

Measure to Monitor

*(a sub-project of Smarter Irrigation in SA)
South East, South Australia*

A weekly review of irrigation sensor and pasture growth data to improve irrigation scheduling throughout the year.

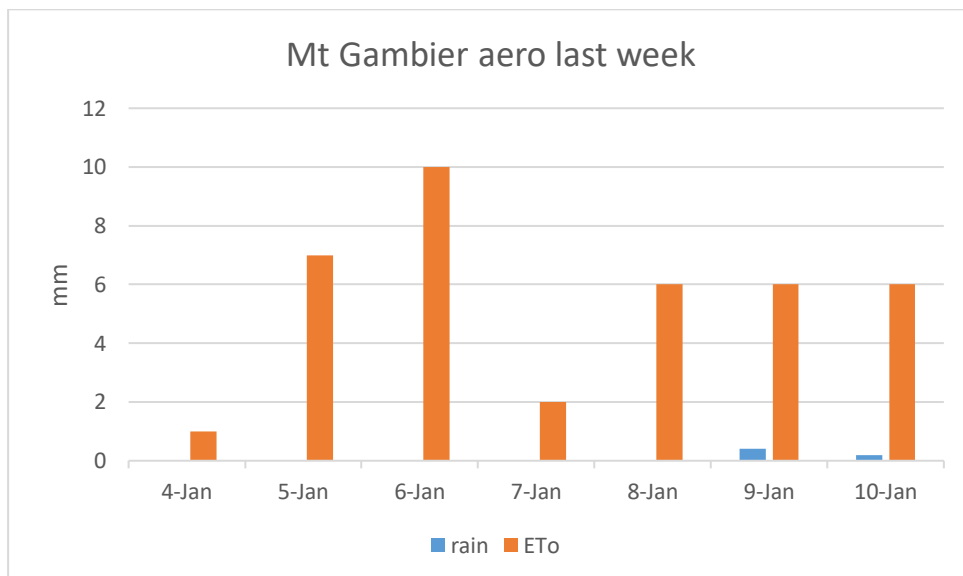
11 January 2018

Brought to you by Nigel Fleming, SARDI, (0401) 122 136

Previous 7 days ~ average Evapotranspiration & Rainfall

	ETo's (mm/day)	Rainfall (mm)
MacDonnell*	-	-
Mt Gambier aero	5.4	0.6

*No data from MacDonnell for the last week (web site is down)

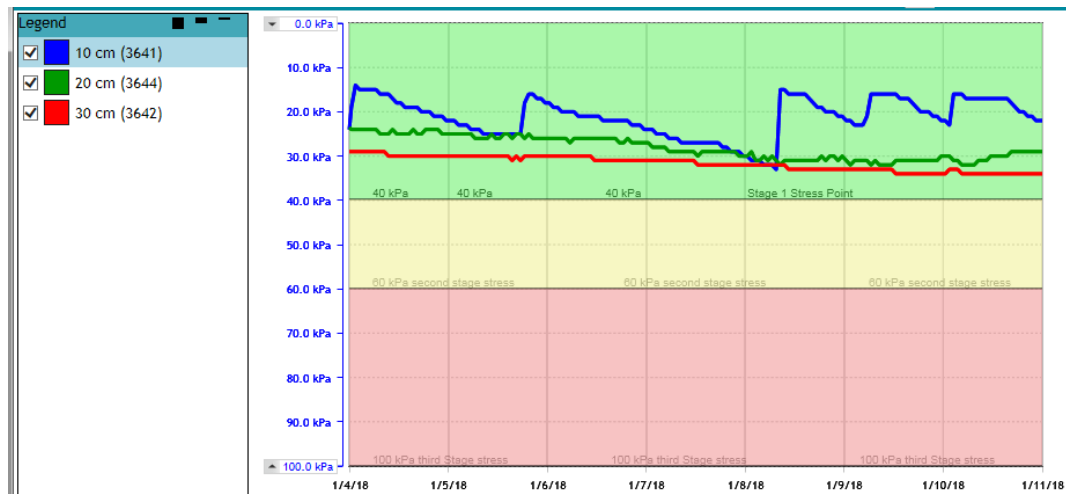


A pretty dry week, with high ET on Saturday, when temperature of 42.3° C was recorded at Mt Gambier aero

What are the irrigation sensors telling us:

