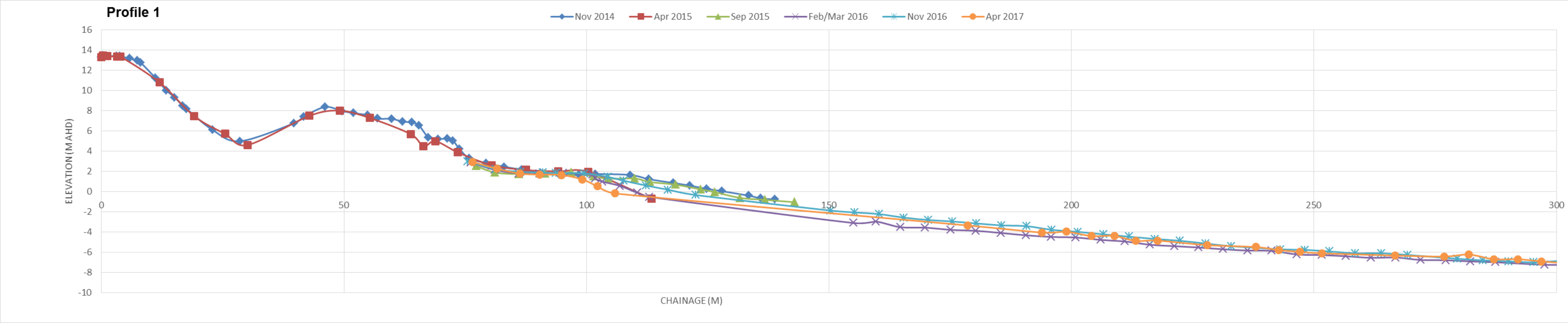
7.2 Appendix B – Wave Buoy Data at Rottnest and Cottesloe Wave Buoys: April 2016 to March 2017

7.3 Appendix C – Water Level Data at Fremantle: April 2016 to March 2017

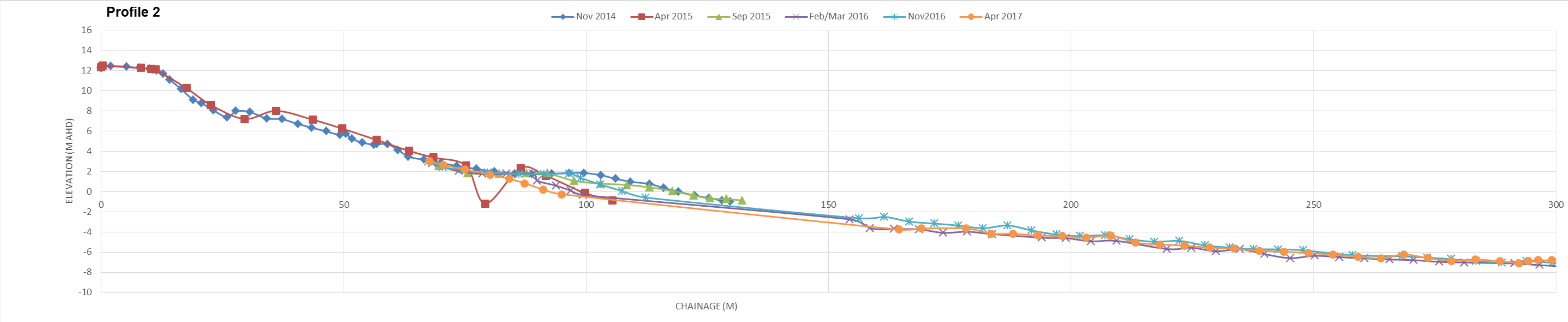
7.4 Appendix D – Daily Weather Observations at Swanbourne, WA: April 2016 to March 2017

Appendix A

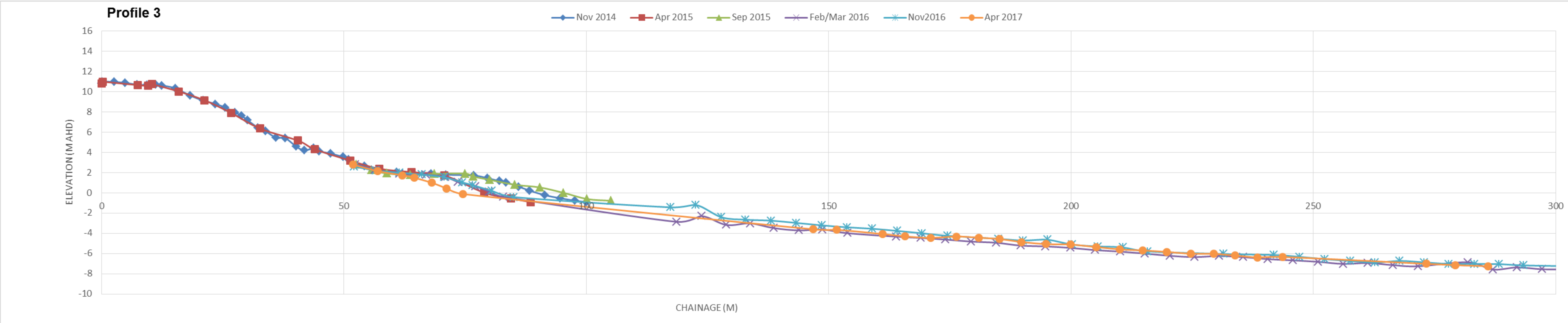
Survey Profile Data: November 2014 to April 2017



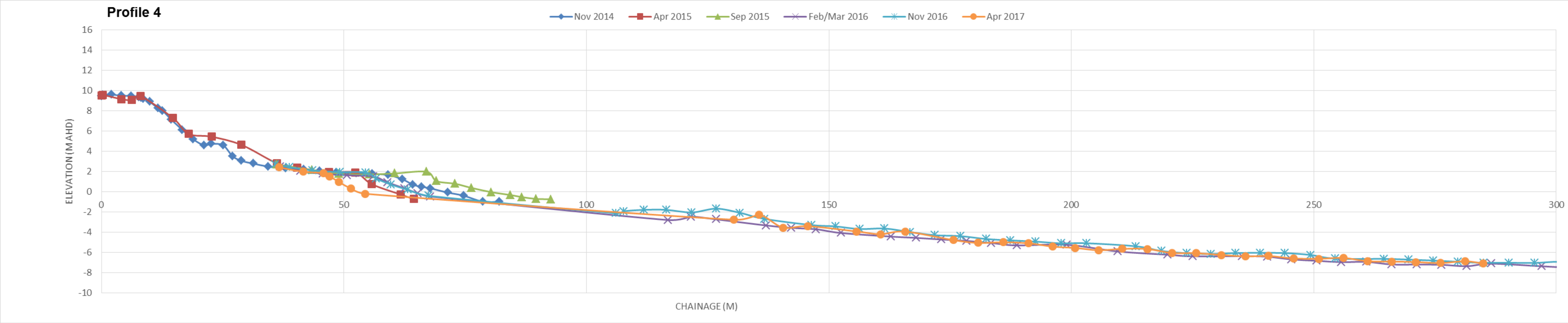
Profile 1
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

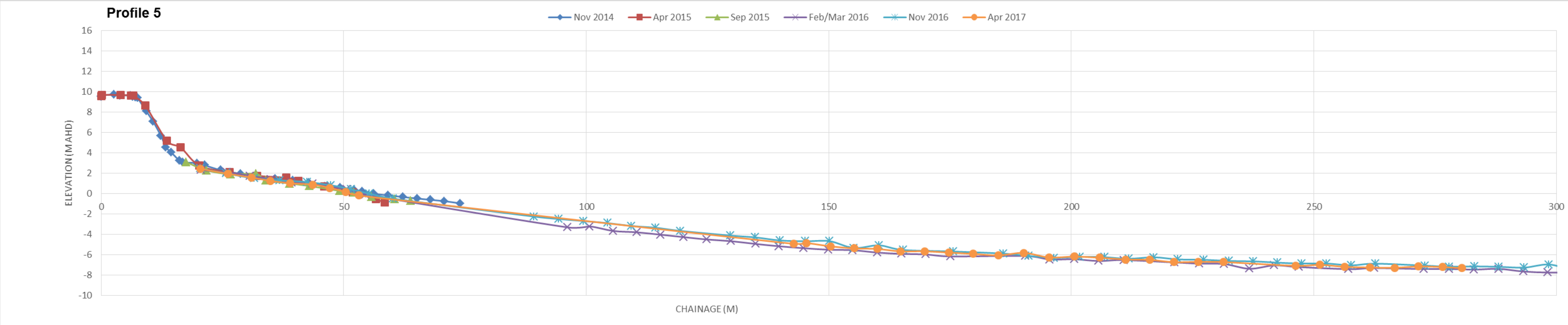


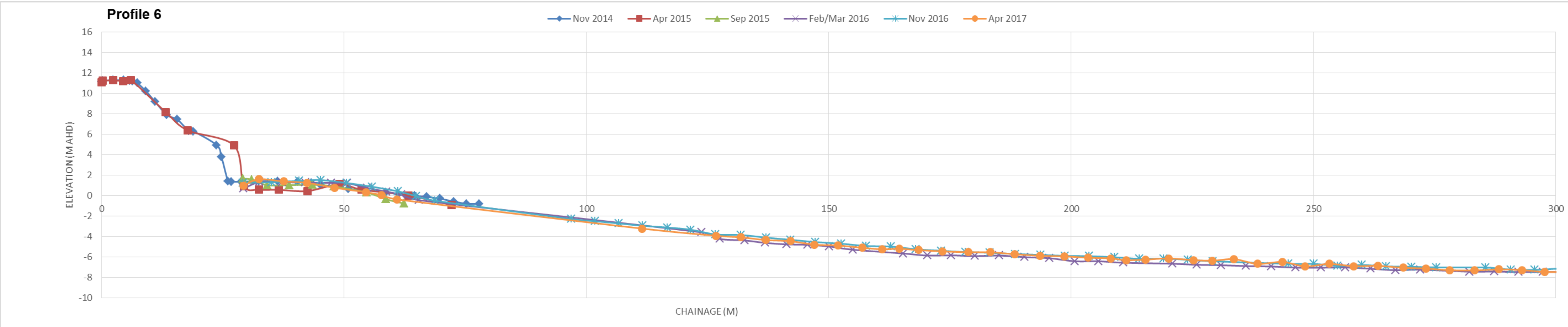
Profile 2
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

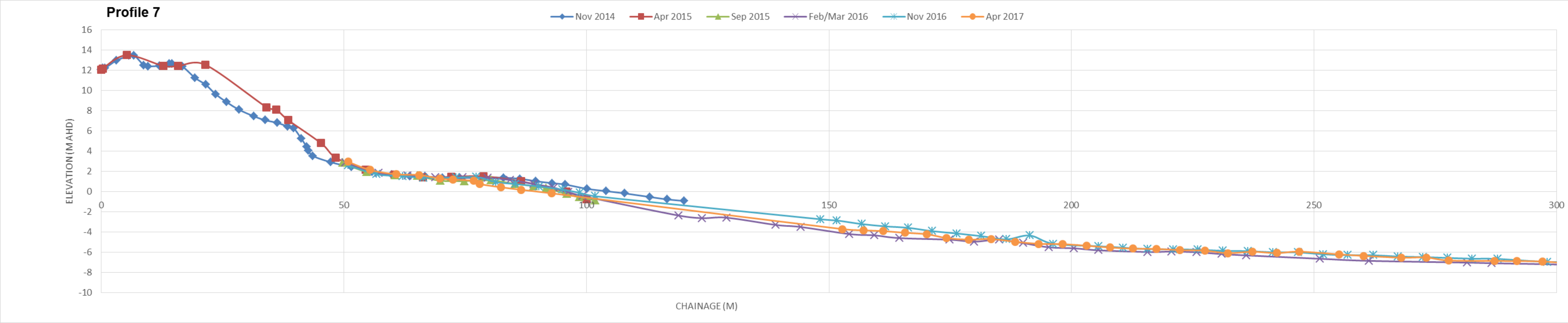


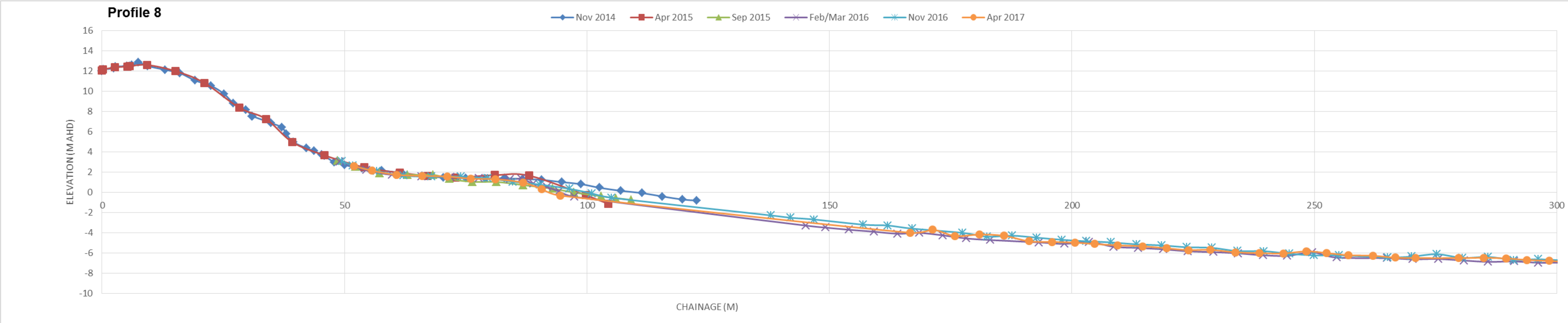
Profile 3
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

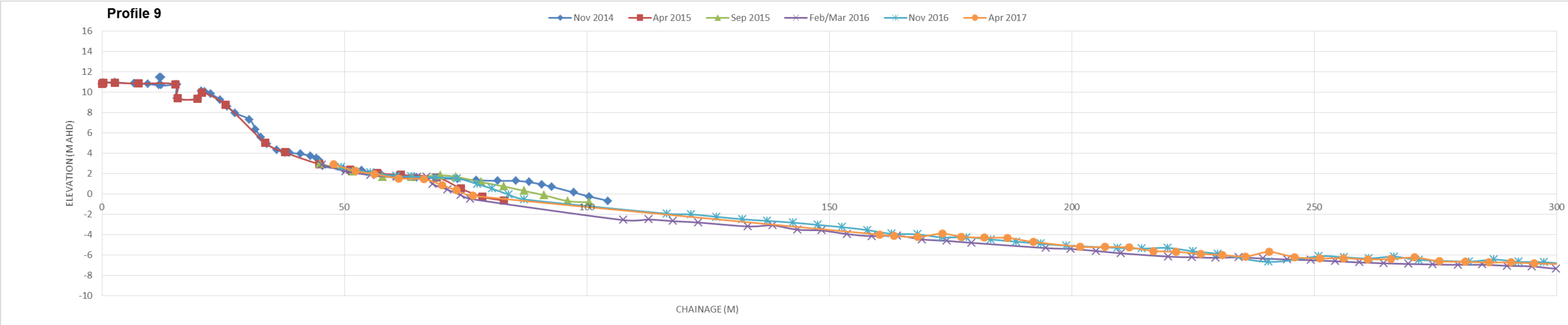

Profile 4
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

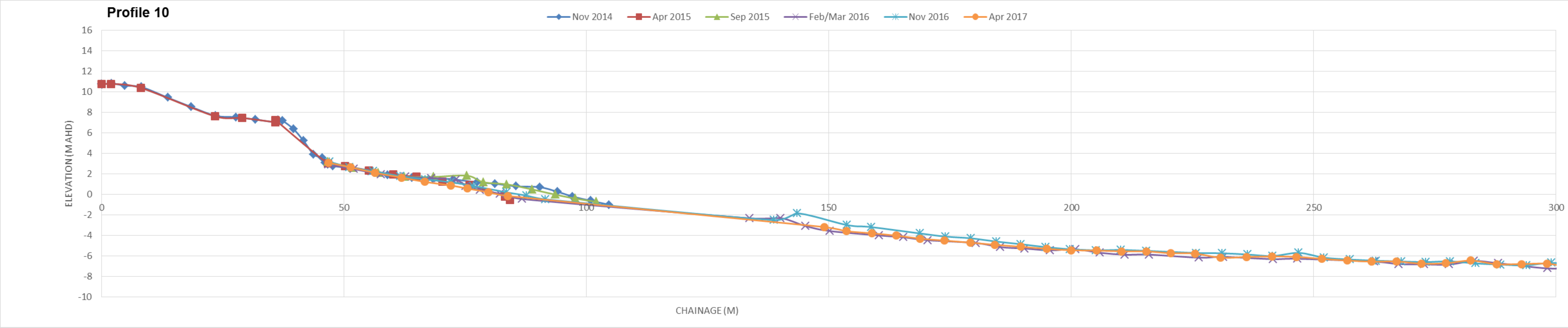

Profile 5
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)


Profile 6
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

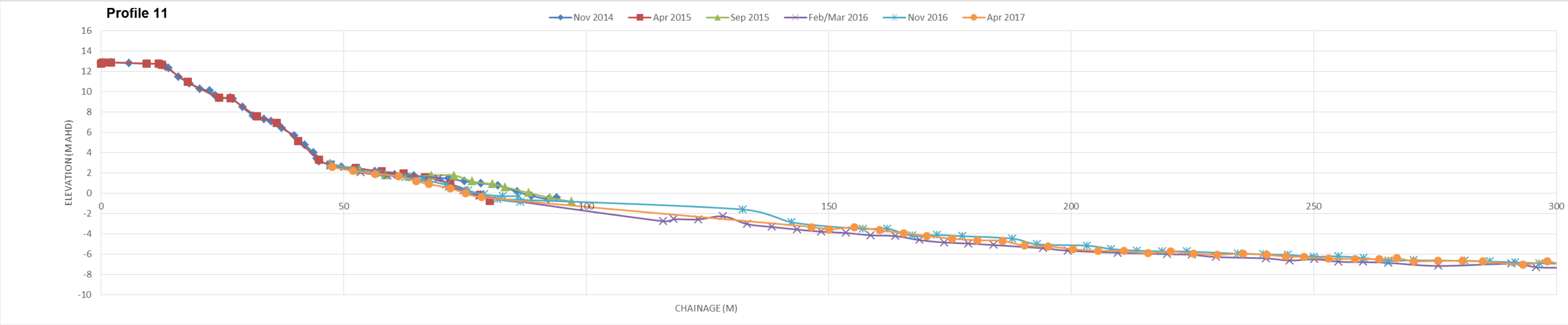

Profile 7
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
50
100
150
200
250
300


Profile 8
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
50
100
150
200
250
300

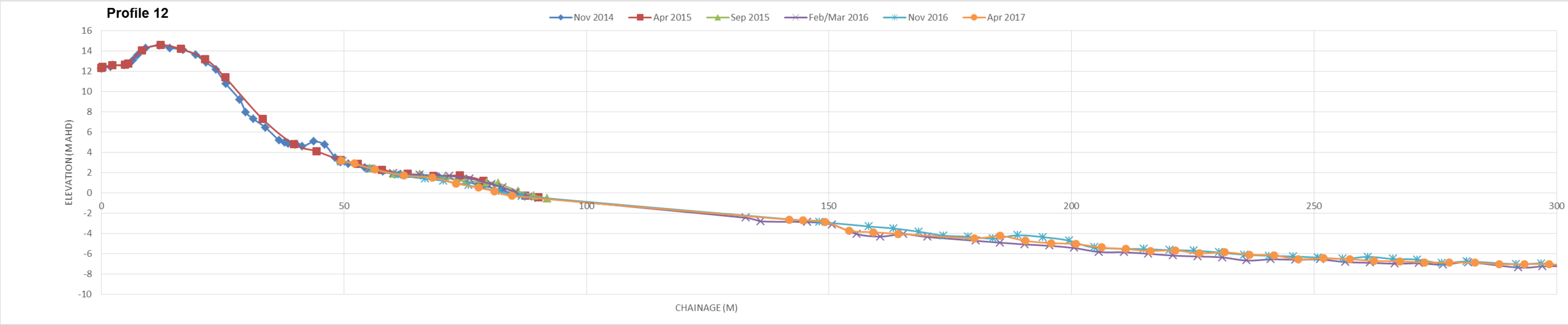

Profile 9
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
50
100
150
200
250
300



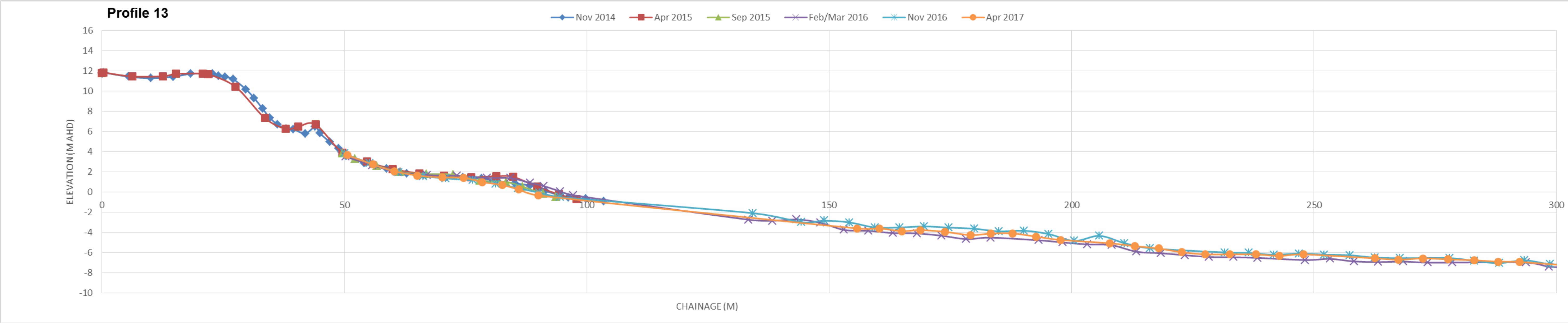
Profile 10
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)