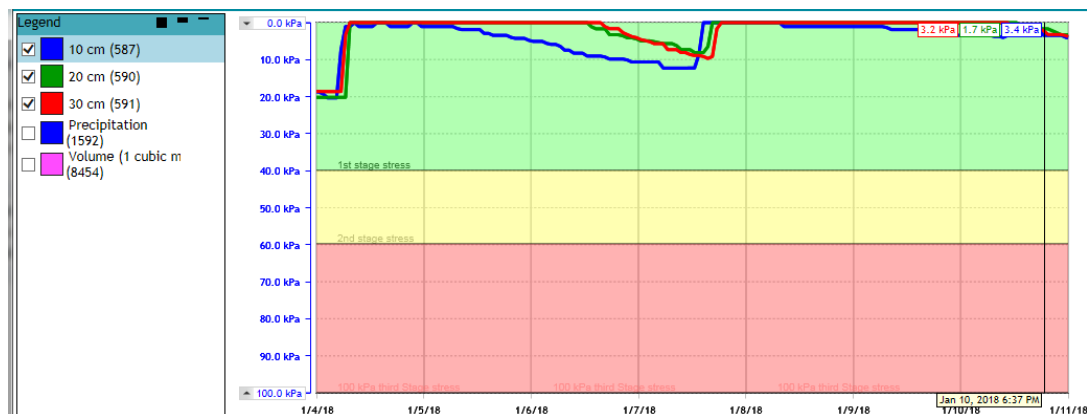
Allendale East:

Sensors are tracking nicely - all within the desired moisture range.



Mt Schank

The sensors are tracking the same as last week.

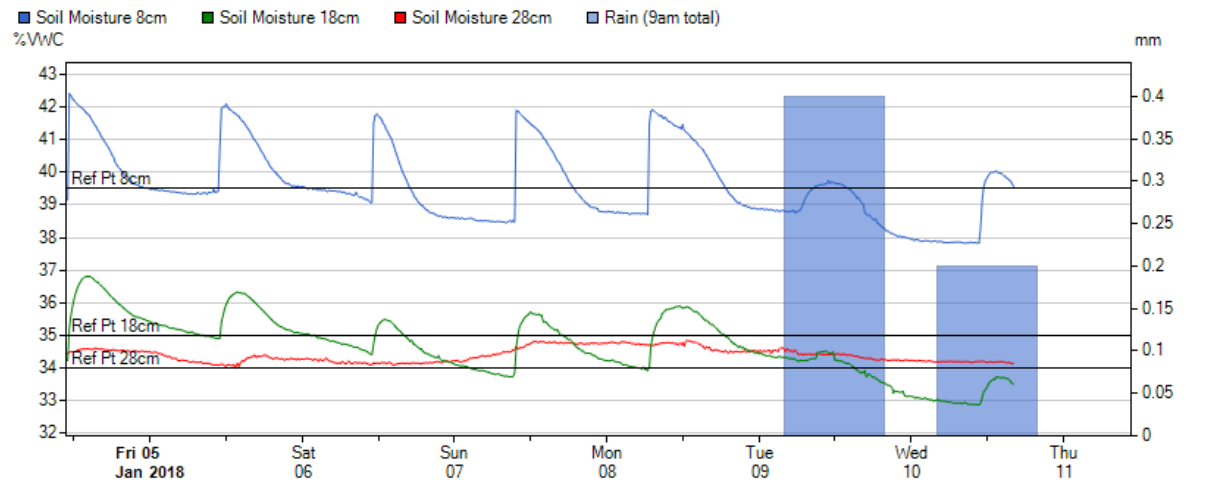


From discussion with Tim Powell last week, it seems that the current sensor location is in heavier soil than the previous one, although still in the same pivot. In line with typical RAW values for this pivot, a low rate of irrigation is being applied frequently. In lighter soil, such as at the other sites, a distinct peak is seen for each irrigation. At this sensor location, however, the soil can absorb more water and the rate of irrigation is not sufficient to produce individual peaks in soil moisture. In this case, the thing to look for is the trend over time. In the chart above, soil water has been fully replenished twice during the week.