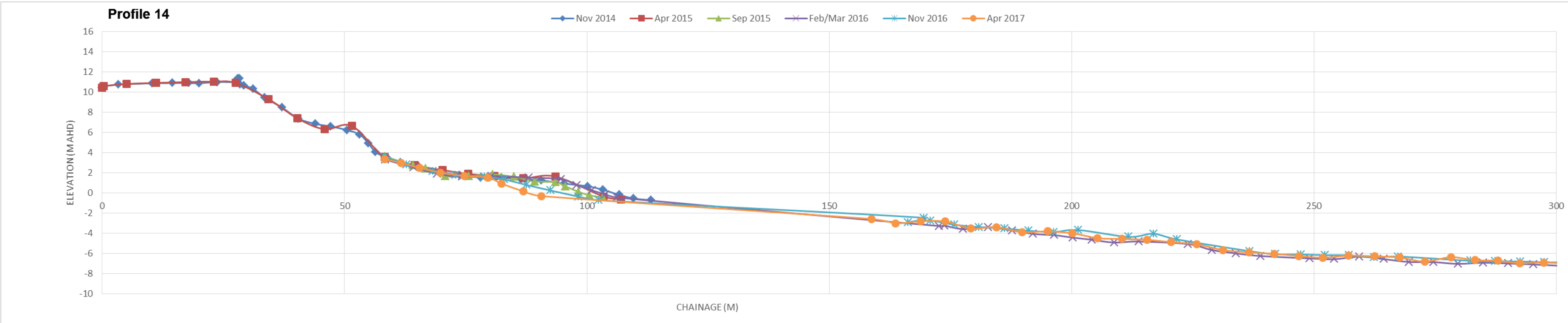
Profile 11
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)



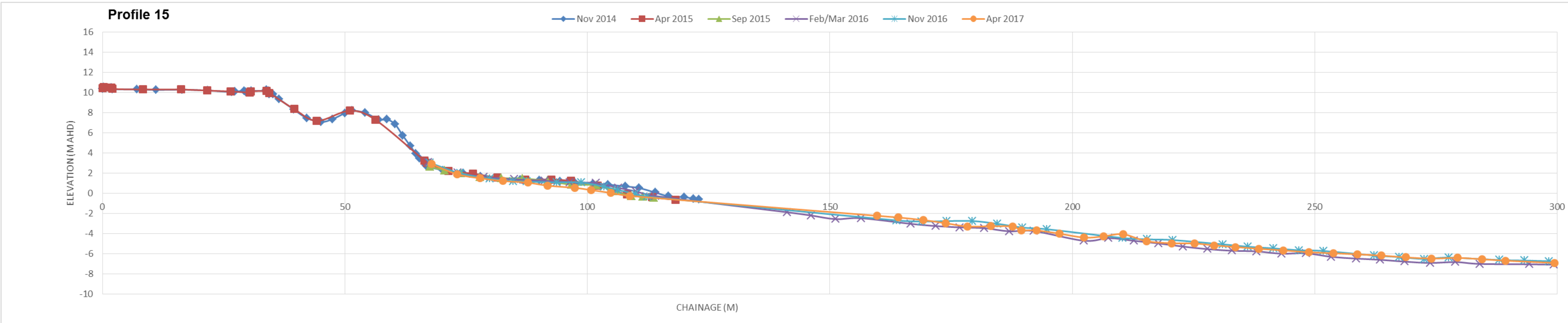
Profile 12
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)



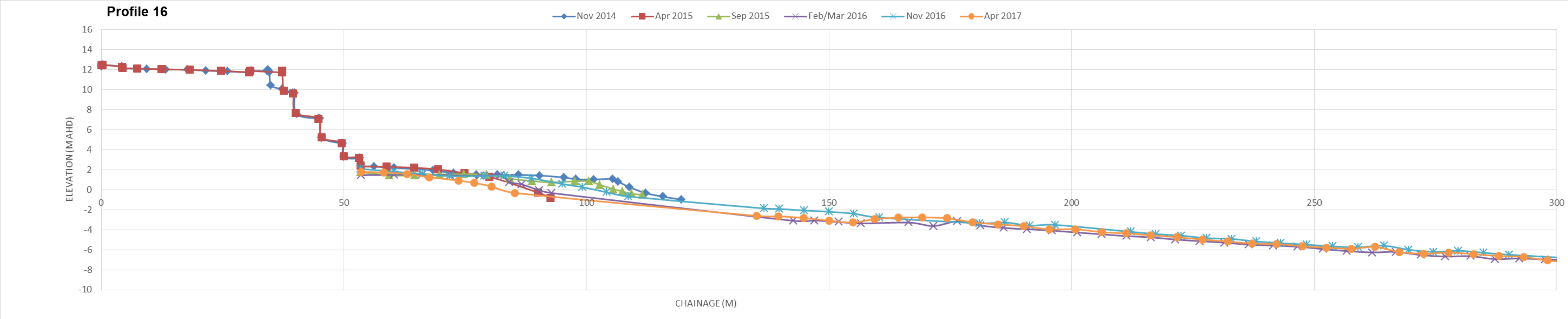
Profile 13
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

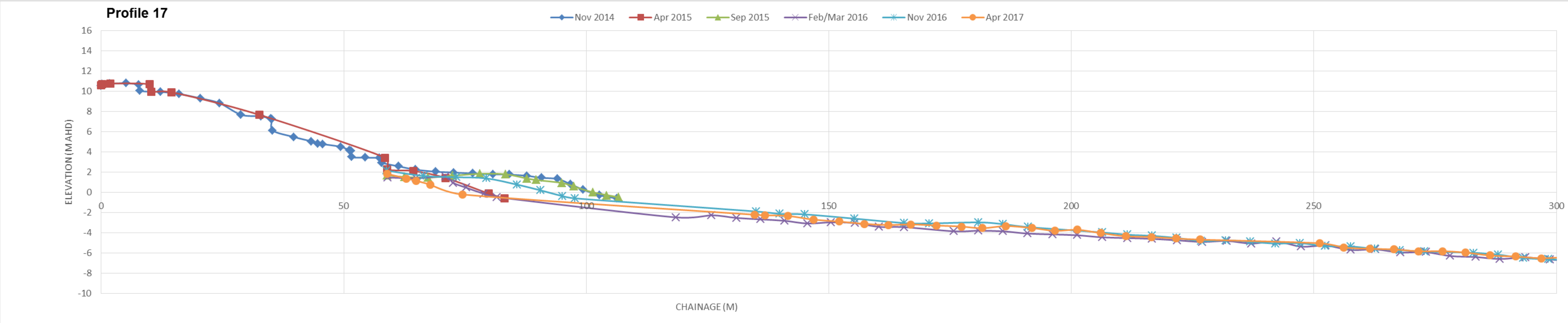


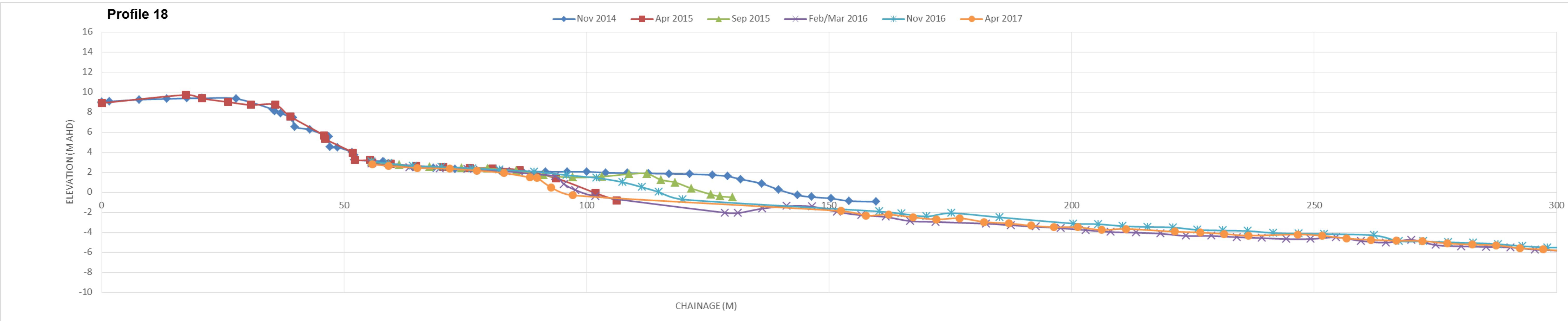
Profile 14
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

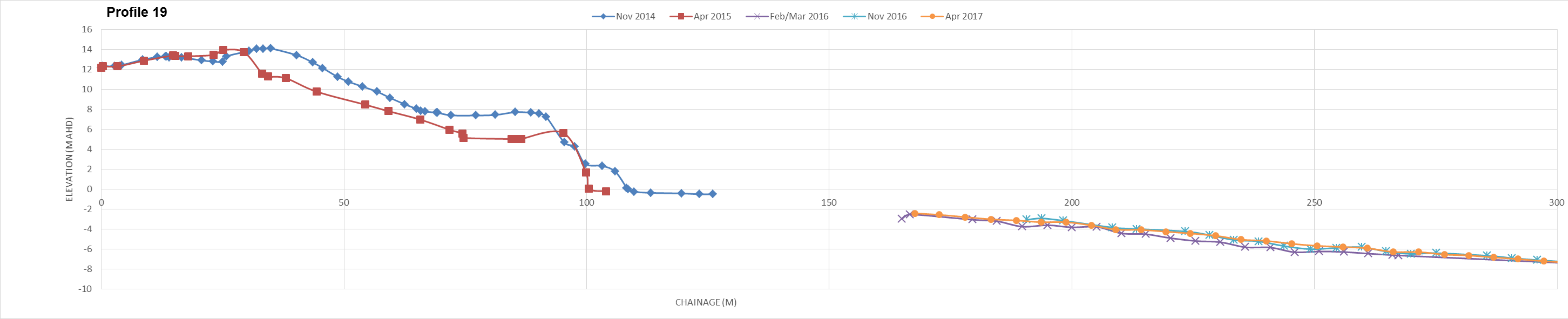


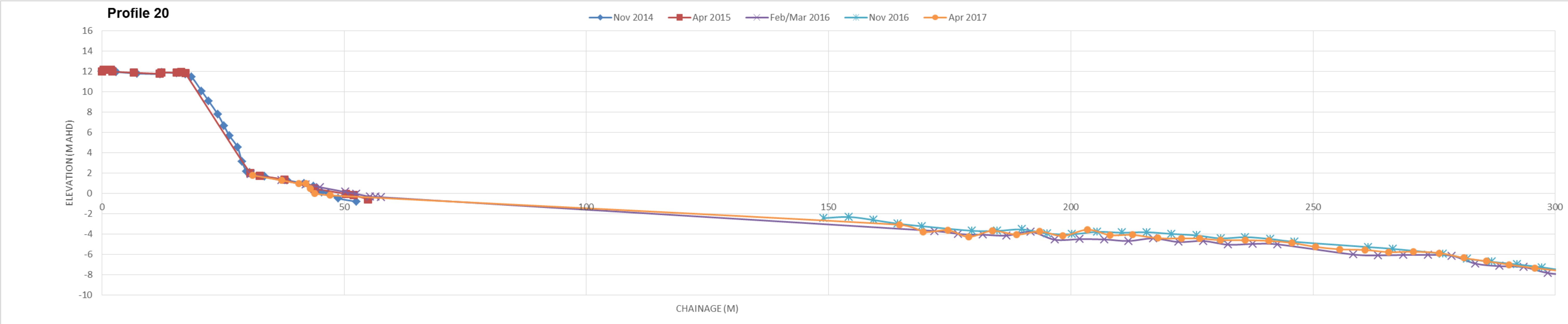
Profile 15
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

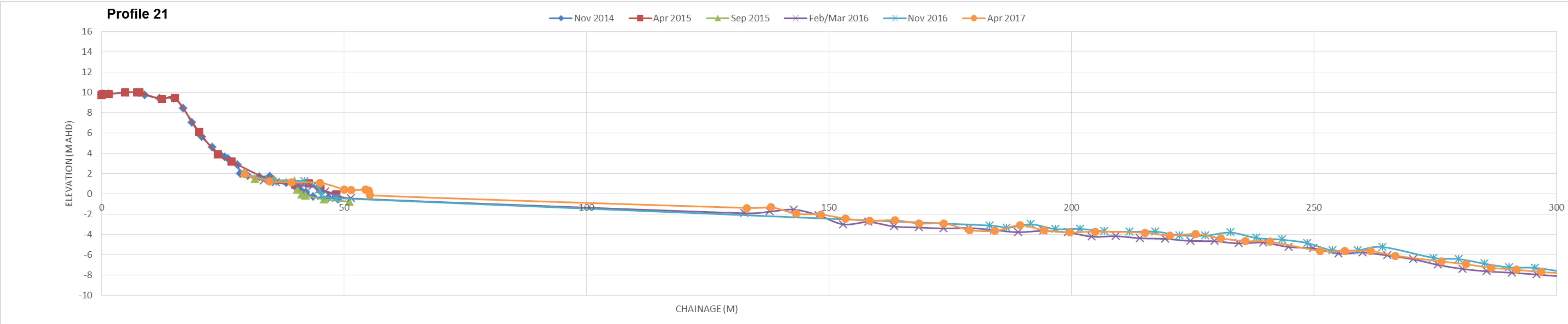

Profile 16
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

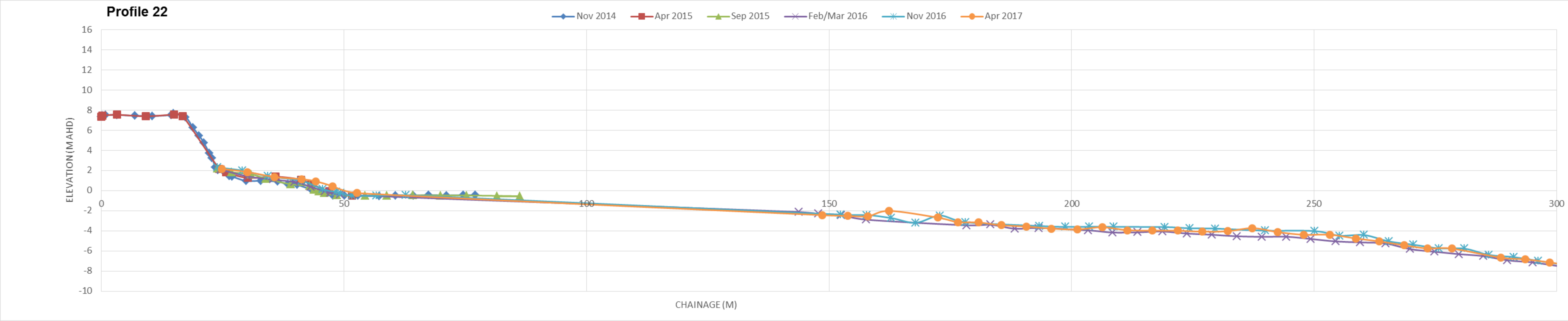

Profile 17
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

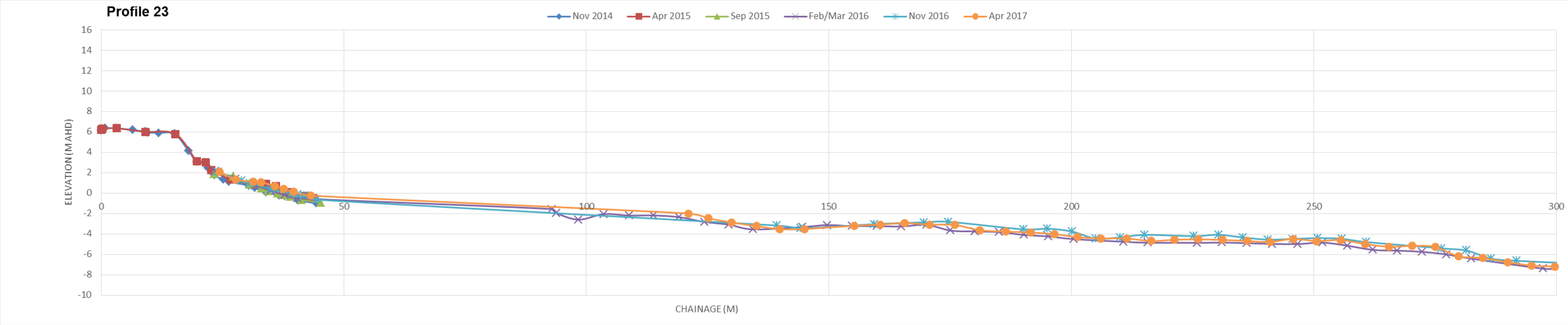

Profile 18
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

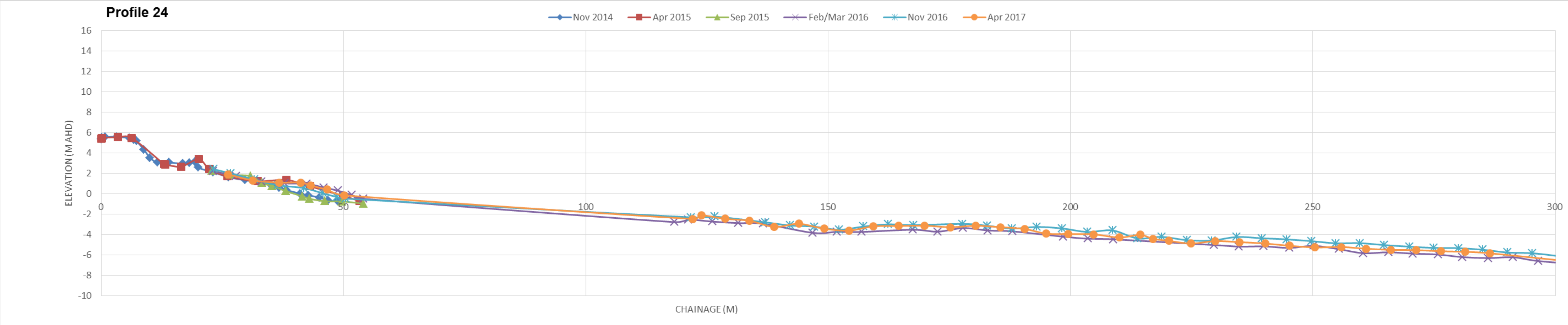

Profile 19
Nov 2014
Apr 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

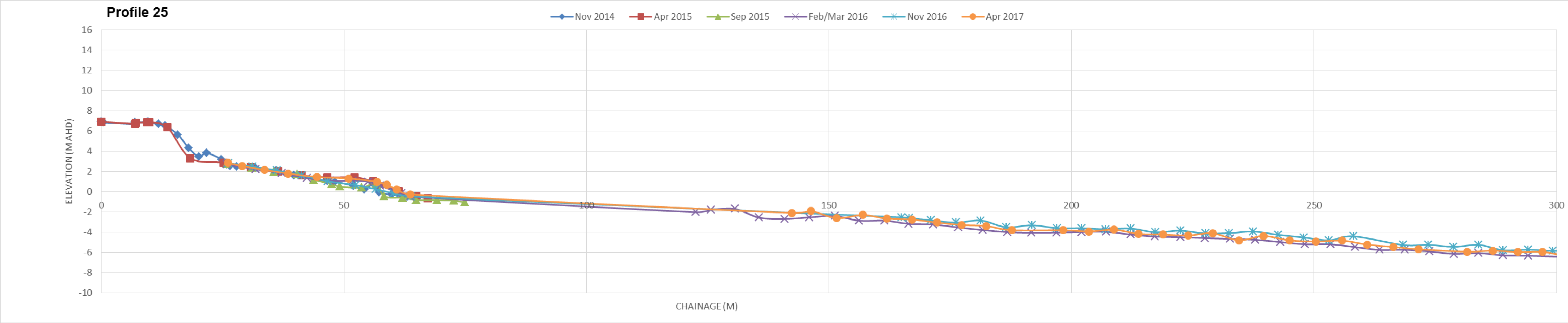

Profile 20
Nov 2014
Apr 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

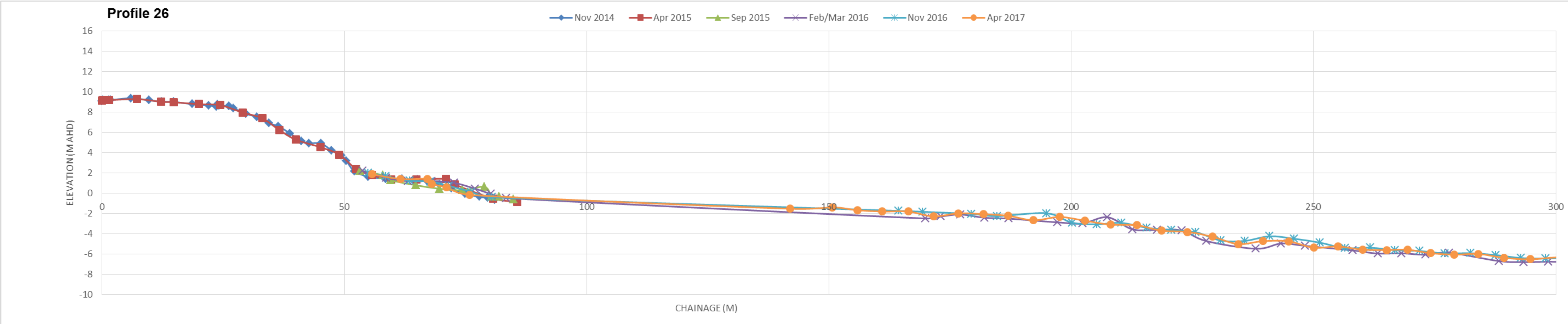

Profile 21
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

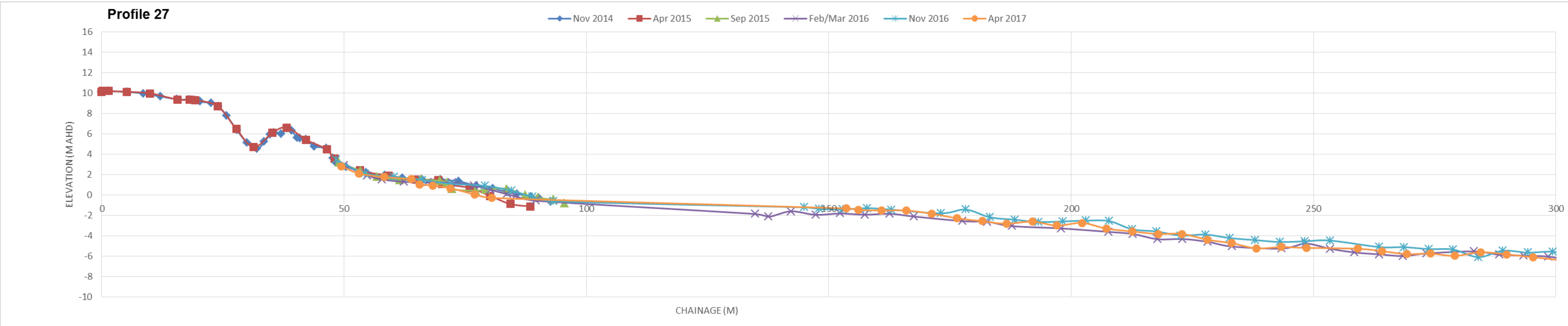

Profile 22
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
50
100
150
200
250
300
CHAINAGE (M)

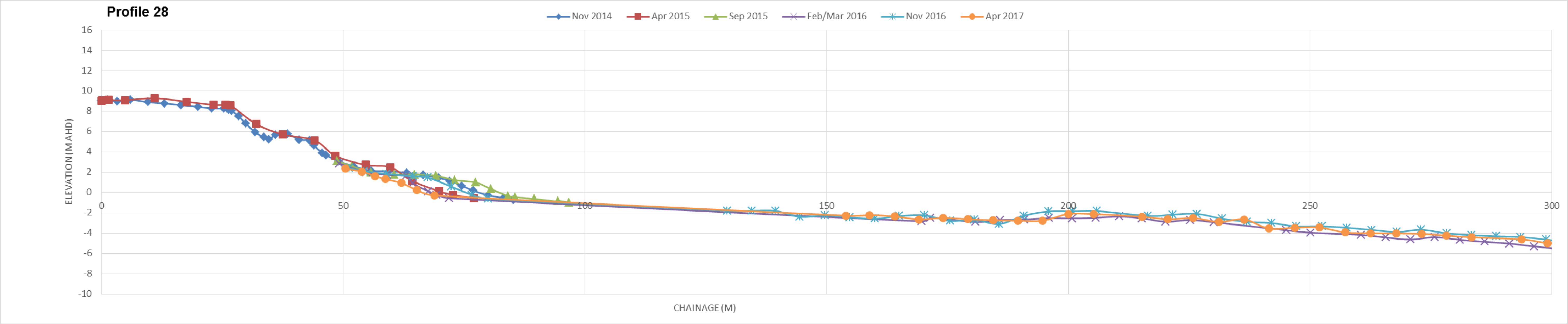

Profile 23
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
50
100
150
200
250
300
CHAINAGE (M)

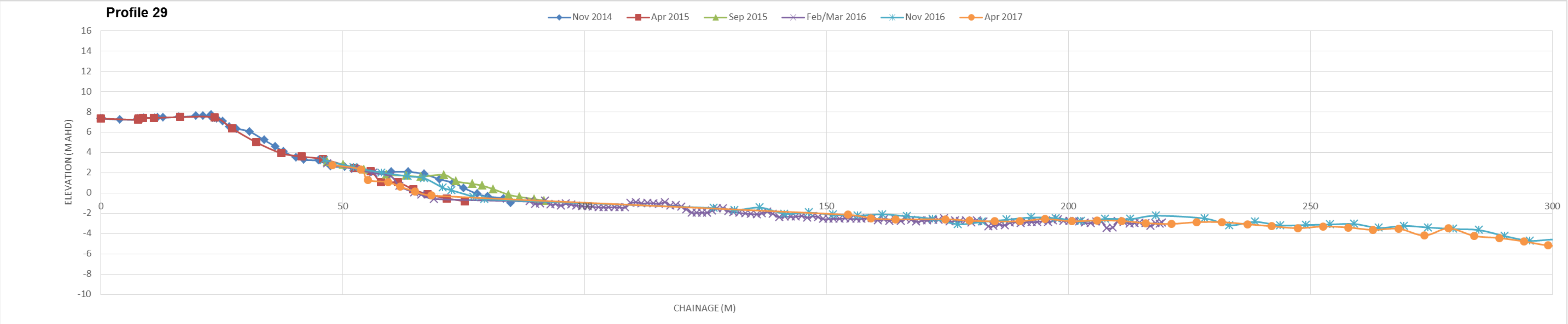

Profile 24
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
50
100
150
200
250
300
CHAINAGE (M)

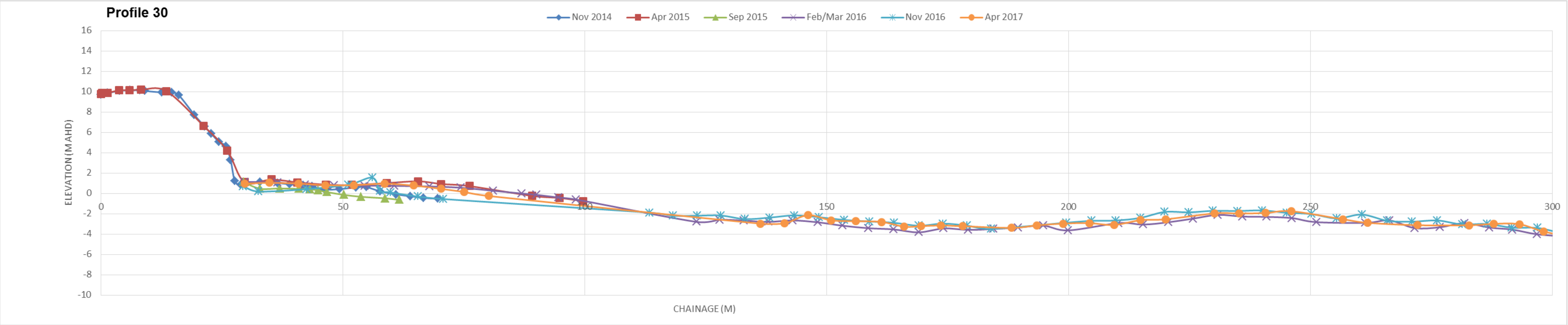

Profile 25
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
50
100
150
200
250
300

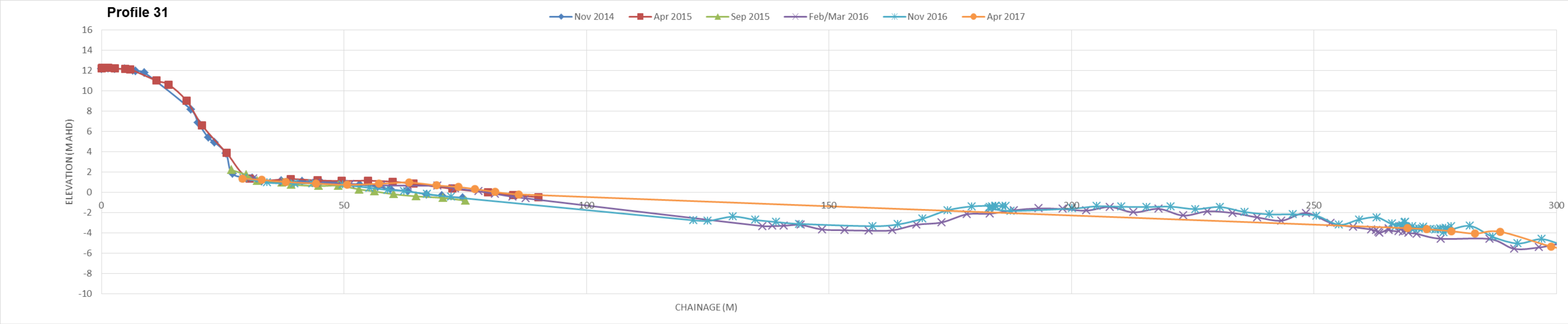

Profile 26
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
50
100
150
200
250
300

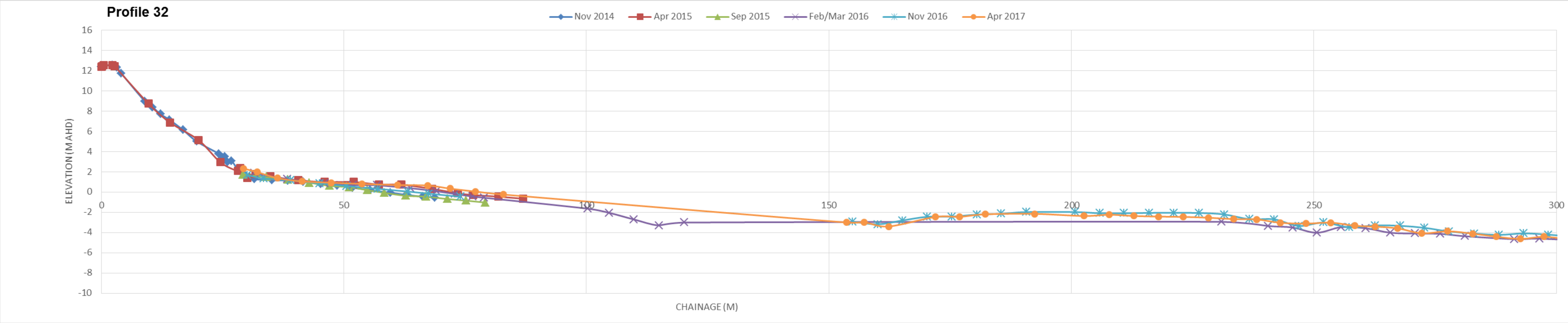

Profile 27
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
50
100
150
200
250
300

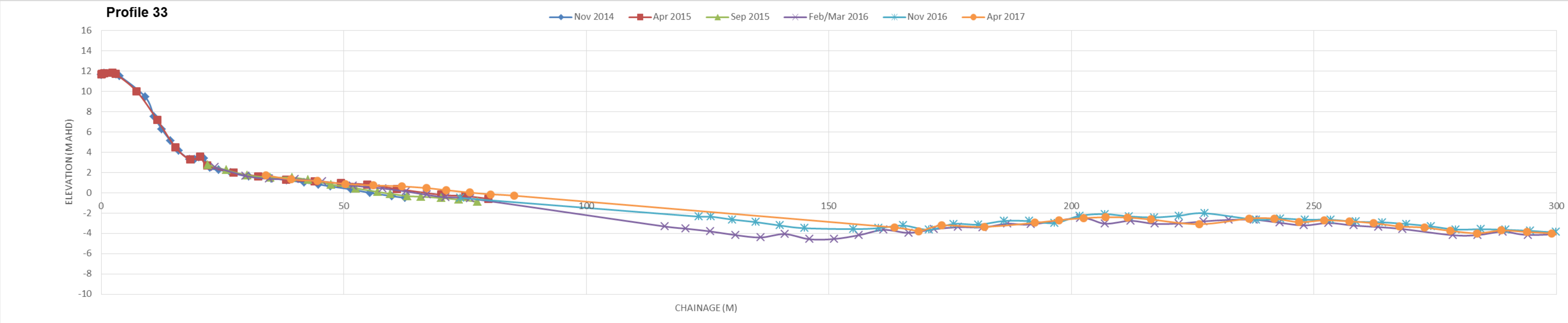

Profile 28
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

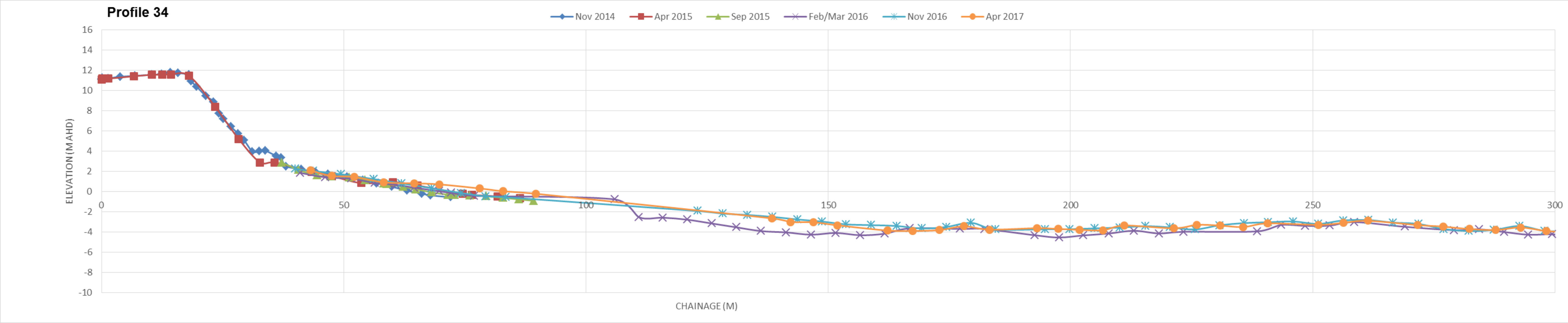

Profile 29
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)


Profile 30
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

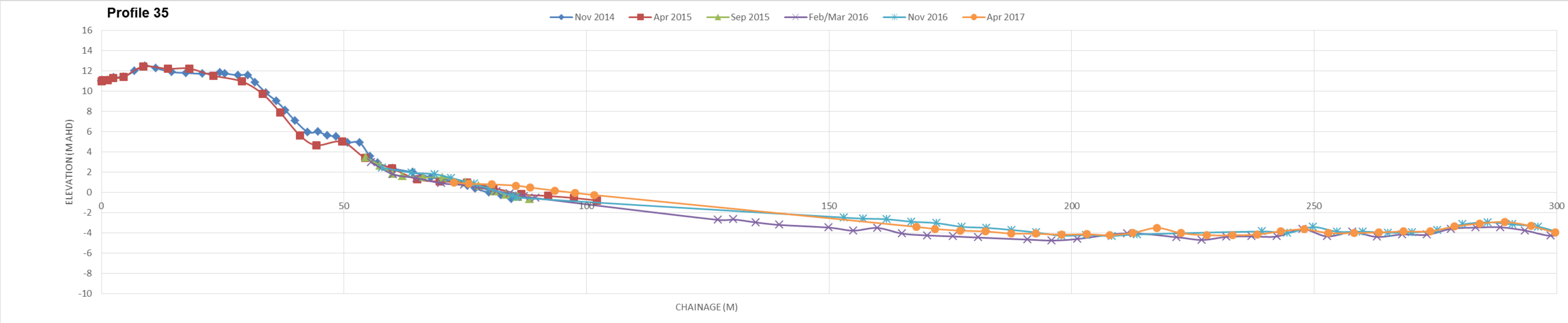

Profile 31
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
50
100
150
200
250
300


Profile 32
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
50
100
150
200
250
300

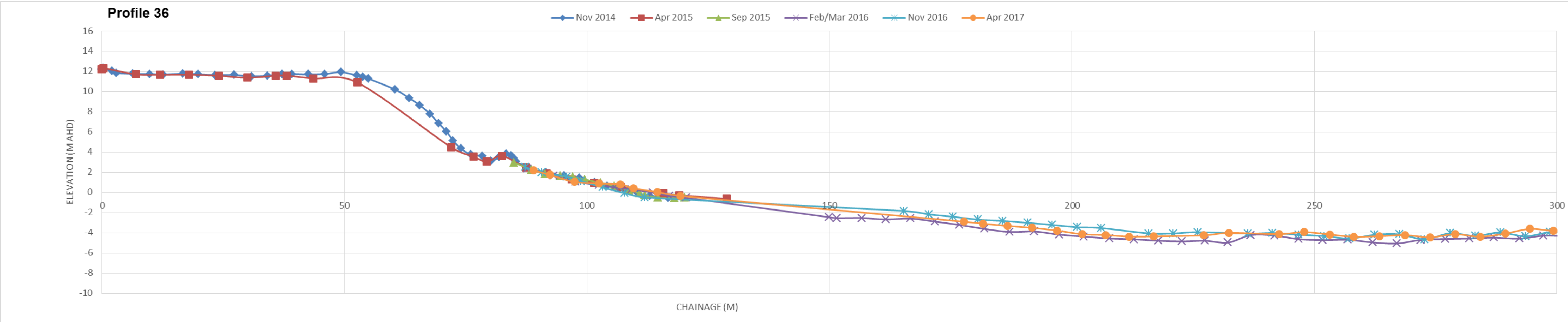

Profile 33
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
50
100
150
200
250
300



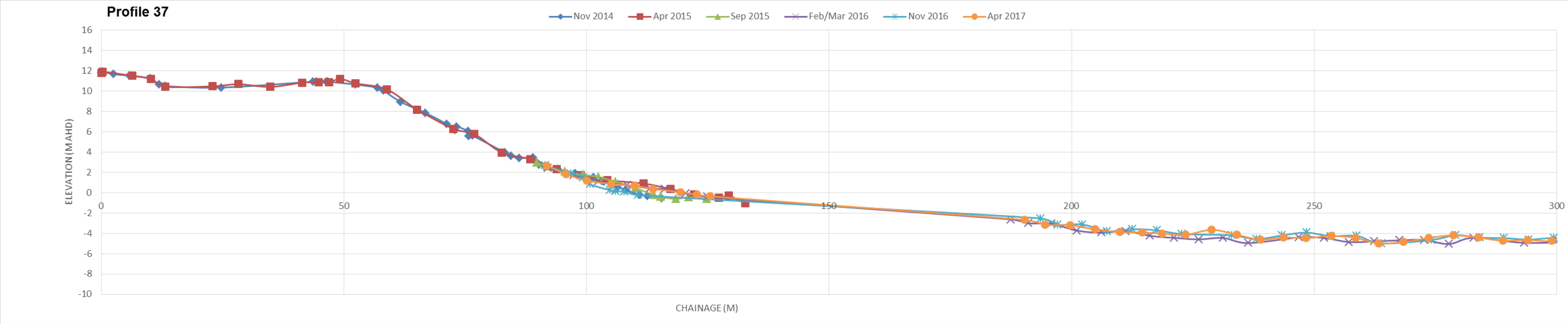
Profile 34
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

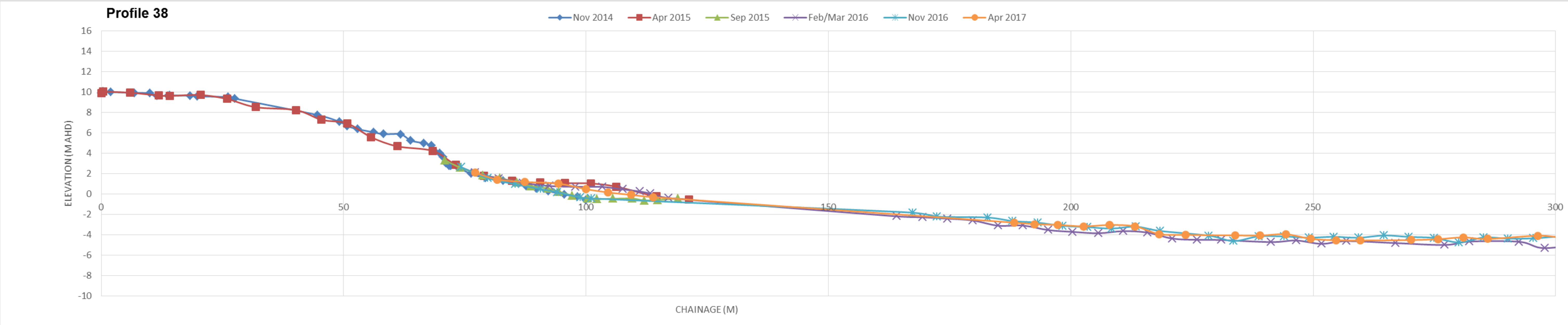


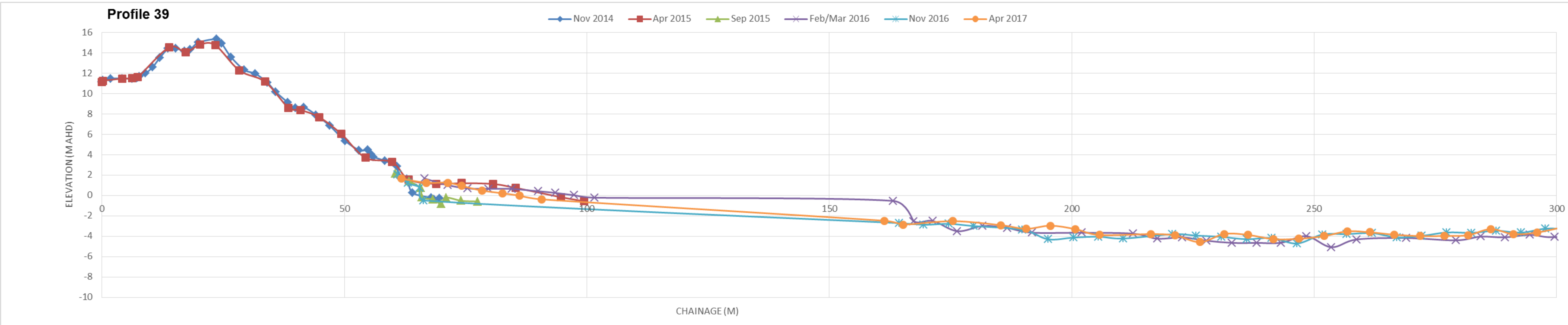
Profile 35
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)