Eight Mile Creek (pivot 6)

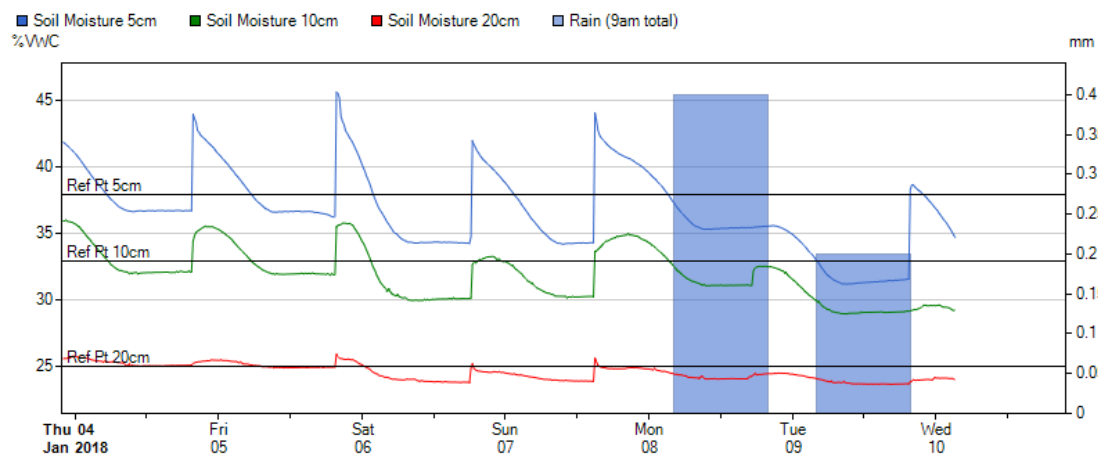
Dry Area

Data looks good, irrigation water is not getting past the root zone. Irrigation may have been skipped over the last 2 days due to rain or heavy dew.



Normal Area

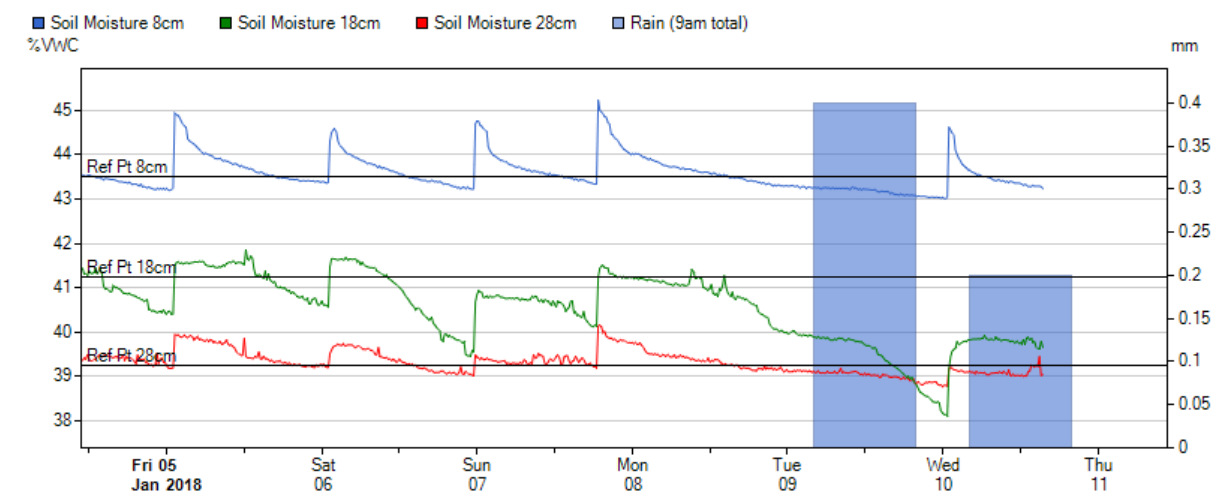
Sensors are reading OK, producing smooth lines of soil moisture. Slight drying over the last two days as per Dry Area.