Profile 36
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

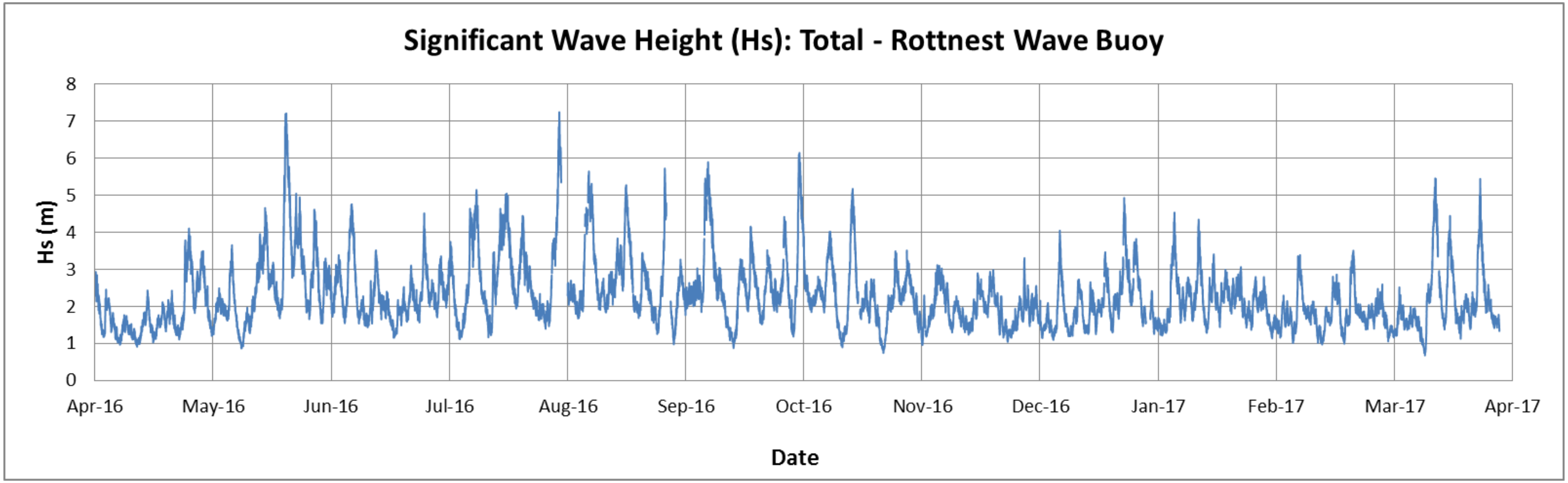

Profile 37
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

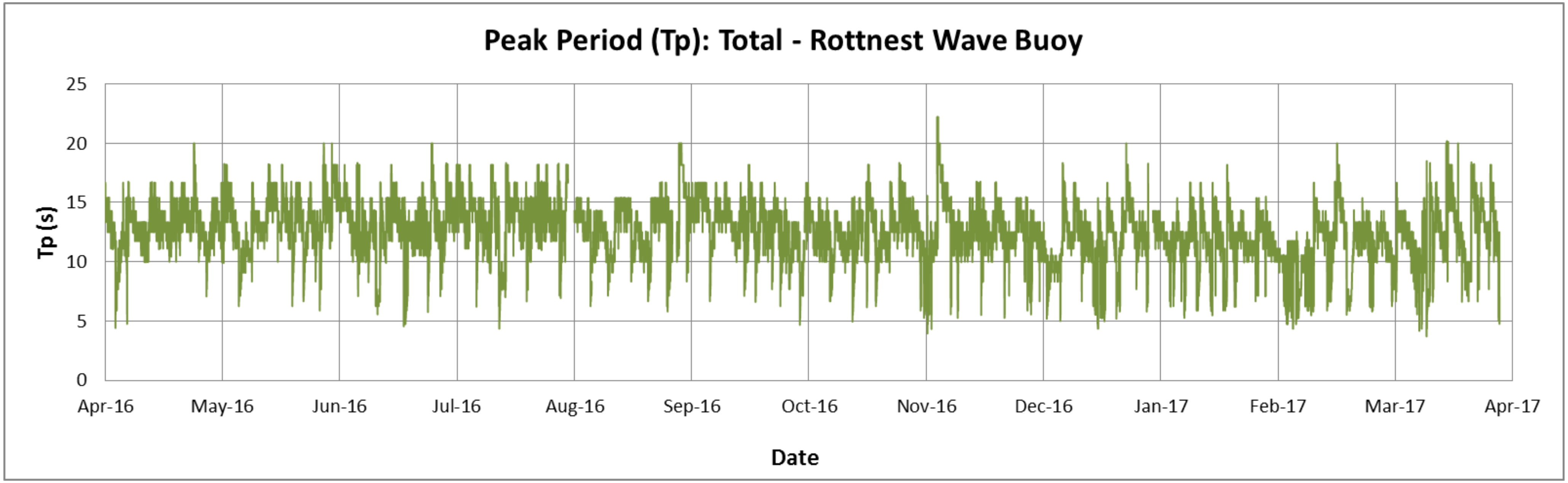

Profile 38
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

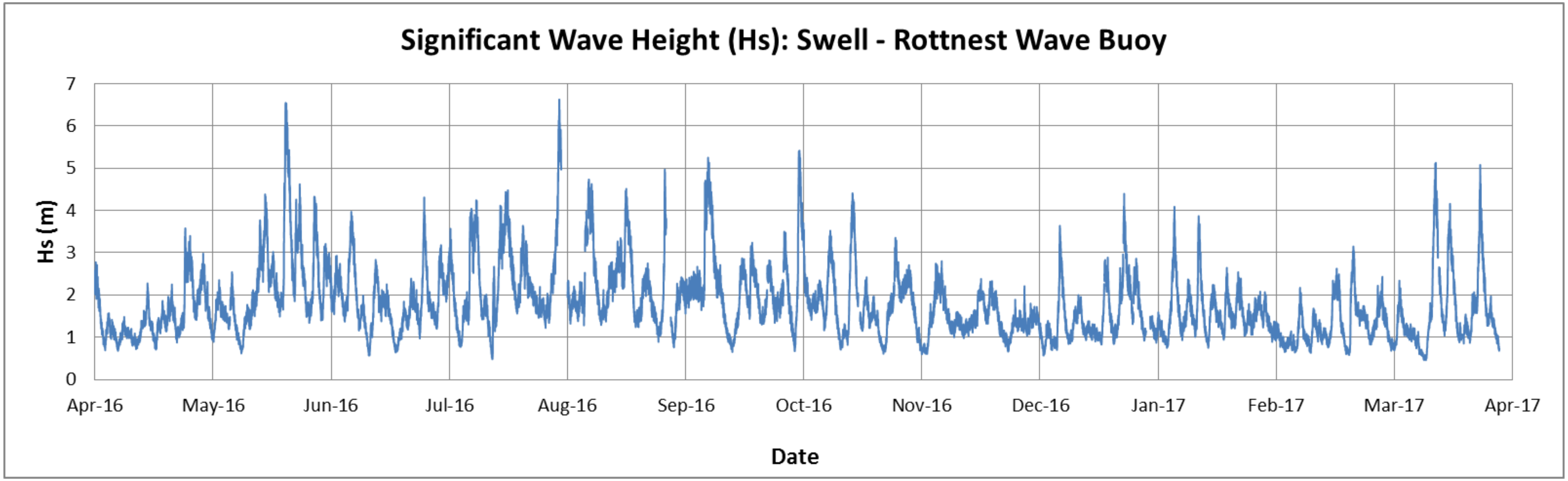

Profile 39
Nov 2014
Apr 2015
Sep 2015
Feb/Mar 2016
Nov 2016
Apr 2017
ELEVATION (M AHD)
CHAINAGE (M)

Appendix B

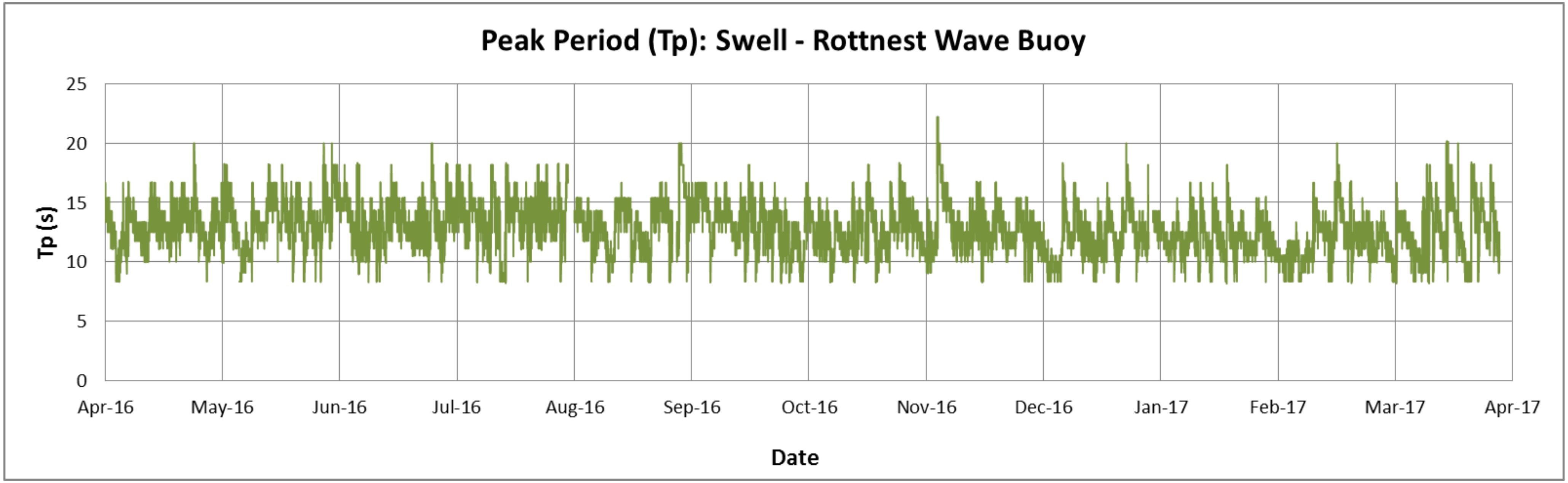
Wave Buoy Data at Rottnest and Cottesloe Wave Buoys: April 2016 to March 2017


Significant Wave Height (Hs): Total - Rottnest Wave Buoy
Hs (m)
8
7
6
5
4
3
2
1
0
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
Date

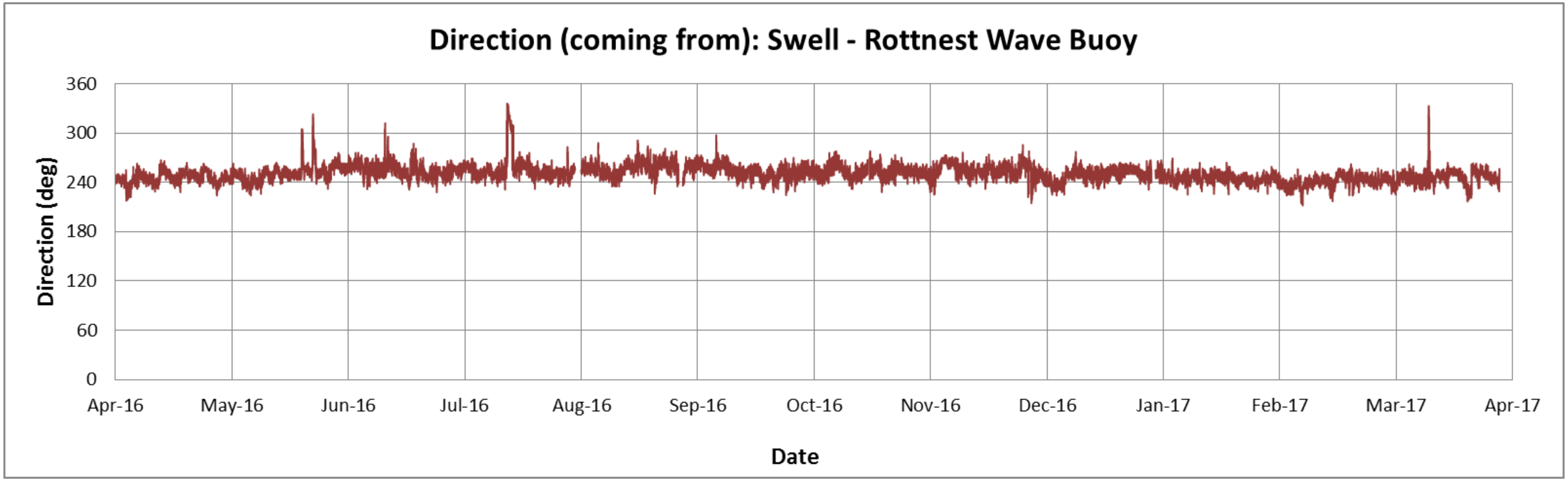

Peak Period (Tp): Total - Rottnest Wave Buoy
Tp (s)
25
20
15
10
5
0
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
Date

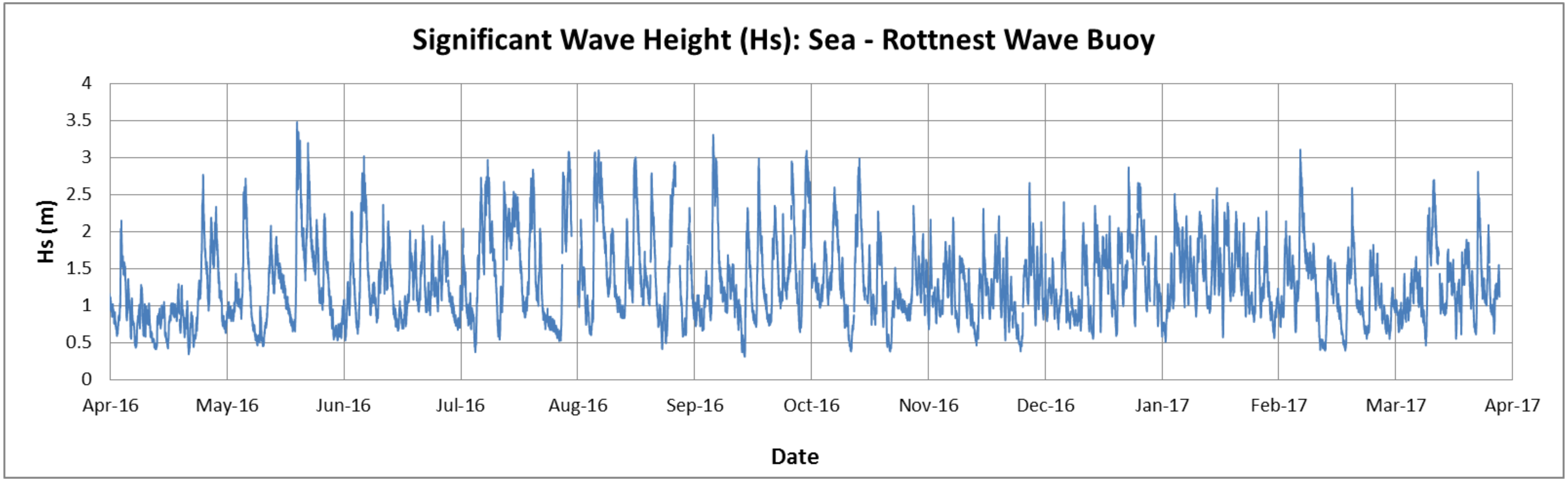


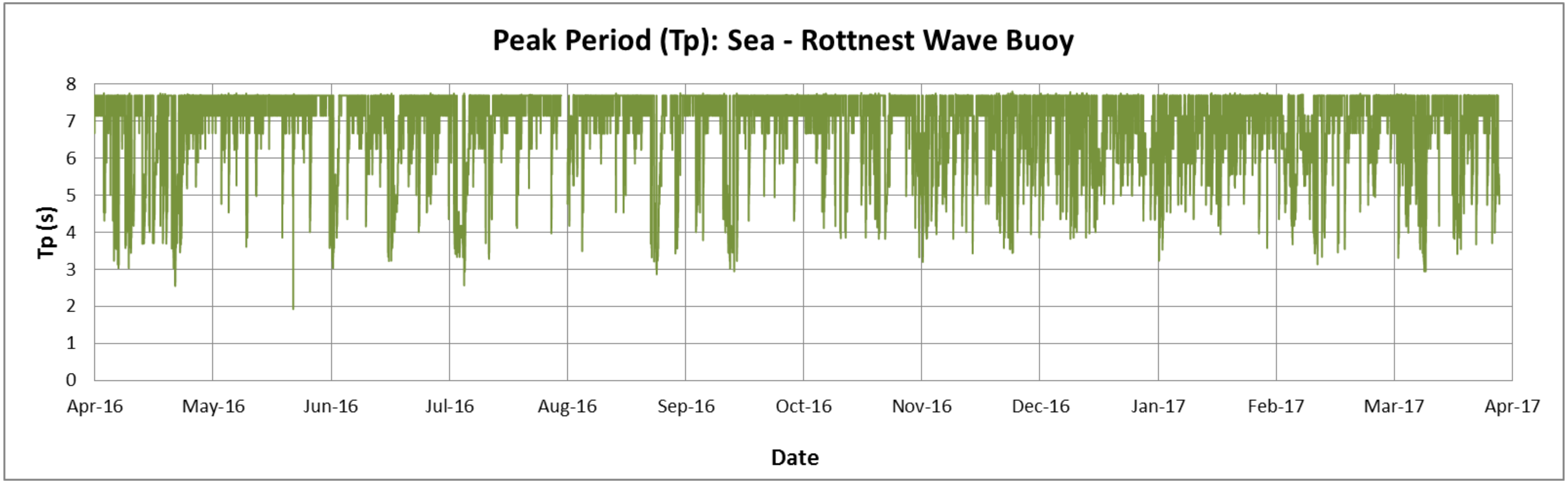
Significant Wave Height (Hs): Swell - Rottnest Wave Buoy
Hs (m)
0
1
2
3
4
5
6
7
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
Date

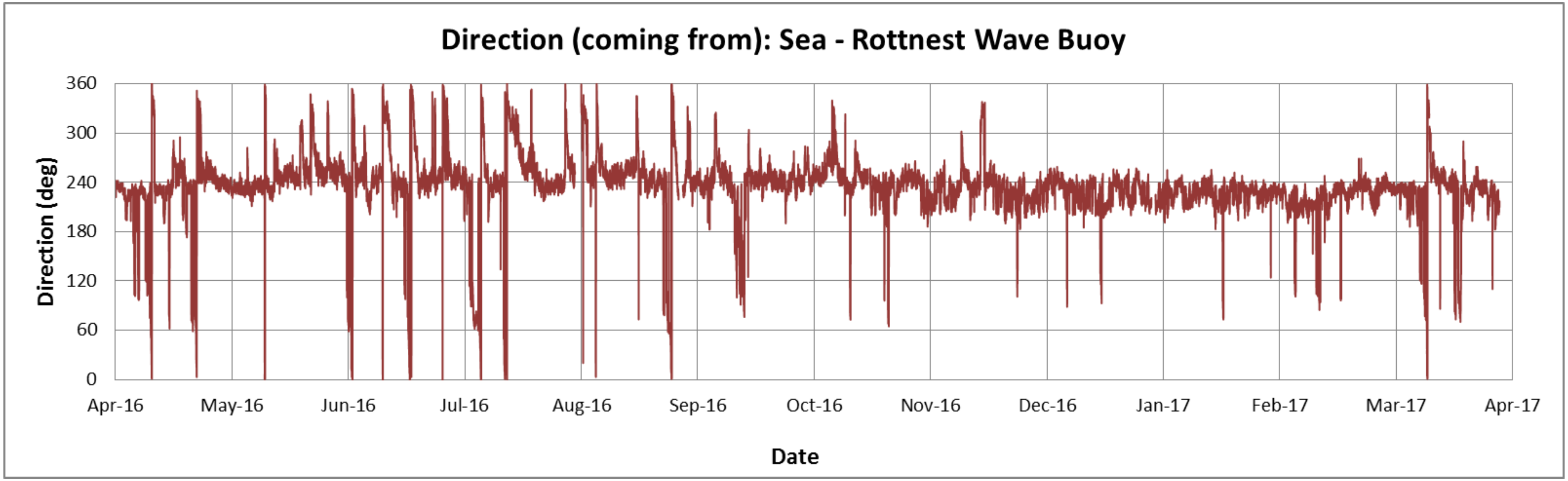


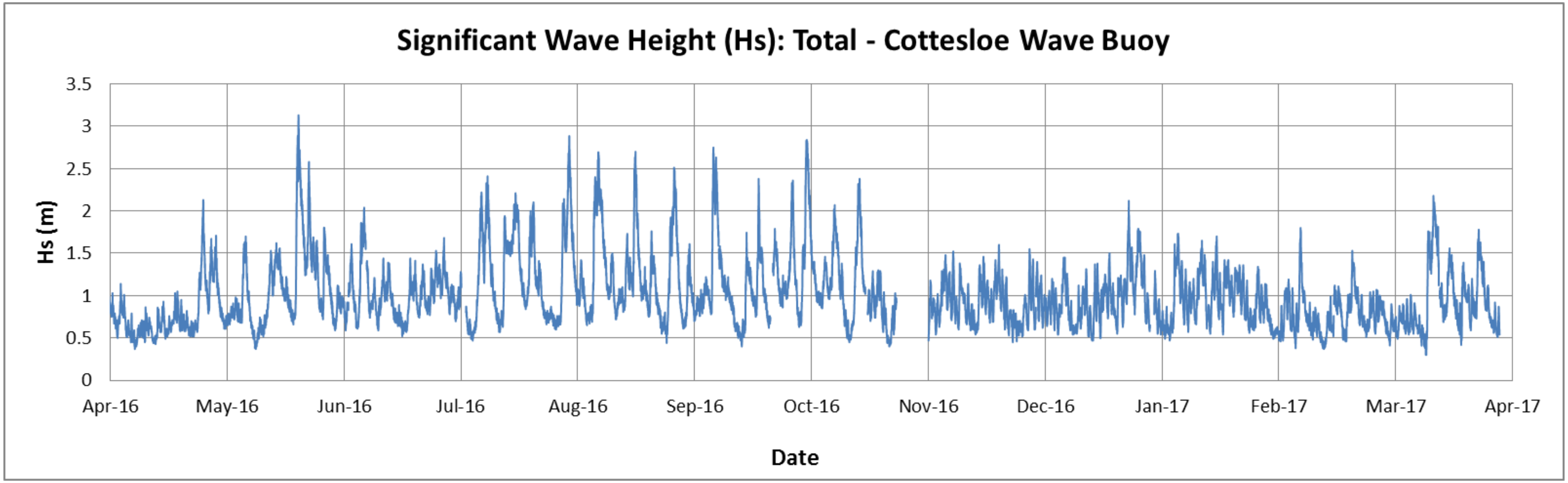
Peak Period (Tp): Swell - Rottnest Wave Buoy
Tp (s)
0
5
10
15
20
25
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
Date


Direction (coming from): Swell - Rottnest Wave Buoy
Direction (deg)
360
300
240
180
120
60
0
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
Date

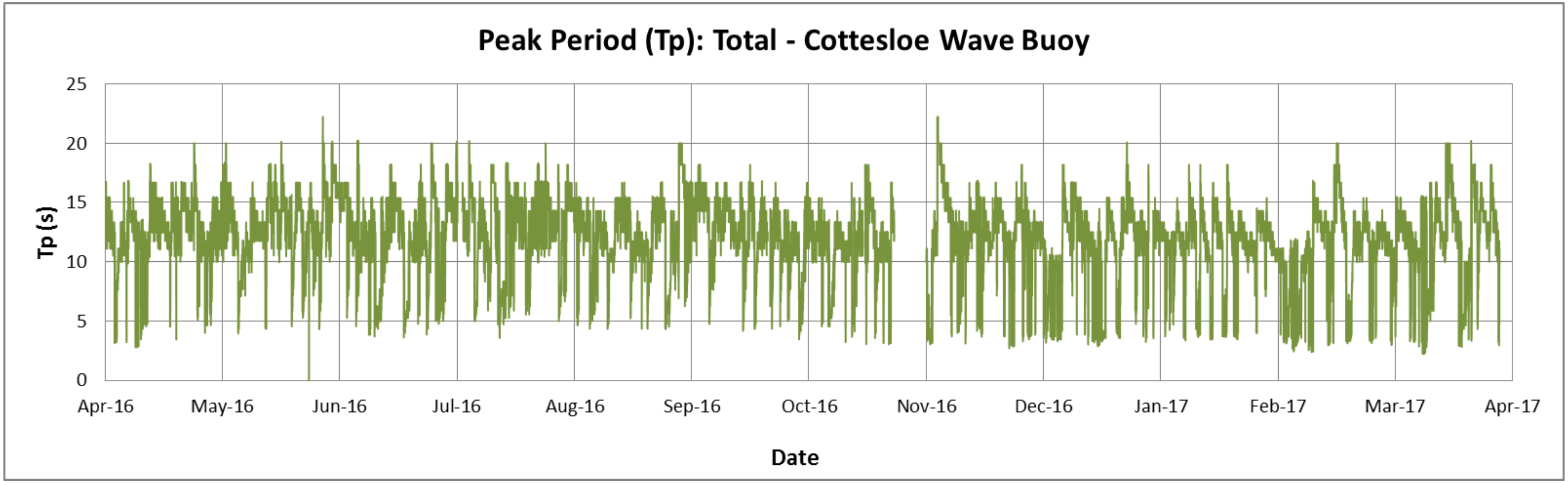

Significant Wave Height (Hs): Sea - Rottnest Wave Buoy
Hs (m)
4
3.5
3
2.5
2
1.5
1
0.5
0
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
Date


Peak Period (Tp): Sea - Rottnest Wave Buoy
Tp (s)
8
7
6
5
4
3
2
1
0
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
Date

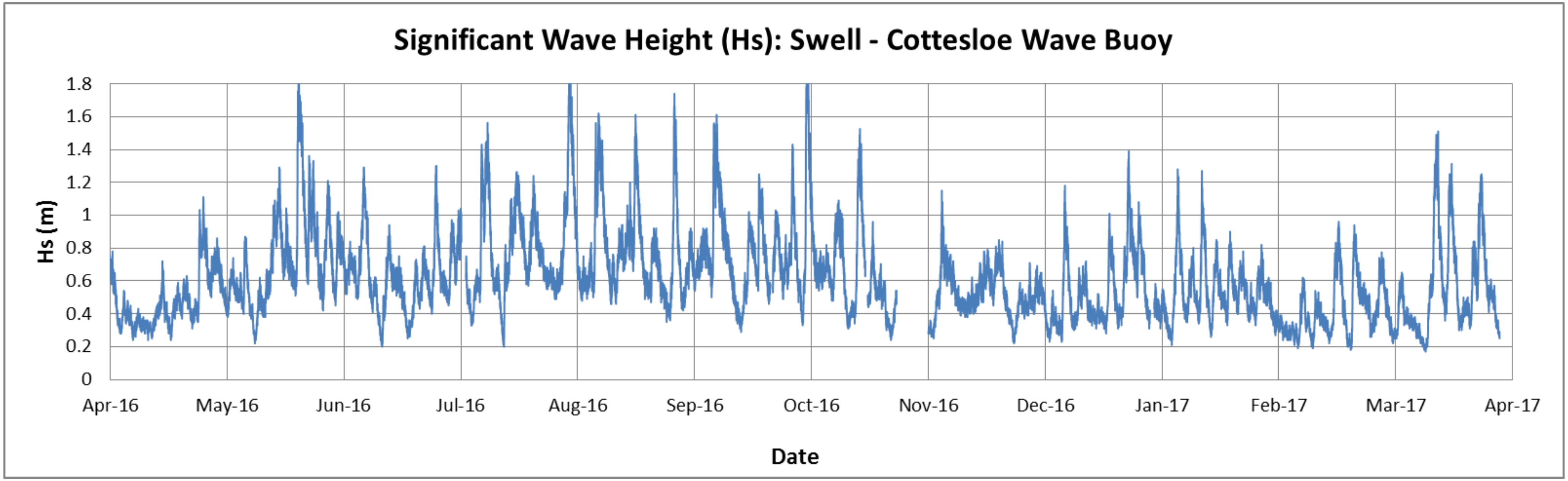

Direction (coming from): Sea - Rottnest Wave Buoy
Direction (deg)
360
300
240
180
120
60
0
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
Date

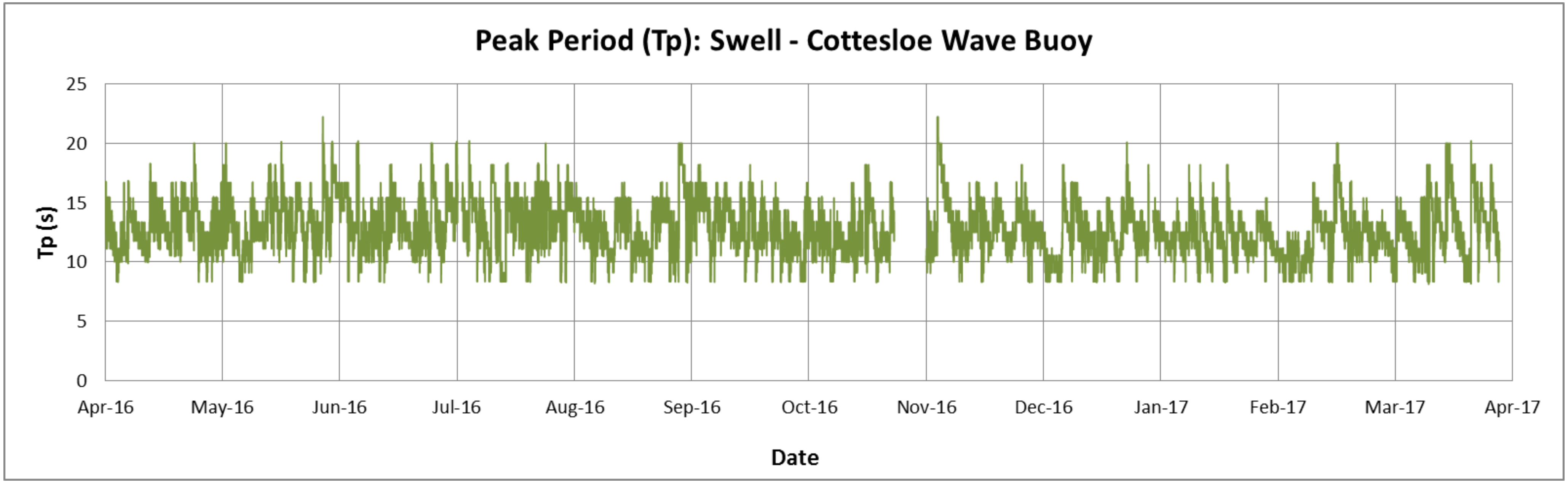


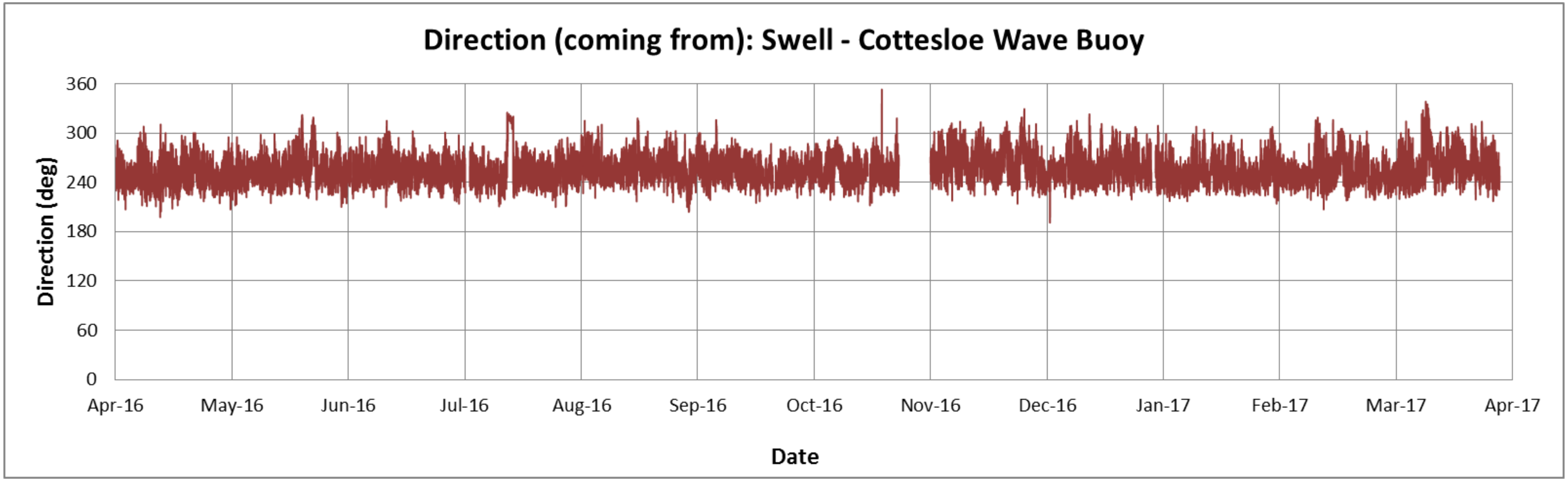
Significant Wave Height (Hs): Total - Cottesloe Wave Buoy
Hs (m)
3.5
3
2.5
2
1.5
1
0.5
0
Apr-16 May-16 Jun-16 Jul-16 Aug-16 Sep-16 Oct-16 Nov-16 Dec-16 Jan-17 Feb-17 Mar-17 Apr-17
Date

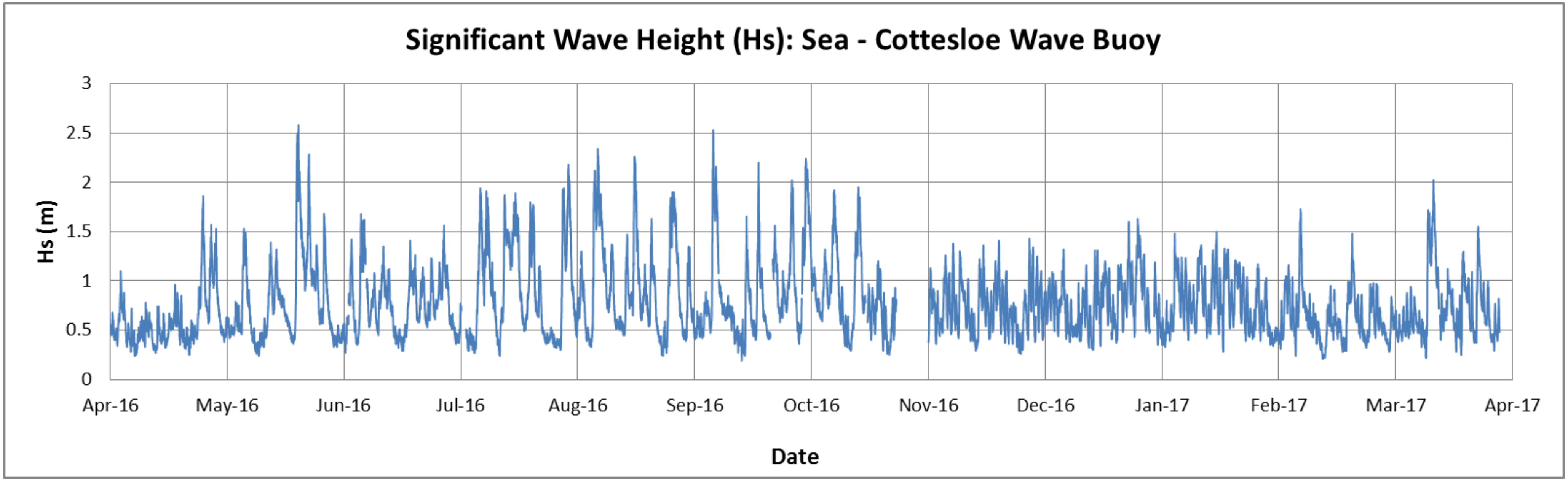


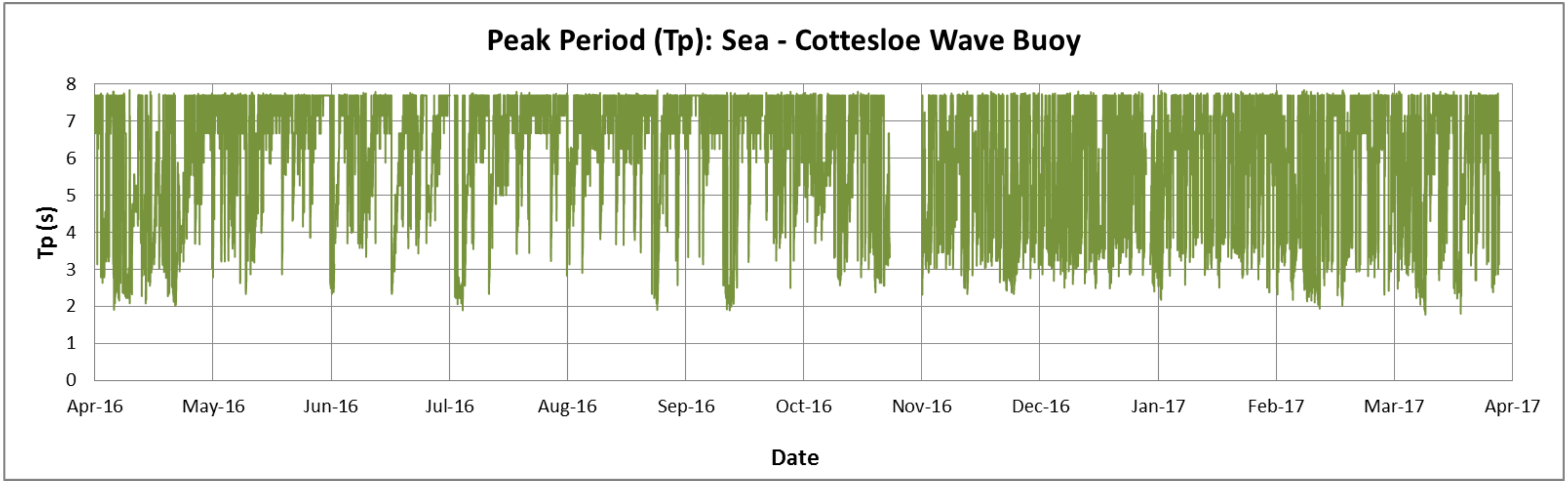
Peak Period (Tp): Total - Cottesloe Wave Buoy
Tp (s)
25
20
15
10
5
0
Apr-16 May-16 Jun-16 Jul-16 Aug-16 Sep-16 Oct-16 Nov-16 Dec-16 Jan-17 Feb-17 Mar-17 Apr-17
Date

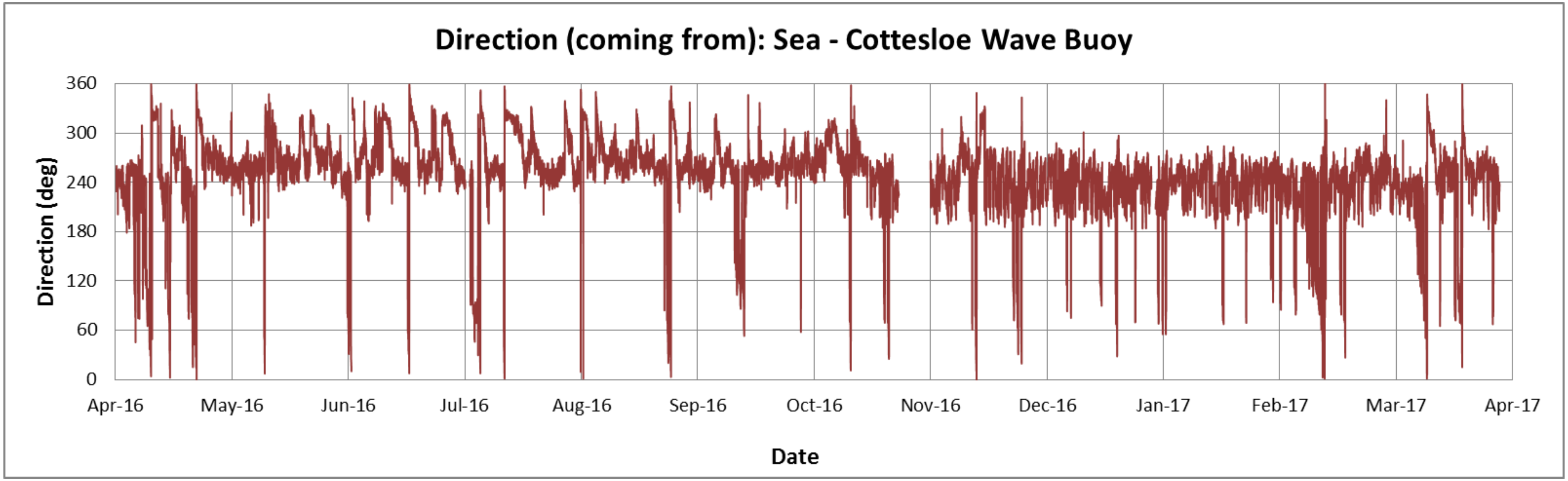

Significant Wave Height (Hs): Swell - Cottesloe Wave Buoy
Hs (m)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
Date


Peak Period (Tp): Swell - Cottesloe Wave Buoy
Tp (s)
0
5
10
15
20
25
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
Date


Direction (coming from): Swell - Cottesloe Wave Buoy
Direction (deg)
360
300
240
180
120
60
0
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
Date

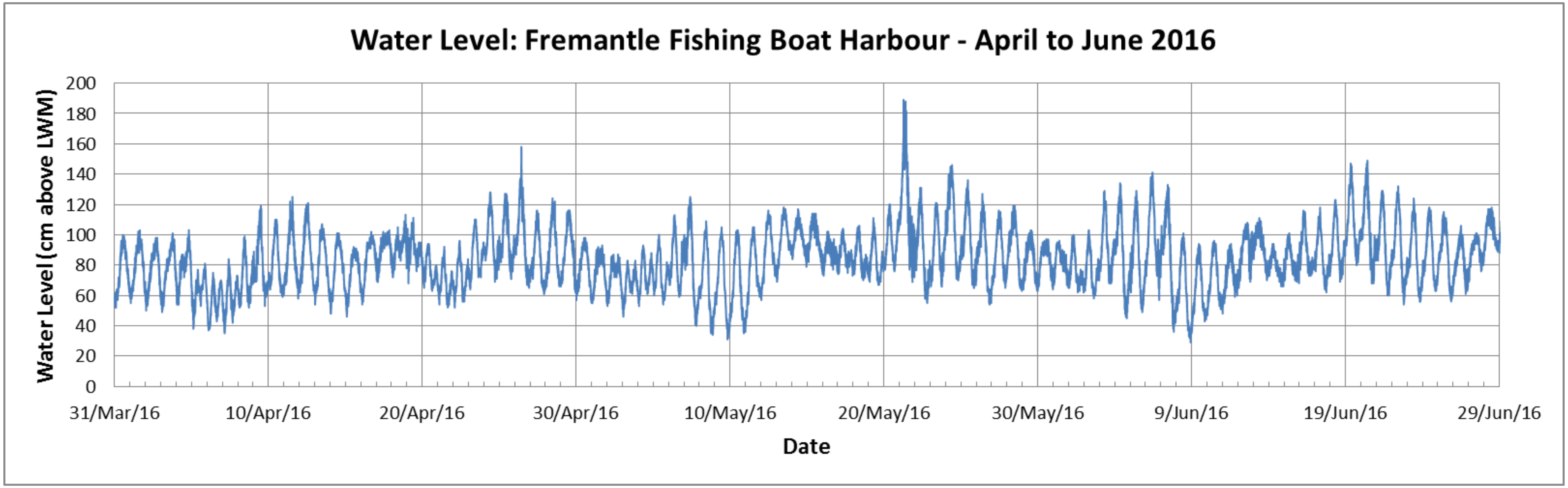

Significant Wave Height (Hs): Sea - Cottesloe Wave Buoy
Hs (m)
3
2.5
2
1.5
1
0.5
0
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
Date

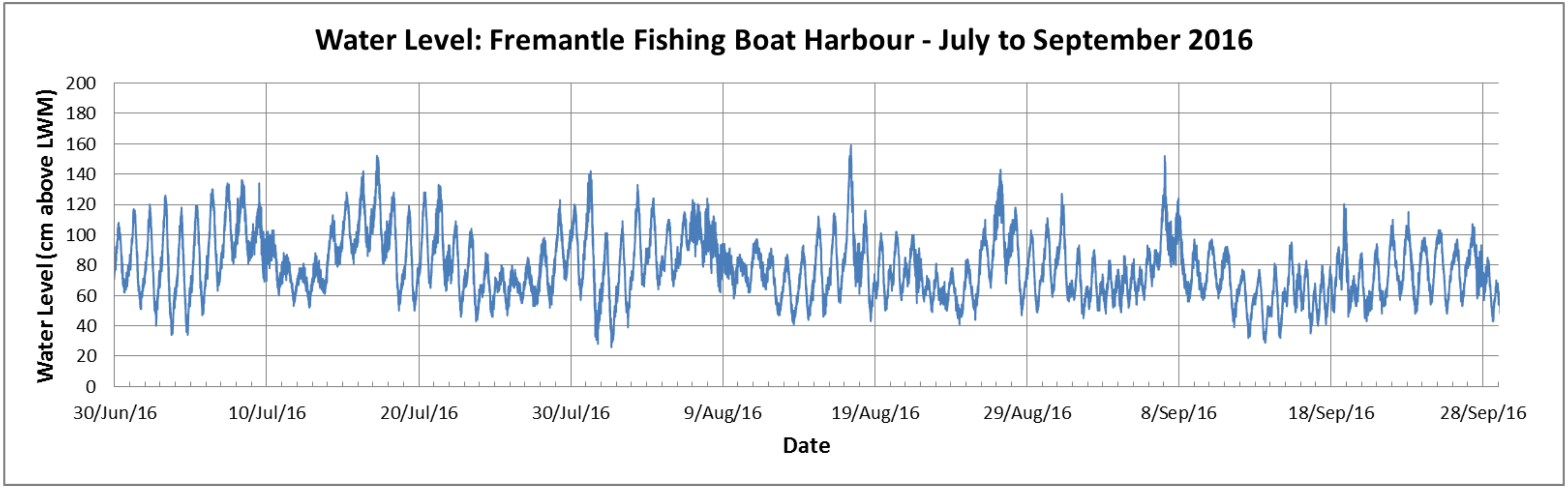

Peak Period (Tp): Sea - Cottesloe Wave Buoy
Tp (s)
0
1
2
3
4
5
6
7
8
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
Date