Wet Area

Data from the two deeper sensors is giving a jagged, or "noisy" trace on the chart. It is hard to know at this stage whether the sensors are reading fine and just have a bit of noise, or if they are actually

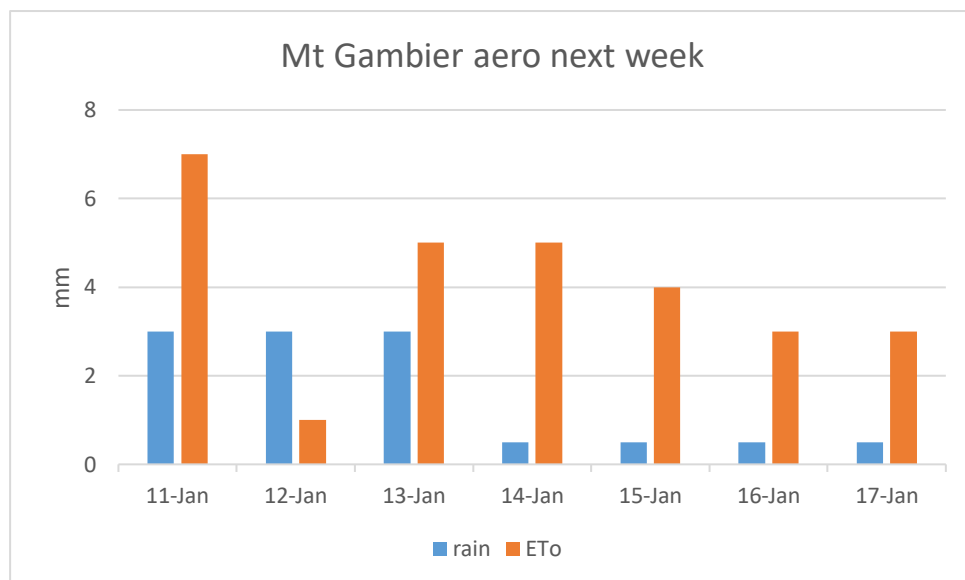
not reading correctly. The fact that all peaks occur at the same time, and that the moisture trends are similar between depths is reassuring. It would be good to be able to get a smoother output from the sensors, though.



Next 7 days ~ average Evapotranspiration & Rainfall

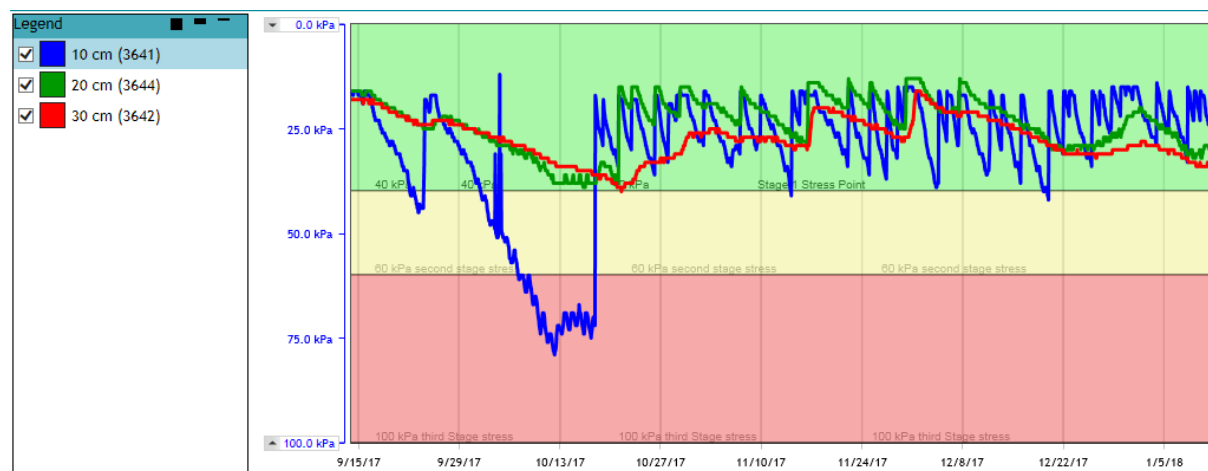
	ETo (mm/day)	Rainfall (mm)
Mt Gambier aero	4.0	11

Traces of rain predicted for the next few days. Highest temperature today at 37°. Predicted ET falling from 7mm today to around 3mm next Wednesday.