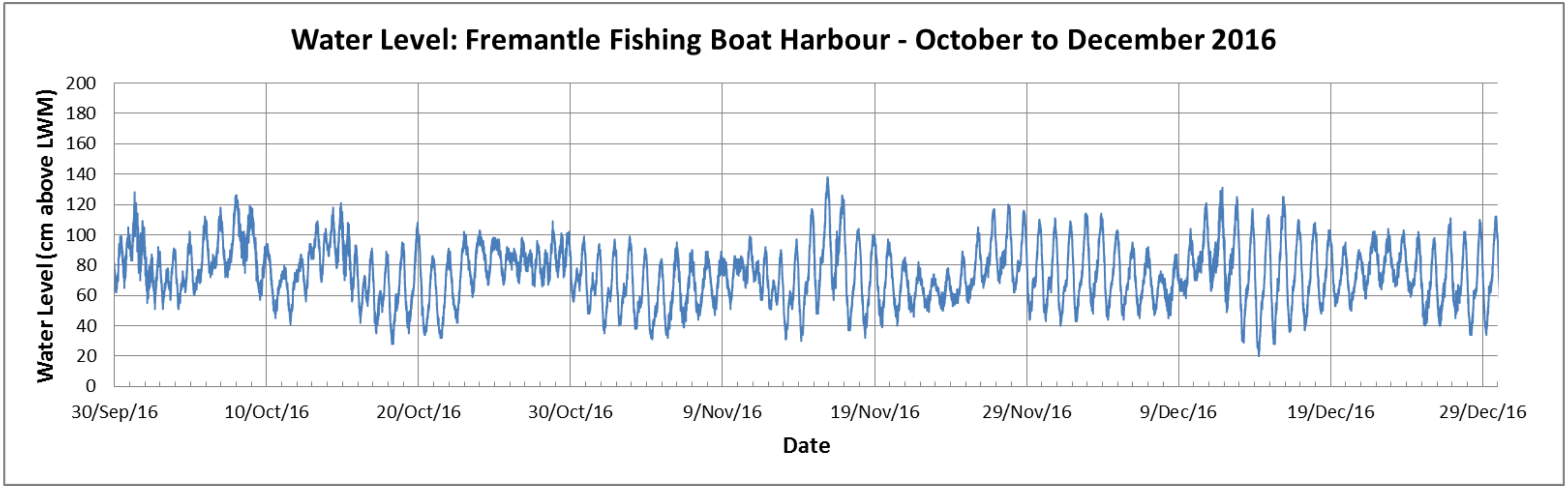

Direction (coming from): Sea - Cottesloe Wave Buoy
Direction (deg)
0
60
120
180
240
300
360
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
Date

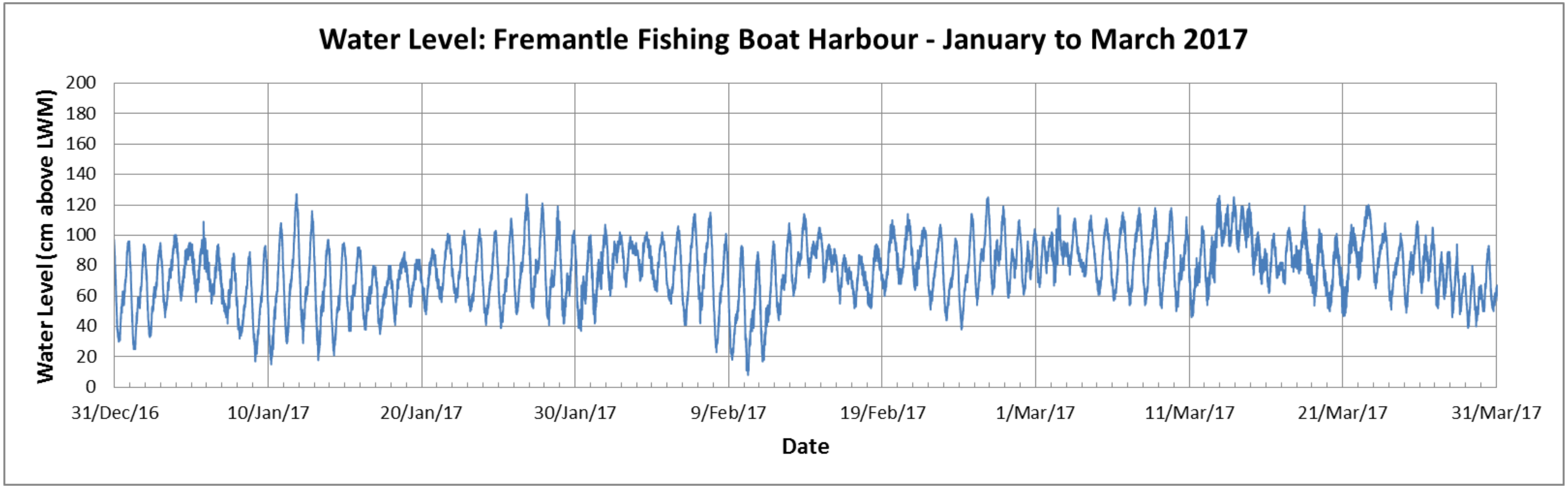
Appendix C

Water Level Data at Fremantle: April 2016 to March 2017


Water Level: Fremantle Fishing Boat Harbour - April to June 2016
Water Level (cm above LWM)
200
180
160
140
120
100
80
60
40
20
0
31/Mar/16
10/Apr/16
20/Apr/16
30/Apr/16
10/May/16
20/May/16
30/May/16
9/Jun/16
19/Jun/16
29/Jun/16
Date


Water Level: Fremantle Fishing Boat Harbour - July to September 2016
Water Level (cm above LWM)
200
180
160
140
120
100
80
60
40
20
0
30/Jun/16
10/Jul/16
20/Jul/16
30/Jul/16
9/Aug/16
19/Aug/16
29/Aug/16
8/Sep/16
18/Sep/16
28/Sep/16
Date


Water Level: Fremantle Fishing Boat Harbour - October to December 2016
Water Level (cm above LWM)
200
180
160
140
120
100
80
60
40
20
0
30/Sep/16
10/Oct/16
20/Oct/16
30/Oct/16
9/Nov/16
19/Nov/16
29/Nov/16
9/Dec/16
19/Dec/16
29/Dec/16
Date


Water Level: Fremantle Fishing Boat Harbour - January to March 2017
Water Level (cm above LWM)
200
180
160
140
120
100
80
60
40
20
0
31/Dec/16
10/Jan/17
20/Jan/17
30/Jan/17
9/Feb/17
19/Feb/17
1/Mar/17
11/Mar/17
21/Mar/17
31/Mar/17
Date

Appendix D

Daily Weather Observations at Swanbourne: April 2016 to March 2017

Swanbourne, Western Australia
April 2016 Daily Weather Observations

Most observations from a site just under 1 km from the coast, combined with some from Mount Lawley.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Fr	18.5	23.8	0			S	31	09:59	21.8	70		WSW	9	1018.0	22.6	60		SSW	19	1017.0
2	Sa	14.4	26.6	0			SSW	30	16:09	21.3	62		E	9	1022.6	23.7	69		SSW	15	1018.8
3	Su	16.5	28.6	0			SSW	28	16:47	25.0	47		E	9	1020.8	26.7	58		SW	9	1016.7
4	Mo	18.0	25.2	0			SSW	37	21:33	22.0	73		SSW	15	1018.0	22.7	72		SSW	20	1016.0
5	Tu	13.0	22.0	0			SE	41	10:32	15.8	58		SSE	20	1024.7	21.2	32		ESE	13	1022.8
6	We	11.5	23.9	0			E	41	09:44	16.4	55		ESE	13	1028.9	23.2	33		SE	17	1025.0
7	Th	13.8	24.8	0			E	35	08:22	17.4	54		E	19	1025.6	21.1	54		SSW	20	1021.2
8	Fr	16.4	28.1	0			E	39	09:32	19.4	45		E	24	1019.1	26.8	42		NNW	6	1016.3
9	Sa	18.1	23.0	0			ESE	35	14:14	19.2	69		E	11	1019.8	21.7	62		SE	15	1018.0
10	Su	17.1	27.1	10.2			ENE	50	12:25	20.7	63		E	22	1020.8	25.5	52		E	22	1018.6
11	Mo	20.7	23.9	0			ENE	52	09:15	23.3	63		ENE	26	1020.7	20.4	98		ENE	20	1021.7
12	Tu	18.9	25.1	3.0			NNE	22	09:08	21.0	98		NNE	11	1021.8	23.4	80		WNW	11	1018.7
13	We	19.6	23.2	7.2			SW	20	14:39	20.6	99		SSW	4	1020.2	22.9	73		SW	13	1018.6
14	Th	16.1	23.1	0			SSW	35	13:10	19.4	91		ENE	6	1022.6	21.2	69		SSW	19	1021.8
15	Fr	15.1	26.6	0			E	33	23:54	21.0	64		E	13	1025.2	26.0	43		E	15	1021.6
16	Sa	18.3	32.3	0			E	41	02:46	22.4	60		ENE	24	1017.9	26.5	52		WNW	9	1014.5
17	Su	18.9	22.5	1.2			NNW	33	14:22	19.9	99		N	9	1017.0	21.3	99		NW	20	1014.6
18	Mo	19.2	22.8	0.6			NW	33	20:07	20.9	75		WSW	6	1016.4	21.0	73		WNW	9	1013.9
19	Tu	16.3	22.3	26.0			SSW	37	17:10	18.7	98		S	9	1015.1	21.7	68		SW	17	1015.1
20	We	13.9	22.3	0			SSW	39	16:16	18.5	75		ESE	9	1024.2	21.5	63		SSW	24	1023.3
21	Th	14.5	25.2	0			E	37	22:59	18.8	66		E	20	1029.1	24.9	44		ESE	13	1025.3
22	Fr	15.3	26.7	0			ENE	37	09:23	19.5	56		ENE	22	1027.1	25.7	37		E	19	1023.1
23	Sa	18.0	30.4	0			ENE	41	08:14	22.0	45		NE	22	1021.1	29.5	31		NW	9	1016.7
24	Su	20.1	24.8	0			NNW	22	10:22	22.2	51		N	13	1014.9	23.9	82		NW	9	1013.8
25	Mo	19.0	20.6	15.0			W	43	22:54	19.6	99		WNW	19	1014.2	19.9	93		W	9	1012.6
26	Tu	16.9	21.5	18.0			W	74	08:26	18.6	82		W	33	1009.9	17.5	68		WSW	28	1012.0
27	We	10.1	19.2	2.2			ESE	20	00:01	12.6	98		NNE	6	1018.6	17.9	55		SW	7	1016.3
28	Th	12.5	21.3	1.2			WSW	59	14:46	19.2	61		W	26	1015.7	17.1	91		WSW	31	1013.8
29	Fr	16.2	21.7	1.2			WSW	57	20:17	19.3	75		WNW	13	1016.2	20.1	54		WSW	28	1014.5
30	Sa	12.1	19.1	5.0			SE	30	00:20	14.4	67		ESE	11	1021.0	17.9	50		SSW	15	1019.7
Statistics for April 2016																					
	Mean	16.3	24.3							19.7	70			15	1020.2	22.5	61			16	1018.1
	Lowest	10.1	19.1							12.6	45		SSW	4	1009.9	17.1	31		NNW	6	1012.0
	Highest	20.7	32.3	26.0			W	74		25.0	99		W	33	1029.1	29.5	99		WSW	31	1025.3
	Total			90.8																	

Temperature, humidity, wind and rainfall observations are from Swanbourne {station 009215}. Pressure observations are from Perth Metro {station 009225}

IDCJDW6121.201604 Prepared at 13:08 GMT on 11 Mar 2017

Swanbourne, Western Australia
May 2016 Daily Weather Observations

Most observations from a site just under 1 km from the coast, combined with some from Mount Lawley.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Su	13.7	19.1	0			SSW	24	14:27	15.7	54		ENE	4	1023.6	18.7	53		WSW	13	1020.8
2	Mo	11.6	20.5	0			SSW	28	18:07	17.6	67		N	6	1022.2	19.0	76		WSW	6	1020.2
3	Tu	12.7	21.9	0.4			SSW	22	15:39	16.9	77		E	11	1022.4	20.5	68		SW	13	1019.6
4	We	14.0	22.3	0			SSW	33	20:09	16.6	83		ENE	4	1018.0	20.6	61		SW	9	1014.6
5	Th	14.0	21.4	0.2			SSW	28	01:55	17.5	78		ENE	6	1016.5	19.1	73		SSW	7	1013.6
6	Fr	13.9	20.4	4.0			W	48	20:43	14.7	98		ESE	7	1012.9	19.3	68		WNW	13	1008.0
7	Sa	12.8	17.9	13.4			SSW	57	14:16	14.8	91		SSE	11	1008.5	15.1	83		SSW	28	1009.9
8	Su	8.5	16.6	3.0			SE	43	10:59	13.4	60		S	15	1019.8	16.2	47		S	17	1019.0
9	Mo	8.7	20.0	0			SE	24	12:13	14.1	65		E	11	1025.5	19.1	58		SSW	15	1023.8
10	Tu	10.2	22.0	0.2			SSW	24	14:56	15.1	84		ENE	11	1029.0	20.3	56		SSW	17	1026.0
11	We	11.2	23.3	0			ENE	28	08:39	16.3	66		ENE	13	1024.7	22.8	46		W	7	1020.8
12	Th	10.1	23.4	0			NNW	28	11:36	16.3	53		NE	11	1016.6	22.6	65		WNW	13	1014.4
13	Fr	12.2	22.1	0.2			NW	35	22:39	17.5	84		N	9	1016.2	21.9	72		NW	17	1014.3
14	Sa	17.3	21.7	3.2			WNW	43	05:25	20.2	80		WSW	19	1018.7	20.7	54		SW	15	1018.4
15	Su	13.7	22.4	0			WSW	44	15:59	18.5	77		WNW	17	1018.7	20.9	69		WSW	20	1017.2
16	Mo	11.2	21.0	0.2			W	19	23:48	15.5	68		ENE	7	1022.0	20.6	47		W	9	1018.7
17	Tu	10.6	21.3	0			NW	26	13:12	14.2	79		NE	9	1021.8	20.8	63		NW	9	1020.8
18	We	13.6	21.5	6.2			WNW	17	13:57	16.0	99		NE	6	1023.5	20.2	75		W	9	1020.9
19	Th	13.8	19.6	0			SSW	15	14:58	15.7	87		SE	6	1019.5	18.9	73		SSW	9	1015.5
20	Fr	11.8	21.5	0			NW	56	22:40	16.1	81		ENE	7	1013.0	21.0	62		NW	20	1008.1
21	Sa	15.4	18.4	25.8			WSW	96	10:35	16.4	99		WNW	33	996.4	16.7	50		W	46	1001.9
22	Su	11.1	20.1	9.4			WSW	61	00:21	17.4	65		WSW	22	1017.0	18.6	55		WNW	24	1018.8
23	Mo	11.5	20.6	7.2			N	44	22:31	14.1	74		NNE	17	1019.8	19.8	48		NNW	24	1012.4
24	Tu	14.1	19.4	30.2			NNW	70	04:33	17.6	68		SW	30	1007.0	18.1	60		SW	22	1008.1
25	We	12.8	19.9	1.0			WNW	43	23:59	16.8	64		SW	15	1012.4	19.6	55		WNW	19	1011.6
26	Th	14.3	19.7	2.6			WSW	48	01:27	16.8	69		SSW	20	1017.3	17.8	65		SSW	9	1019.3
27	Fr	9.3	21.2	0.2			WNW	31	20:00	13.2	74		ENE	13	1022.9	20.5	38		NNE	9	1018.0
28	Sa	13.2	19.8	4.2			NW	56	03:35	18.2	54		WSW	26	1014.9	19.3	52		WSW	19	1014.3
29	Su	11.8	18.9	0			SE	22	12:40	13.5	89		E	7	1019.6	16.8	61		SSW	11	1017.5
30	Mo	8.6	19.6	0			NE	26	10:20	12.6	67		ENE	15	1020.1	18.6	44		WSW	7	1017.3
31	Tu	8.1	19.4	0			SW	22	13:47	12.9	65		ENE	11	1021.3	17.9	55		SW	13	1019.1
Statistics for May 2016																					
	Mean	12.1	20.5							15.9	74			12	1018.1	19.4	59			15	1016.2
	Lowest	8.1	16.6							12.6	53		ENE	4	996.4	15.1	38		WSW	6	1001.9
	Highest	17.3	23.4	30.2			WSW	96		20.2	99		WNW	33	1029.0	22.8	83		W	46	1026.0
	Total			111.6																	

Temperature, humidity, wind and rainfall observations are from Swanbourne {station 009215}. Pressure observations are from Perth Metro {station 009225}

IDCJDW6121.201605 Prepared at 13:09 GMT on 10 Mar 2017

Swanbourne, Western Australia
June 2016 Daily Weather Observations

Most observations from a site just under 1 km from the coast, combined with some from Mount Lawley.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	We	9.3	21.0	0			ESE	24	13:36	13.0	70		E	11	1023.2	20.6	39		ESE	9	1019.9
2	Th	10.5	21.4	0			E	39	13:25	14.3	55		ENE	17	1020.8	21.1	39		ENE	19	1015.8
3	Fr	14.3	23.1	0			NE	37	05:10	16.6	60		NE	19	1012.7	20.1	81		NNW	17	1010.5
4	Sa	14.5	17.7	7.2			SSW	56	06:57	15.8	69		SSW	17	1015.6	16.9	50		S	13	1015.4
5	Su	10.1	18.2	0			ENE	33	08:44	12.3	61		ENE	19	1017.1	16.8	48		SSE	7	1013.6
6	Mo	8.2	17.8	0			WSW	59	19:52	11.3	97		NE	17	1011.0	16.0	88		N	9	1006.5
7	Tu	10.6	13.8	28.8			SSW	57	14:42	11.3	77		SSE	17	1010.6	12.5	65		S	28	1013.0
8	We	8.4	15.2	0.6			SSW	41	14:22	11.4	60		SSE	15	1025.5	14.4	48		S	24	1024.8
9	Th	9.5	16.7	0			NNW	30	13:33	12.0	59		N	9	1028.3	15.4	62		NNW	17	1025.8
10	Fr	11.7	18.7	16.4			W	30	00:10	13.1	99		N	13	1026.8	17.6	79		NW	9	1025.7
11	Sa	10.3	19.8	1.2			NE	39	11:05	12.7	78		ENE	9	1026.2	18.1	50		NNE	15	1022.5
12	Su	12.6	21.5	0			W	54	16:17	14.6	54		NE	20	1018.9	19.1	48		NNW	22	1013.4
13	Mo	11.4	18.4	37.2			SSE	30	21:38	12.7	99		E	7	1015.5	17.8	67		WSW	6	1016.3
14	Tu	11.9	18.8	0			SSE	28	11:07	13.1	96		SSE	11	1022.9	17.8	68		S	9	1020.7
15	We	9.8	17.4	0.2			SSW	20	16:40	13.2	99		ESE	2	1022.7	16.4	71		SW	11	1020.1
16	Th	9.9	18.2	0			S	20	16:54	11.5	96		E	7	1021.9	17.1	68		SW	13	1019.4
17	Fr	10.7	17.1	0			E	28	10:10	12.5	77		E	11	1023.0	16.1	60		ENE	15	1021.5
18	Sa	8.3	20.0	0			NE	31	08:47	12.0	73		ENE	19	1021.8	19.0	47		N	11	1016.9
19	Su	11.4	19.4	0			WNW	44	16:49	14.6	67		N	13	1011.6	19.2	81		NW	24	1008.5
20	Mo	14.4	17.6	7.0			SSW	43	22:59	16.9	82		S	6	1010.2	15.8	91		SW	15	1009.0
21	Tu	9.5	16.3	2.4			SSE	26	00:53	12.4	72		ESE	9	1016.7	15.7	54		SSW	9	1015.8
22	We	11.3	18.1	4.0			WSW	52	17:02	13.2	98		ESE	4	1017.7	15.2	81		SW	22	1016.4
23	Th	10.9	16.6	4.8			SW	41	00:06	12.4	99		ENE	6	1021.7	15.5	58		SSW	7	1020.4
24	Fr	10.7	17.7	0			ENE	24	04:35	11.9	64		NE	11	1020.8	16.2	52		NNW	7	1017.4
25	Sa	10.3	16.3	11.4			N	33	05:27	12.6	98		NNE	6	1019.5	15.9	63		S	17	1020.4
26	Su	5.7	17.8	3.2			N	22	11:08	10.8	64		NNE	7	1026.0	17.3	48		NNW	11	1022.8
27	Mo	8.6	17.9	0			N	37	10:57	11.8	57		NNE	20	1021.3	16.9	47		NW	19	1016.0
28	Tu	10.3	17.6	1.0			NNW	46	10:53	14.9	74		N	19	1013.0	17.4	98		W	17	1011.3
29	We	14.7	18.7	16.2			SW	37	05:38	15.8	73		SSW	9	1018.1	16.9	64		SSW	19	1019.3
30	Th	7.8	17.5	2.4			SSW	22	14:19	10.9	91		E	11	1027.2	17.1	50		SW	9	1024.7
Statistics for June 2016																					
	Mean	10.6	18.2							13.1	77			12	1019.6	17.1	62			14	1017.5
	Lowest	5.7	13.8							10.8	54		ESE	2	1010.2	12.5	39		WSW	6	1006.5
	Highest	14.7	23.1	37.2			WSW	59		16.9	99		#	20	1028.3	21.1	98		S	28	1025.8
	Total			144.0																	

Temperature, humidity, wind and rainfall observations are from Swanbourne {station 009215}. Pressure observations are from Perth Metro {station 009225}

IDCJDW6121.201606 Prepared at 13:08 GMT on 9 Mar 2017

Swanbourne, Western Australia
July 2016 Daily Weather Observations

Most observations from a site just under 1 km from the coast, combined with some from Mount Lawley.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Fr	6.2	18.8	0			ENE	22	11:04	9.3	78		ENE	13	1028.9	18.1	39		SSE	4	1025.2
2	Sa	7.4	22.0	0			SSW	31	13:32	12.0	70		E	4	1024.8	17.1	63		SSW	15	1021.1
3	Su	10.0	16.5	0			ESE	35	21:23	13.1	75		E	7	1024.0	16.0	56		SE	15	1023.9
4	Mo	6.4	14.4	0.4			ESE	43	11:31	8.5	66		ESE	11	1030.3	14.2	52		E	15	1026.9
5	Tu	8.5	17.2	0			E	39	04:43	10.3	67		E	22	1025.2	15.2	57		E	20	1022.0
6	We	8.6	17.9	0			E	31	07:07	10.0	70		E	19	1022.1	17.2	53		NE	9	1018.8
7	Th	10.0	17.6	0			NW	48	23:45	11.1	78		NNE	13	1019.4	15.9	69		N	15	1015.3
8	Fr	11.1	17.6	12.8			W	56	06:38	14.2	74		WSW	30	1009.9	16.7	57		SW	19	1006.4
9	Sa	8.0	14.3	37.8			SW	74	15:29	10.3	74		SSE	19	1007.9	10.8	93		W	26	1008.8
10	Su	8.6	16.3	40.0			SW	67	02:20	12.1	88		S	28	1014.1	12.9	83		S	11	1014.9
11	Mo	9.5	15.9	3.2			SSW	35	14:21	11.1	92		ESE	7	1022.6	15.2	58		S	17	1022.6
12	Tu	6.1	14.7	0			E	30	10:16	8.9	69		E	15	1030.5	14.0	46		ENE	9	1029.1
13	We	3.4	16.3	0			NNE	31	09:52	8.3	70		ENE	15	1030.3	15.9	40		NE	11	1025.5
14	Th	7.4	18.6	0			N	61	09:31	11.3	49		N	24	1020.7	17.5	45		N	19	1016.0
15	Fr	11.3	20.6	0			N	44	10:01	17.8	42		N	22	1017.3	19.6	57		NNW	24	1015.1
16	Sa	15.8	19.9	0			N	52	10:00	16.1	70		NNE	15	1012.8	18.4	93		NNW	28	1007.2
17	Su	14.0	19.0	20.4			W	65	05:48	16.4	66		W	31	1010.6	17.3	61		WNW	28	1010.3
18	Mo	9.5	16.0	9.0			SW	50	03:04	11.4	82		SSE	13	1020.3	15.3	61		SSW	19	1020.0
19	Tu	6.3	18.4	0			ENE	24	09:46	10.6	79		ENE	13	1024.0	16.4	49		WNW	9	1020.3
20	We	6.2	17.6	0			NW	41	18:42	11.0	64		NNE	11	1017.5	17.0	54		NW	22	1012.9
21	Th	8.6	15.1	23.2			W	61	18:52	8.8	98		SE	15	1012.4	13.8	58		W	24	1013.8
22	Fr	8.6	15.3	4.0			SW	52	00:03	10.8	63		SE	9	1023.4	14.3	51		SSW	15	1022.9
23	Sa	9.1	17.3	0.2			SSW	39	14:17	11.1	85		NE	6	1023.8	12.7	98		SSE	11	1022.4
24	Su	4.3	14.5	3.8			SE	24	17:35	8.3	76		ENE	7	1029.1	13.7	53		SSE	11	1026.1
25	Mo	8.2	16.5	0			SE	24	12:33	12.0	70		ENE	6	1028.6	15.7	56		SSE	11	1026.5
26	Tu	6.8	18.0	0			SW	15	15:32	9.9	86		E	9	1029.2	16.5	68		SW	9	1026.9
27	We	7.6	19.5	0			ENE	30	10:49	9.7	98		E	13	1027.0	18.3	50		NE	7	1023.0
28	Th	9.7	20.3	0			ENE	19	04:32	14.6	65		ENE	7	1022.8	19.5	50		W	6	1019.1
29	Fr	13.1	20.9	0			W	57	22:51	16.6	70		N	13	1015.5	20.1	80		NW	30	1011.4
30	Sa	15.2	19.4	0			WNW	59	23:39	17.4	55		WNW	22	1017.7	17.6	61		NW	22	1015.7
31	Su	12.2	15.4	3.0			WNW	87	01:44	13.7	76		WSW	39	1018.5	13.1	69		SSW	22	1023.2
Statistics for July 2016																					
	Mean	9.0	17.5							11.8	73			15	1021.3	16.0	60			16	1019.1
	Lowest	3.4	14.3							8.3	42		E	4	1007.9	10.8	39		SSE	4	1006.4
	Highest	15.8	22.0	40.0			WNW	87		17.8	98		WSW	39	1030.5	20.1	98		NW	30	1029.1
	Total			157.8																	

Temperature, humidity, wind and rainfall observations are from Swanbourne {station 009215}. Pressure observations are from Perth Metro {station 009225}

IDCJDW6121.201607 Prepared at 13:08 GMT on 8 Mar 2017

Swanbourne, Western Australia
August 2016 Daily Weather Observations

Most observations from a site just under 1 km from the coast, combined with some from Mount Lawley.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min °C	Max °C	mm	mm	hours	Dirn	Spd km/h	Time local	Temp °C	RH %	Cld eighths	Dirn	Spd km/h	MSLP hPa	Temp °C	RH %	Cld eighths	Dirn	Spd km/h	MSLP hPa
1	Mo	4.0	16.2	1.2			E	24	10:47	8.9	73		ENE	11	1031.9	15.8	39		ENE	6	1029.0
2	Tu	4.7	17.9	0			N	41	10:45	9.8	60		ENE	15	1026.3	16.9	35		N	11	1021.3
3	We	8.1	18.3	0			NE	37	05:27	13.0	42		NNE	20	1016.4	17.6	41		N	13	1015.1
4	Th	12.5	15.6	4.8			N	30	00:57	12.7	98		ENE	11	1016.7	15.1	98		E	9	1015.3
5	Fr	8.9	16.5	3.6			E	17	08:48	11.0	98		E	9	1019.9	15.1	78		SW	9	1017.4
6	Sa	10.4	18.0	0			W	65	22:48	13.7	87		NNE	11	1013.3	16.9	69		N	20	1008.9
7	Su	11.3	17.9	5.0			WNW	85	22:19	13.2	68		WSW	30	1013.4	17.5	48		WNW	28	1012.9
8	Mo	10.5	14.9	8.6			WSW	67	12:26	12.1	82		WSW	28	1014.9	13.0	66		WSW	33	1015.8
9	Tu	10.5	17.4	5.4			WSW	52	03:44	13.9	55		WSW	20	1021.5	16.2	50		WSW	24	1020.3
10	We	9.1	17.8	5.8			NW	24	11:45	12.4	98		NNE	9	1024.5	16.6	70		NW	13	1022.1
11	Th	12.2	19.9	2.8			W	50	15:19	13.8	83		N	15	1020.0	17.8	66		WNW	24	1017.3
12	Fr	7.6	17.2	10.8			SSW	24	15:14	11.8	88		E	9	1026.6	16.3	47		SW	15	1024.8
13	Sa	8.5	18.4	0			SW	19	15:09	12.4	67		ENE	6	1027.7	16.7	58		SW	13	1023.8
14	Su	7.5	19.6	0			SW	24	15:53	13.0	64		E	13	1020.0	17.6	50		SSW	13	1013.9
15	Mo	12.9	19.5	0			WNW	52	11:15	17.8	63		WNW	24	1012.8	17.8	73		WNW	11	1012.8
16	Tu	9.1	19.4	4.6			NW	30	14:20	14.0	98		NNE	11	1018.6	18.6	62		NNW	19	1015.4
17	We	14.0	17.1	11.2			WSW	94	16:27	14.7	98		NW	41	1002.9	13.8	74		W	50	1003.2
18	Th	8.0	14.8	12.8			SW	59	05:42	9.7	85		ESE	6	1021.7	14.4	49		SSW	19	1021.7
19	Fr	9.6	16.0	0			W	43	21:46	11.7	71		NE	7	1024.7	13.9	74		NNW	17	1022.1
20	Sa	11.4	17.6	1.4			SSW	44	09:42	14.0	88		ENE	2	1021.2	17.1	63		SSW	17	1019.2
21	Su	9.4	18.9	3.4			WSW	52	16:43	12.7	86		NE	7	1019.2	17.8	61		NW	20	1014.8
22	Mo	8.5	15.4	7.6			SSW	44	16:10	11.2	66		S	19	1022.3	14.4	49		SSW	26	1020.9
23	Tu	5.9	16.9	0			SE	26	11:40	10.6	64		ESE	9	1025.3	16.6	37		ENE	6	1022.3
24	We	4.7	16.8	0			E	31	09:42	9.9	60		E	19	1026.6	16.2	38		E	11	1023.5
25	Th	7.4	18.9	0			ENE	41	09:32	11.9	66		ENE	19	1025.4	18.2	43		ENE	17	1019.5
26	Fr	11.9	21.2	0			NNW	61	20:12	17.1	41		NNE	19	1012.9	19.5	49		NNW	22	1007.6
27	Sa	11.9	17.0	33.6			WSW	67	16:54	15.1	71		WNW	39	1003.1	14.4	72		WSW	35	1003.6
28	Su	11.2	15.7	4.2			SW	63	00:51	13.3	72		S	30	1011.3	15.0	67		SSW	31	1010.8
29	Mo	10.7	16.7	0			SSW	33	15:02	13.3	72		SSE	9	1016.7	15.6	61		SW	20	1015.4
30	Tu	6.9	17.4	0			NW	26	13:57	11.9	69		NNE	11	1018.2	16.2	63		NW	13	1015.3
31	We	11.4	16.0	12.2			SSW	48	14:00	13.3	98		S	9	1012.7	15.8	67		SSW	28	1014.3
Statistics for August 2016																					
	Mean	9.4	17.4							12.7	75			15	1019.0	16.3	58			19	1016.8
	Lowest	4.0	14.8							8.9	41		ENE	2	1002.9	13.0	35		ENE	6	1003.2
	Highest	14.0	21.2	33.6			WSW	94		17.8	98		NW	41	1031.9	19.5	98		W	50	1029.0
	Total			139.0																	

Temperature, humidity, wind and rainfall observations are from Swanbourne {station 009215}. Pressure observations are from Perth Metro {station 009225}

IDCJDW6121.201608 Prepared at 16:08 GMT on 7 Mar 2017

Swanbourne, Western Australia
September 2016 Daily Weather Observations

Most observations from a site just under 1 km from the coast, combined with some from Mount Lawley.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Th	7.2	15.8	3.0			SSE	26	09:55	11.8	73		SE	9	1026.5	14.6	58		SW	15	1023.7
2	Fr	8.7	17.5	0			S	30	19:56	12.7	69		E	9	1023.4	16.0	57		WSW	7	1020.7
3	Sa	8.2	18.0	1.0			S	24	17:30	11.6	92		ESE	9	1025.5	16.6	65		SW	13	1021.8
4	Su	10.3	20.3	0			SSW	33	15:46	13.7	68		E	9	1021.3	17.5	65		SSW	20	1016.8
5	Mo	10.0	17.7	0			SW	33	14:21	13.5	80		S	11	1018.1	17.1	67		SW	22	1015.3
6	Tu	10.2	19.1	0.2			NW	52	21:45	16.0	87		ENE	6	1013.4	17.9	68		NW	20	1009.2
7	We	12.8	17.5	9.4			W	87	02:10	15.2	58		WSW	35	1012.2	16.7	47		WNW	43	1013.9
8	Th	11.4	17.2	4.6			SW	59	04:09	14.7	55		S	15	1024.2	16.1	47		WSW	11	1023.5
9	Fr	10.2	18.7	0			W	28	21:29	13.5	71		NE	6	1025.1	16.6	66		NW	13	1021.7
10	Sa	12.1	18.8	1.2			S	30	18:27	15.4	98		NNE	9	1021.3	16.9	73		SSW	11	1018.8
11	Su	11.0	16.6	0			ESE	56	22:30	13.4	63		ESE	20	1024.5	15.2	56		ESE	19	1023.0
12	Mo	9.2	17.6	0			ESE	54	05:46	12.3	50		E	20	1028.3	17.2	37		E	20	1024.9
13	Tu	8.6	17.3	0			ESE	41	15:10	12.8	45		E	20	1029.0	16.5	31		ESE	19	1025.3
14	We	6.8	18.8	0			ENE	35	08:12	13.2	59		ENE	15	1027.5	16.5	49		SSW	19	1022.8
15	Th	6.9	18.7	0			WSW	57	18:49	15.1	59		ENE	4	1017.4	16.6	62		WNW	26	1012.8
16	Fr	7.7	16.1	10.8			SSE	37	09:40	11.4	62		SSE	20	1021.4	15.1	53		SW	19	1020.8
17	Sa	7.3	17.9	0			ENE	28	07:57	12.6	56		ENE	15	1026.6	16.7	47		WSW	13	1023.7
18	Su	6.7	17.5	0			WNW	96	20:35	14.8	51		N	9	1017.9	13.6	82		W	19	1013.6
19	Mo	7.3	15.0	15.6			SSW	65	00:21	11.3	69		SSE	15	1017.3	14.4	69		SSW	15	1017.5
20	Tu	8.3	19.1	0			WNW	19	13:06	14.4	63		E	9	1022.1	17.8	46		WNW	11	1019.4
21	We	8.0	19.1	0			SW	24	15:51	15.8	63		E	7	1019.4	18.3	65		SW	15	1015.4
22	Th	9.8	18.1	0			WSW	48	10:40	16.4	76		N	11	1011.5	14.9	72		SW	26	1011.5
23	Fr	10.0	15.6	10.0			SW	57	07:14	10.9	74		SW	30	1015.5	13.8	51		SSW	24	1015.5
24	Sa	7.9	17.2	1.2			NW	31	13:44	10.6	72		E	6	1018.3	15.9	55		NW	22	1014.4
25	Su	9.7	16.7	22.2			SSW	39	16:58	11.2	94		SE	15	1018.0	15.1	53		SSW	22	1017.7
26	Mo	8.0	18.0	0			W	33	13:56	15.6	59		WNW	15	1021.1	16.7	66		WNW	22	1018.7
27	Tu	13.4	19.0	2.8			SW	72	20:36	17.3	68		WNW	26	1013.4	14.3	72		WSW	37	1011.0
28	We	7.8	15.0	8.0						12.1	51		SSE	17	1024.1	14.1	52		SSW	22	1022.4
29	Th	5.9	17.4				ENE	33	06:22	12.7	51		ENE	17	1021.8	15.6	47		SW	13	1015.5
30	Fr	9.8	19.1	0			WSW	50	15:26	17.3	59		WNW	22	1008.7	16.3	80		W	26	1007.1
Statistics for September 2016																					
	Mean	9.0	17.7							13.6	66			14	1020.5	16.0	58			19	1017.9
	Lowest	5.9	15.0							10.6	45		ENE	4	1008.7	13.6	31		WSW	7	1007.1
	Highest	13.4	20.3	22.2			WNW	96		17.3	98		WSW	35	1029.0	18.3	82		WNW	43	1025.3
	Total			90.0																	

Temperature, humidity, wind and rainfall observations are from Swanbourne {station 009215}. Pressure observations are from Perth Metro {station 009225}

IDCJDW6121.201609 Prepared at 13:08 GMT on 20 Mar 2017

Swanbourne, Western Australia
October 2016 Daily Weather Observations

Most observations from a site just under 1 km from the coast, combined with some from Mount Lawley.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Sa	13.5	16.3	5.4			WSW	85	11:15	15.1	64		WSW	48	1004.5	13.9	46		WSW	50	1006.8
2	Su	9.7	17.4	3.2			SW	59	01:12	13.9	64		SW	33	1016.8	16.2	52		SW	28	1017.9
3	Mo	13.5	19.2	0			W	31	07:20	16.2	75		W	19	1019.9	17.2	76		W	17	1019.2
4	Tu	12.9	20.4	0.6			NW	28	11:20	16.4	81		NNW	9	1018.7	19.0	71		WNW	15	1016.1
5	We	10.4	21.3	0			NW	28	10:44	17.9	66		NNW	11	1013.9	19.9	67		WNW	13	1010.0
6	Th	16.2	20.3	0			NW	41	21:36	18.9	79		NW	22	1010.7	19.4	84		NW	22	1010.5
7	Fr	14.9	22.2	9.4			N	30	23:22	18.0	98		NNE	15	1012.8	21.2	71		NW	17	1009.7
8	Sa	15.0	18.6	7.0			W	72	11:49	16.4	98		NW	24	1008.3	15.1	85		W	31	1008.9
9	Su	13.5	17.8	4.2			WSW	57	06:58	15.4	69		WSW	26	1021.7	15.5	62		SW	26	1022.4
10	Mo	8.9	18.1	0			SSW	39	16:28	14.6	50		ESE	13	1029.6	16.9	53		SSW	22	1026.4
11	Tu	9.1	24.8	0			E	39	08:18	16.1	49		E	24	1026.1	20.5	57		SSW	24	1021.5
12	We	15.0	33.4	0			ENE	48	08:34	22.6	27		ENE	28	1016.8	31.9	14		WNW	9	1011.3
13	Th	15.2	22.7	0			WNW	33	23:53	18.7	74		NNW	13	1011.8	20.4	69		W	13	1010.7
14	Fr	15.8	21.1	1.0			W	59	23:07	18.7	64		W	33	1012.3	18.3	57		W	28	1010.9
15	Sa	10.7	17.2	3.6			WSW	83	03:02	14.3	62		SW	37	1016.6	16.0	51		SW	31	1018.9
16	Su	9.6	18.6	1.8			SW	37	13:29	14.7	53		SE	15	1026.6	16.9	56		SSW	22	1024.3
17	Mo	12.0	19.3	0			SW	39	15:20	15.6	60		SSW	19	1025.5	17.7	66		SSW	22	1022.6
18	Tu	10.8	19.9	0			SSW	37	14:46	15.7	51		E	19	1023.9	16.6	57		SSW	24	1019.7
19	We	9.7	19.9	0			SW	39	22:34	15.1	58		SSE	7	1017.4	18.0	55		SW	22	1013.9
20	Th	10.4	18.0	4.0			SW	46	15:52	13.7	54		SSE	22	1019.7	16.3	50		SSW	28	1019.7
21	Fr	8.2	21.4	0			E	37	03:11	14.2	44		ENE	19	1028.2	17.9	47		SSW	20	1023.8
22	Sa	11.5	28.1	0			ENE	44	04:29	19.2	31		ENE	24	1023.1	23.6	44		SW	15	1016.9
23	Su	14.4	25.8	0			SW	30	16:06	20.6	55		WNW	6	1012.0	21.9	59		SW	17	1010.0
24	Mo	11.8	20.4	0			SSW	39	15:18	17.3	68		SW	13	1013.5	18.2	60		SW	26	1011.9
25	Tu	10.7	19.3	0			SSW	31	00:56	17.0	50		ESE	4	1016.7	17.7	66		WSW	9	1016.4
26	We	10.3	20.6	0			SW	30	15:37	18.0	63		SE	7	1020.7	19.2	57		SW	19	1018.6
27	Th	11.4	21.1	0			SW	33	12:12	17.3	58		SSW	13	1020.9	19.9	50		SSW	20	1018.3
28	Fr	11.0	21.1	0			WSW	31	12:56	17.7	59		SSW	17	1015.3	19.9	57		SW	17	1012.2
29	Sa	15.3	20.3	0.2			SW	57	11:09	19.2	67		W	26	1013.1	18.9	52		SW	26	1014.5
30	Su	10.0	19.4	1.6			SSW	46	17:39	15.2	43		SSE	17	1023.7	17.0	51		SSW	30	1020.3
31	Mo	9.9	19.4	0			SSW	48	15:27	15.9	53		SE	17	1021.8	18.4	54		SSW	28	1018.9
Statistics for October 2016																					
	Mean	12.0	20.8							16.8	60			19	1018.1	18.7	57			22	1016.2
	Lowest	8.2	16.3							13.7	27		ESE	4	1004.5	13.9	14		#	9	1006.8
	Highest	16.2	33.4	9.4			WSW	85		22.6	98		WSW	48	1029.6	31.9	85		WSW	50	1026.4
	Total			42.0																	

Temperature, humidity, wind and rainfall observations are from Swanbourne {station 009215}. Pressure observations are from Perth Metro {station 009225}

IDCJDW6121.201610 Prepared at 13:08 GMT on 19 Mar 2017

Swanbourne, Western Australia
November 2016 Daily Weather Observations

Most observations from a site just under 1 km from the coast, combined with some from Mount Lawley.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Tu	11.4	22.0	0			SSW	43	14:47	17.7	49		ESE	15	1020.2	18.9	63		SSW	30	1015.2
2	We	12.8	26.1	0			SSW	39	16:56	21.9	37		ENE	13	1014.5	21.6	62		SSW	22	1010.8
3	Th	14.1	20.3	0			SW	41	15:00	17.1	71		SSW	22	1016.8	19.1	63		SSW	26	1016.8
4	Fr	15.5	26.2	0			SSW	39	15:23	19.1	64		ESE	11	1022.0	21.0	66		SSW	20	1018.5
5	Sa	15.8	31.9	0			E	33	07:52	25.6	42		SSE	9	1017.8	23.7	62		SSW	17	1012.7
6	Su	17.6	23.1	0			SW	46	13:32	20.2	71		SSW	20	1014.1	20.5	76		SSW	26	1015.1
7	Mo	10.6	19.8	0			SW	43	15:06	15.7	48		SE	13	1019.4	18.0	54		SW	30	1016.5
8	Tu	10.8	21.1	0			SSW	48	21:28	15.9	55		WSW	11	1014.2	19.3	54		SW	24	1010.2
9	We	12.9	20.9	0			SSW	37	00:07	16.7	60		SSE	9	1011.4	18.6	53		SW	24	1010.5
10	Th	10.6	21.2	0			NW	48	14:42	18.1	57		NNW	17	1011.6	16.7	98		WSW	24	1009.2
11	Fr	15.1	20.6	1.0			SW	37	17:09	18.9	52		SW	20	1016.2	19.2	52		SW	20	1016.4
12	Sa	11.0	21.7	0			SSW	44	15:09	18.6	47		S	9	1022.1	19.2	60		SSW	30	1020.3
13	Su	13.3	28.6	0			SSW	39	14:59	21.5	41		ENE	15	1023.0	21.2	68		SSW	28	1017.7
14	Mo	16.8	37.5	0			ENE	46	08:01	28.6	14		NE	24	1014.1	35.9	9		NNW	9	1008.5
15	Tu	22.0	34.8	0			WNW	35	10:35	32.4	14		NE	13	1005.7	23.5	73		NW	13	1004.6
16	We	18.2	20.3	0			NW	44	12:24	20.0	66		W	6	1004.6	17.7	74		SSW	15	1007.8
17	Th	10.9	22.1	5.6			SW	37	15:39	16.8	40		SE	9	1022.7	18.5	51		SW	26	1021.1
18	Fr	10.8	27.0	0			SSW	35	17:34	21.9	38		ENE	15	1020.0	21.9	62		SSW	22	1015.7
19	Sa	13.8	22.9	0			SSW	48	21:52	20.5	64		SW	11	1013.4	20.9	68		SW	26	1012.1
20	Su	15.5	21.9	0			SSW	50	14:17	20.0	48		SSW	22	1016.4	20.1	47		SSW	31	1015.6
21	Mo	10.4	22.0	0			SSW	43	17:40	16.3	49		E	7	1020.9	18.4	48		SSW	24	1018.2
22	Tu	13.2	26.2	0			SSW	48	15:18	21.3	33		E	19	1019.7	21.5	59		SSW	30	1016.0
23	We	15.9	30.4	0			SSW	43	16:21	26.0	30		E	9	1018.4	23.4	60		SSW	28	1015.8
24	Th	19.3	32.0	0			E	44	07:27	26.5	31		E	19	1018.4	25.9	50		SSW	22	1015.3
25	Fr	17.7	34.5	0			ENE	50	06:25	26.2	32		ENE	24	1017.3	28.2	39		SSW	20	1013.6
26	Sa	20.7	36.8	0			ENE	39	06:42	32.3	20		NE	15	1013.8	34.7	14		SSW	15	1010.4
27	Su	18.1	24.7	0			SSW	39	14:40	23.0	77		SSW	15	1013.2	22.9	71		SW	24	1013.2
28	Mo	16.4	25.7	0			SSW	44	23:04	24.1	46		SW	4	1015.4	23.7	61		SW	20	1013.5
29	Tu	15.3	23.7	0			SSW	52	17:27	20.3	55		SSE	13	1017.3	22.0	61		SSW	31	1013.6
30	We	14.2	23.2	0			SSW	46	20:25	20.0	57		SW	13	1014.5	21.1	61		SSW	28	1012.9
Statistics for November 2016																					
	Mean	14.7	25.6							21.4	46			14	1016.3	21.9	57			23	1013.9
	Lowest	10.4	19.8							15.7	14		SW	4	1004.6	16.7	9		NNW	9	1004.6
	Highest	22.0	37.5	5.6			SSW	52		32.4	77		#	24	1023.0	35.9	98		SSW	31	1021.1
	Total			6.6																	