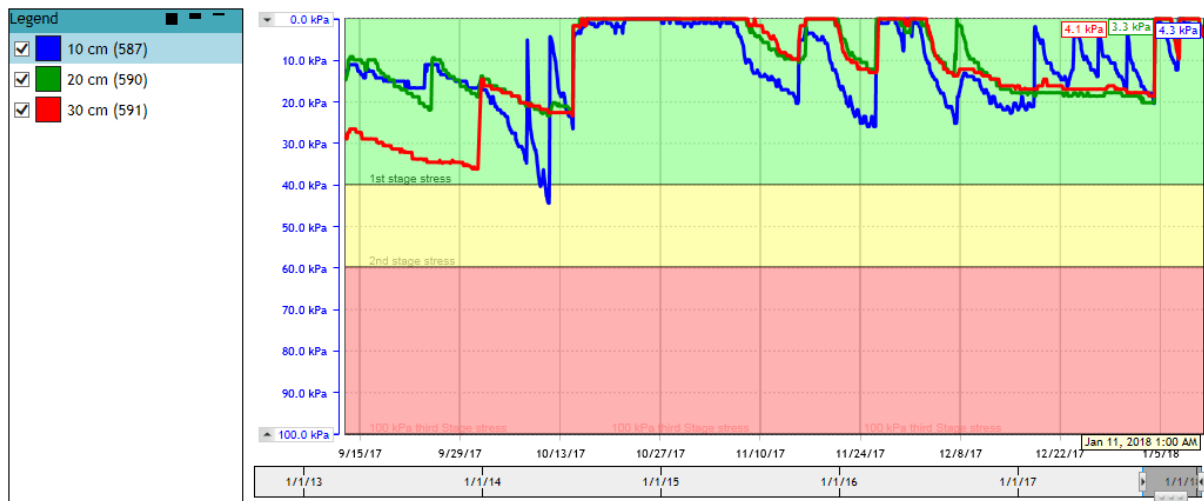
Site Summaries for this irrigation season

Allendale East

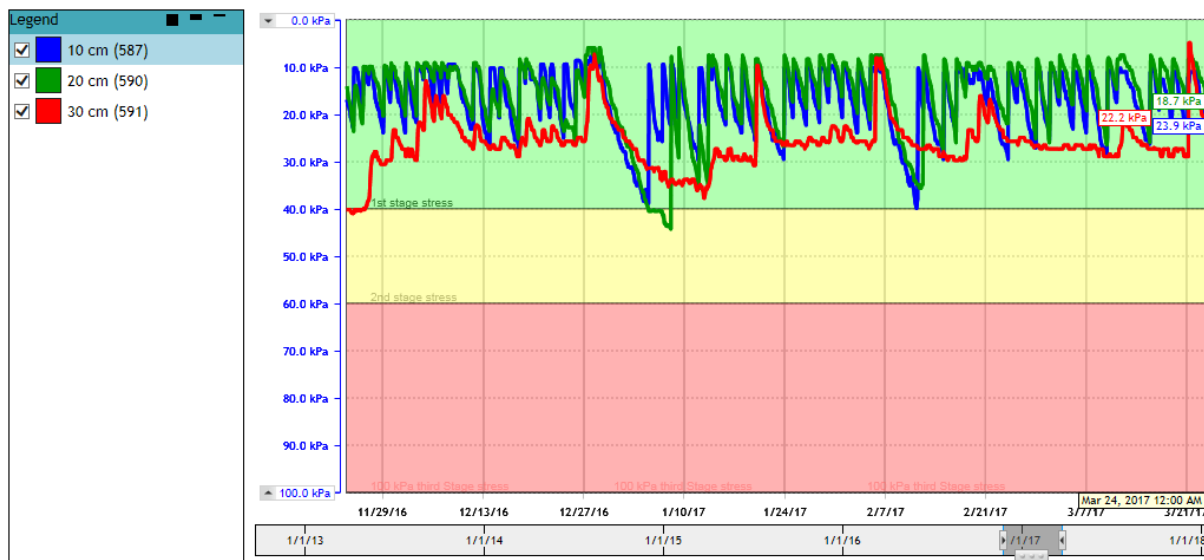


the above chart shows soil moisture readings from September through to current (January). Soil moisture readings have been maintained closely within the desirable range throughout. The shallow sensor (10cm) became quite dry in mid-October. This would not have affected pasture growth, however as there was adequate soil moisture elsewhere in the root zone. There was an odd spike in surface soil moisture from the 10cm sensor in early October. This was not repeated, though, and was probably just a random event (e.g. urine splash from a cow). Overall, the sensors are stable and seem to be well integrated with the irrigation scheduling.

Mt Schank



In October last year, the sensors were moved to another part of the centre pivot at this site. This was done in order to better monitor soil moisture in newly sown pasture. The recorded soil moisture changed from distinct peaks (as seen in the chart below from last year) to more slowly changing soil moisture which did not show individual peaks for watering events.