Temperature, humidity, wind and rainfall observations are from Swanbourne {station 009215}. Pressure observations are from Perth Metro {station 009225}

IDCJDW6121.201611 Prepared at 13:08 GMT on 18 Mar 2017

Swanbourne, Western Australia
December 2016 Daily Weather Observations

Most observations from a site just under 1 km from the coast, combined with some from Mount Lawley.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Th	13.9	23.5	0			SSW	43	16:19	19.8	58		SE	11	1016.4	20.5	54		SSW	28	1013.9
2	Fr	13.1	23.6	0			SW	35	15:24	20.2	48		SSW	7	1012.7	21.9	57		SW	20	1009.1
3	Sa	16.1	22.9	0			WSW	50	17:46	19.4	58		SW	17	1009.1	19.7	73		W	20	1008.8
4	Su	14.5	21.8	0.2			SSW	41	17:39	18.1	39		SE	15	1015.3	20.2	43		SW	24	1012.9
5	Mo	13.2	22.2	0			SSW	46	15:14	18.9	49		SE	15	1015.4	20.4	51		SW	30	1014.1
6	Tu	13.7	23.5	0			SSW	41	14:23	20.2	57		SW	13	1016.9	21.4	57		SW	24	1014.1
7	We	17.7	23.1	0			SSW	46	08:55	20.0	66		SSW	31	1016.5	21.6	52		SSW	28	1015.7
8	Th	13.7	28.4	0			E	48	06:26	19.9	38		E	20	1020.1	22.0	55		SSW	24	1015.4
9	Fr	15.8	33.8	0			E	43	05:02	27.3	25		ENE	15	1014.6	26.1	53		SSW	24	1011.7
10	Sa	18.5	36.2	0			E	35	07:13	33.0	13		NE	17	1010.6	26.0	46		NW	13	1009.8
11	Su	18.0	25.1	0			SW	46	16:30	21.6	71		SW	13	1011.8	22.2	74		SSW	15	1007.5
12	Mo	17.4	23.7	5.6			SE	46	19:09	20.1	92		SW	15	1010.1	23.1	51		SE	22	1011.2
13	Tu	13.9	22.6	0			SSW	44	17:29	17.0	62		SSE	15	1020.6	21.6	58		SSW	28	1018.3
14	We	15.7	27.8	0			E	41	06:58	22.3	50		E	13	1021.5	23.3	61		SW	24	1016.6
15	Th	18.4	31.8	0			SSW	44	16:06	26.8	34		ENE	17	1012.1	27.3	43		SSW	20	1009.7
16	Fr	17.1	27.5	0			E	56	23:19	21.2	49		SE	19	1013.9	23.4	56		SSW	31	1010.8
17	Sa	14.3	28.6	0			E	50	02:26	21.9	41		ENE	17	1014.0	22.4	59		SSW	31	1010.2
18	Su	15.4	23.1	0			SW	50	15:38	20.9	64		SSW	24	1012.7	21.9	62		SSW	28	1012.8
19	Mo	14.3	24.0	0			S	46	17:06	20.1	50		ESE	13	1016.8	22.0	59		SSW	28	1013.8
20	Tu	16.9	33.3	0			S	43	17:24	23.8	40		E	17	1015.2	27.5	53		SSW	22	1010.2
21	We	21.1	42.0	0			ENE	50	07:50	30.9	24		ENE	28	1008.0	38.6	16		SW	13	1001.7
22	Th	19.5	26.5	0			SW	44	14:16	20.0	73		SSW	24	1010.1	23.1	63		SSW	30	1008.5
23	Fr	17.6	29.8	0			SSW	43	14:26	26.3	39		SSE	9	1009.0	27.7	36		SSW	28	1005.7
24	Sa	18.9	25.5	0			SSW	54	20:53	23.8	53		SSW	19	1007.1	23.4	68		SSW	30	1004.8
25	Su	16.7	28.8	0			SSW	52	15:15	22.7	49		SE	19	1011.3	24.1	57		SSW	33	1007.6
26	Mo	16.8	27.1	0			SW	52	23:26	25.3	41		ENE	9	1006.7	23.3	59		SW	30	1003.7
27	Tu	17.1	22.4	0.2			SW	65	05:48	18.9	52		SW	37	1005.9	20.6	51		SSW	35	1006.8
28	We	14.1	21.9	0			SSW	46	16:01	18.2	47		S	20	1012.1	21.3	47		SW	24	1011.0
29	Th	11.6	21.8	0			SSW	39	17:41	17.2	49		ESE	11	1013.8	20.7	53		SW	20	1010.3
30	Fr	13.5	22.5	0			S	59	20:45	19.3	59		WSW	11	1008.9	20.6	56		SSW	35	1008.3
31	Sa	12.7	24.1	0			SSW	50	17:19	18.9	53		SSE	13	1016.3	22.5	60		SSW	28	1013.4
Statistics for December 2016																					
	Mean	15.8	26.4							21.7	49			16	1013.1	23.2	54			25	1010.6
	Lowest	11.6	21.8							17.0	13		SSW	7	1005.9	19.7	16		#	13	1001.7
	Highest	21.1	42.0	5.6			SW	65		33.0	92		SW	37	1021.5	38.6	74		SSW	35	1018.3
	Total			6.0																	

Temperature, humidity, wind and rainfall observations are from Swanbourne {station 009215}. Pressure observations are from Perth Metro {station 009225}

IDCJDW6121.201612 Prepared at 13:08 GMT on 17 Mar 2017

Swanbourne, Western Australia
January 2017 Daily Weather Observations

Most observations from a site just under 1 km from the coast, combined with some from Mount Lawley.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Su	16.5	29.1	0			SSW	43	13:56	22.5	42		E	22	1017.2	23.7	61		SSW	28	1013.1
2	Mo	19.0	36.5	0			E	48	07:11	27.4	33		ENE	24	1013.8	31.2	29		SSW	26	1010.0
3	Tu	20.8	38.4	0			E	35	04:55	32.3	22		ENE	19	1010.7	32.1	37		SSW	20	1007.4
4	We	21.1	40.1	0			ENE	31	09:24	34.9	15		ENE	15	1007.7	33.3	17		W	13	1005.2
5	Th	19.2	24.0	0			SW	59	19:12	20.2	83		WSW	15	1007.7	22.6	63		WSW	20	1007.6
6	Fr	17.0	23.0	0			SW	48	03:07	19.5	49		SW	22	1011.8	21.3	59		SW	28	1009.6
7	Sa	14.7	23.9	0			SSW	52	16:59	19.7	50		SE	11	1012.5	21.3	58		SSW	28	1009.9
8	Su	16.1	26.7	0			SSW	44	12:36	23.4	47		SE	9	1011.7	23.8	59		SSW	28	1009.3
9	Mo	18.3	33.9	0			SSW	43	18:40	24.9	38		ESE	11	1012.1	26.2	60		SSW	22	1008.0
10	Tu	19.7	29.3	0			SSW	39	18:23	27.2	37		SSE	9	1010.4	25.7	55		SSW	24	1008.3
11	We	20.8	32.1	0			SSW	44	22:14	28.7	36		NE	9	1006.1	25.0	64		SW	22	1003.6
12	Th	16.8	23.1	0.4			SSW	59	05:51	21.3	53		SSW	26	1008.2	21.6	52		SSW	28	1008.9
13	Fr	12.8	25.5	0			S	46	18:14	19.0	44		ESE	9	1015.7	21.7	54		SSW	28	1012.5
14	Sa	16.3	32.1	0			E	35	07:36	25.3	36		E	15	1013.2	27.6	54		SSW	22	1009.7
15	Su	19.1	26.9	0			SSW	48	21:02	25.6	61		SSW	13	1008.4	25.1	66		SSW	24	1006.1
16	Mo	17.4	24.3	0			SSW	57	15:25	21.7	52		SSE	20	1010.3	22.6	60		SSW	33	1009.3
17	Tu	16.4	29.1	0			SSW	46	14:57	21.6	44		ESE	17	1014.5	23.8	53		SSW	31	1010.9
18	We	17.2	32.5	0			E	50	04:51	24.1	41		ENE	24	1011.0	25.6	62		SSW	24	1006.4
19	Th	17.8	23.0	0			SSW	50	10:29	19.4	61		SSW	31	1011.8	21.8	54		SW	28	1011.0
20	Fr	13.6	24.3	0			S	39	17:52	22.1	43		E	9	1012.3	21.8	57		SSW	24	1009.8
21	Sa	16.1	27.4	0			SSW	46	16:32	23.7	49		S	13	1009.0	24.4	64		SSW	24	1005.4
22	Su	17.4	23.6	0			SSW	50	11:52	21.6	64		SSW	26	1010.1	22.1	53		SW	28	1010.7
23	Mo	14.1	23.3	0			SSW	46	12:50	19.9	56		S	9	1016.8	21.7	54		SSW	26	1015.5
24	Tu	14.3	30.6	0			SSW	43	17:27	22.5	40		ENE	20	1018.0	24.7	59		SSW	22	1014.7
25	We	18.5	37.1	0			ENE	39	08:24	28.1	29		E	22	1016.8	30.0	45		SSW	19	1013.0
26	Th	23.4	40.1	0			NNE	35	09:18	33.7	13		NE	19	1012.9	37.9	12		SSW	13	1009.3
27	Fr	20.9	27.9	0			SSW	48	15:50	25.5	61		SW	19	1009.9	25.6	63		SSW	28	1007.8
28	Sa	19.7	33.3	0			S	46	15:00	27.1	40		E	15	1008.8	28.0	47		SSW	28	1004.5
29	Su	21.0	23.9	0			E	43	23:53	21.0	95		SW	11	1011.3	23.6	78		S	9	1010.3
30	Mo	16.8	19.5	7.4			E	41	05:02	17.2	98		ENE	6	1016.8	17.9	98		ESE	13	1014.4
31	Tu	15.9	22.1	26.0			E	30	08:14	17.1	99		E	17	1014.7	19.7	97		SE	15	1012.3
Statistics for January 2017																					
	Mean	17.7	28.6							23.8	49			16	1012.0	24.9	56			23	1009.5
	Lowest	12.8	19.5							17.1	13		ENE	6	1006.1	17.9	12		S	9	1003.6
	Highest	23.4	40.1	26.0			#	59		34.9	99		SSW	31	1018.0	37.9	98		SSW	33	1015.5
	Total			33.8																	

Temperature, humidity, wind and rainfall observations are from Swanbourne {station 009215}. Pressure observations are from Perth Metro {station 009225}

IDCJDW6121.201701 Prepared at 13:08 GMT on 3 Apr 2017

Swanbourne, Western Australia
February 2017 Daily Weather Observations

Most observations from a site just under 1 km from the coast, combined with some from Mount Lawley.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	We	17.0	29.5	1.4			SSW	30	15:47	21.4	64		ESE	15	1017.9	29.3	48		SE	13	1015.7
2	Th	19.6	32.3	0			ESE	37	12:37	22.4	72		E	20	1017.2	31.0	47		ESE	11	1012.0
3	Fr	20.1	27.7	0			SSW	37	15:44	25.0	73		SSW	13	1009.1	24.7	70		SSW	22	1006.9
4	Sa	16.9	24.5	0			SSW	46	15:04	21.1	68		SSW	15	1009.2	23.2	70		SSW	28	1007.5
5	Su	17.9	29.4	0			E	46	22:37	22.2	54		ESE	19	1012.1	24.9	57		SSW	22	1008.7
6	Mo	17.2	32.7	0			E	50	01:08	22.5	49		E	28	1010.7	26.0	60		SSW	24	1005.8
7	Tu	20.4	25.2	0			SSW	63	17:38	24.3	72		SSW	19	1004.3	22.6	63		SSW	31	1004.4
8	We	14.4	27.0	0			ESE	50	19:49	16.8	51		SSE	24	1012.7	25.5	24		SE	22	1009.9
9	Th	13.9	17.1	2.0			ESE	46	11:08	14.4	91		ESE	22	1012.5	15.9	98		ESE	19	1008.8
10	Fr	14.4	23.2	97.4			ESE	50	07:01	16.3	99		ESE	26	1007.5	18.6	99		ESE	20	1007.2
11	Sa	16.3	26.8	36.4			E	54	21:56	23.1	73		ESE	20	1010.3	25.4	61		ESE	26	1010.8
12	Su	20.1	28.3	0			E	54	13:48	22.0	71		E	28	1015.1	26.9	56		E	26	1013.9
13	Mo	21.8	33.5	0			E	41	01:21	25.2	68		ENE	20	1013.4	29.8	58		SW	11	1010.4
14	Tu	22.0	25.9	0			SSW	31	18:44	22.9	98		SSW	13	1012.4	25.1	77		SW	19	1012.4
15	We	19.9	28.9	0			SSW	41	14:10	24.0	79		SE	9	1015.1	24.4	72		SSW	28	1011.9
16	Th	18.5	27.6	0			SSW	39	16:20	22.9	60		E	13	1014.9	23.9	65		SSW	20	1012.3
17	Fr	16.5	32.7	0			E	41	07:53	22.0	50		E	22	1018.5	31.4	33		SE	17	1015.7
18	Sa	18.5	35.3	0			ENE	52	06:34	23.9	49		E	24	1019.4	34.1	29		E	15	1015.7
19	Su	23.9	35.7	0			E	35	01:41	30.1	31		NE	19	1014.3	31.2	47		WNW	13	1011.4
20	Mo	19.9	23.9	0			SW	43	17:50	21.9	63		SSW	22	1013.4	21.8	64		SW	24	1010.7
21	Tu	16.1	21.5	4.6			WSW	57	06:31	18.6	64		SW	33	1014.3	19.9	49		SSW	30	1015.5
22	We	12.0	22.6	0			SSW	35	16:39	18.2	57		E	9	1021.9	21.2	53		SSW	24	1019.8
23	Th	14.0	29.0	0			SSW	37	17:59	22.2	53		E	19	1021.9	24.1	68		SSW	22	1018.7
24	Fr	18.2	36.8	0			ENE	46	08:37	26.4	40		ENE	26	1020.6	35.4	14		ESE	17	1016.8
25	Sa	22.3	38.3	0			NE	35	08:20	30.1	26		NE	22	1015.5	32.4	37		SW	13	1011.3
26	Su	18.4	24.8	0			SW	37	14:52	22.8	73		SSW	19	1011.7	23.4	70		SW	26	1011.6
27	Mo	16.7	25.8	0			SSW	41	16:31	23.0	54		SSE	6	1015.3	24.5	64		SW	26	1013.5
28	Tu	18.6	28.2	0			SSW	33	16:04	24.1	56		SE	7	1014.8	24.9	66		SW	20	1012.3
Statistics for February 2017																					
	Mean	18.1	28.4							22.5	62			19	1014.1	25.8	57			21	1011.8
	Lowest	12.0	17.1							14.4	26		SSE	6	1004.3	15.9	14		#	11	1004.4
	Highest	23.9	38.3	97.4			SSW	63		30.1	99		SW	33	1021.9	35.4	99		SSW	31	1019.8
	Total			141.8																	

Temperature, humidity, wind and rainfall observations are from Swanbourne {station 009215}. Pressure observations are from Perth Metro {station 009225}

IDCJDW6121.201702 Prepared at 16:08 GMT on 2 Apr 2017

Swanbourne, Western Australia
March 2017 Daily Weather Observations

Most observations from a site just under 1 km from the coast, combined with some from Mount Lawley.

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	We	20.7	34.1	0			NNE	37	23:09	28.0	52		E	15	1013.8	29.8	57		SSW	17	1010.9
2	Th	21.7	26.5	9.8			NNW	39	02:53	23.3	100		W	9	1015.4	23.4	98		SSW	11	1015.5
3	Fr	20.8	27.0	1.8			SSW	37	14:05	25.1	83		SSW	13	1016.2	26.2	75		SSW	22	1013.2
4	Sa	23.0	31.7	0			ESE	30	23:43	26.3	55		ESE	13	1015.6	27.0	69		SSW	19	1012.6
5	Su	21.9	33.4	0			SSW	33	16:37	26.7	51		E	11	1015.9	27.1	67		SSW	20	1012.0
6	Mo	20.2	28.7	0			SW	28	15:01	26.9	58		ENE	6	1013.4	26.1	70		SW	19	1010.6
7	Tu	19.0	26.6	0.2			SSW	35	15:42	23.7	86		SE	2	1013.2	25.3	79		SSW	22	1009.3
8	We	21.4	30.9	0			ESE	37	23:38	24.6	61		SE	15	1010.9	26.3	69		SW	19	1008.1
9	Th	18.0	29.9	0			E	37	01:29	22.3	65		SE	13	1012.8	26.5	65		SW	20	1009.3
10	Fr	19.3	29.9	0			ESE	48	23:07	22.6	60		ESE	20	1013.5	28.7	37		SE	20	1011.1
11	Sa	15.7	30.2	0			ESE	43	00:06	19.9	54		E	26	1017.0	29.1	29		SE	13	1013.3
12	Su	18.6	24.8	0			E	48	02:14	20.7	49		E	30	1011.2	20.5	95		ENE	11	1008.5
13	Mo	20.4	24.7	8.6			NW	48	04:51	22.3	83		WNW	24	1007.4	23.1	64		W	22	1008.6
14	Tu	19.1	24.6	0			WNW	61	15:16	22.0	67		WNW	30	1011.1	22.3	60		WNW	37	1010.1
15	We	16.9	23.3	2.6			SW	54	00:55	18.0	61		SE	13	1019.3	21.8	42		SW	24	1017.9
16	Th	13.9	27.3	0			SSW	37	16:08	19.6	50		E	22	1018.3	25.2	49		SW	15	1013.3
17	Fr	13.7	23.3	0			SW	33	13:02	19.7	61		S	11	1011.3	21.5	68		SSW	15	1010.9
18	Sa	16.9	19.5	2.4			SSW	39	20:22	17.1	98		SSE	13	1017.3	18.5	68		SSW	13	1018.3
19	Su	11.1	23.1	0.8			SW	41	14:39	16.5	59		SE	17	1024.7	21.6	41		SSW	26	1020.4
20	Mo	13.4	26.6	0			E	39	08:05	17.8	50		E	20	1020.3	25.5	31		ESE	13	1014.2
21	Tu	17.5	22.1	0			ENE	57	13:45	19.4	50		E	28	1009.9	19.8	68		E	30	1005.7
22	We	16.8	24.4	0.8			NW	44	05:22	20.5	74		NW	24	1007.8	23.3	64		NW	24	1007.9
23	Th	17.0	23.4	0.6			SSW	35	16:13	20.0	81		S	13	1013.6	21.5	70		SSW	24	1012.6
24	Fr	14.1	23.4	0			SSW	43	16:17	18.7	98		SSE	6	1016.5	22.7	70		SSW	20	1012.5
25	Sa	15.5	24.4	0			W	35	23:29	20.6	66		ESE	7	1012.3	21.7	70		SW	19	1008.6
26	Su	16.6	21.9	1.2			WSW	63	05:53	19.8	52		WSW	31	1013.3	20.8	51		SW	28	1015.9
27	Mo	10.8	22.1	0			SSW	39	16:28	17.9	47		E	7	1023.8	21.0	46		SSW	20	1019.7
28	Tu	11.9	22.1	0			SSW	37	17:05	18.1	67		ESE	11	1019.7	21.1	71		SSW	17	1017.6
29	We	12.9	24.5	0			E	39	08:46	16.1	48		E	24	1025.1	23.7	24		ESE	19	1021.6
30	Th	13.7	26.8	0			E	48	04:08	18.7	42		ENE	24	1023.3	22.8	57		SSW	19	1020.1
31	Fr	14.2	28.5	0			SSW	37	14:47	19.8	42		E	13	1023.1	23.9	58		SSW	26	1020.5
Statistics for March 2017																					
	Mean	17.0	26.1							21.1	63			16	1015.7	23.8	60			20	1013.3
	Lowest	10.8	19.5							16.1	42		SE	2	1007.4	18.5	24		#	11	1005.7
	Highest	23.0	34.1	9.8			WSW	63		28.0	100		WSW	31	1025.1	29.8	98		WNW	37	1021.6
	Total			28.8																	

Temperature, humidity, wind and rainfall observations are from Swanbourne {station 009215}. Pressure observations are from Perth Metro {station 009225}

IDCJDW6121.201703 Prepared at 13:08 GMT on 2 Apr 2017