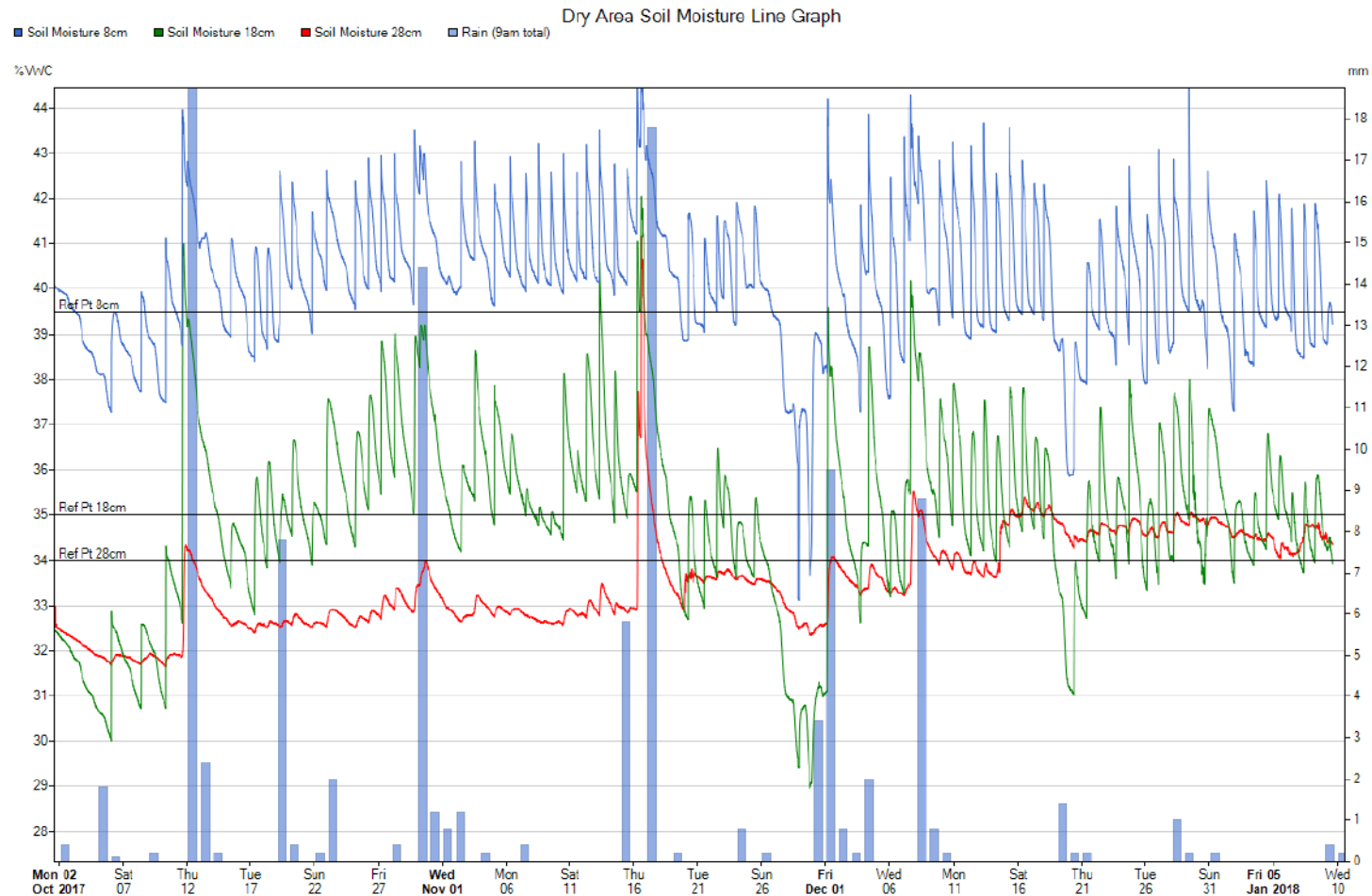


As discussed above, this is likely due to a heavier soil type at the new sensor location. From previous discussion, the key to interpreting the new trace is to watch for the change over time. Gradually dropping soil moisture over time shows that the irrigation is not keeping up with pasture use. Stable or gradually increasing soil moisture shows that irrigation is adequate for pasture growth. Within that framework, soil moisture seems to have been well maintained at this site during the irrigation season.

Eight Mile Creek

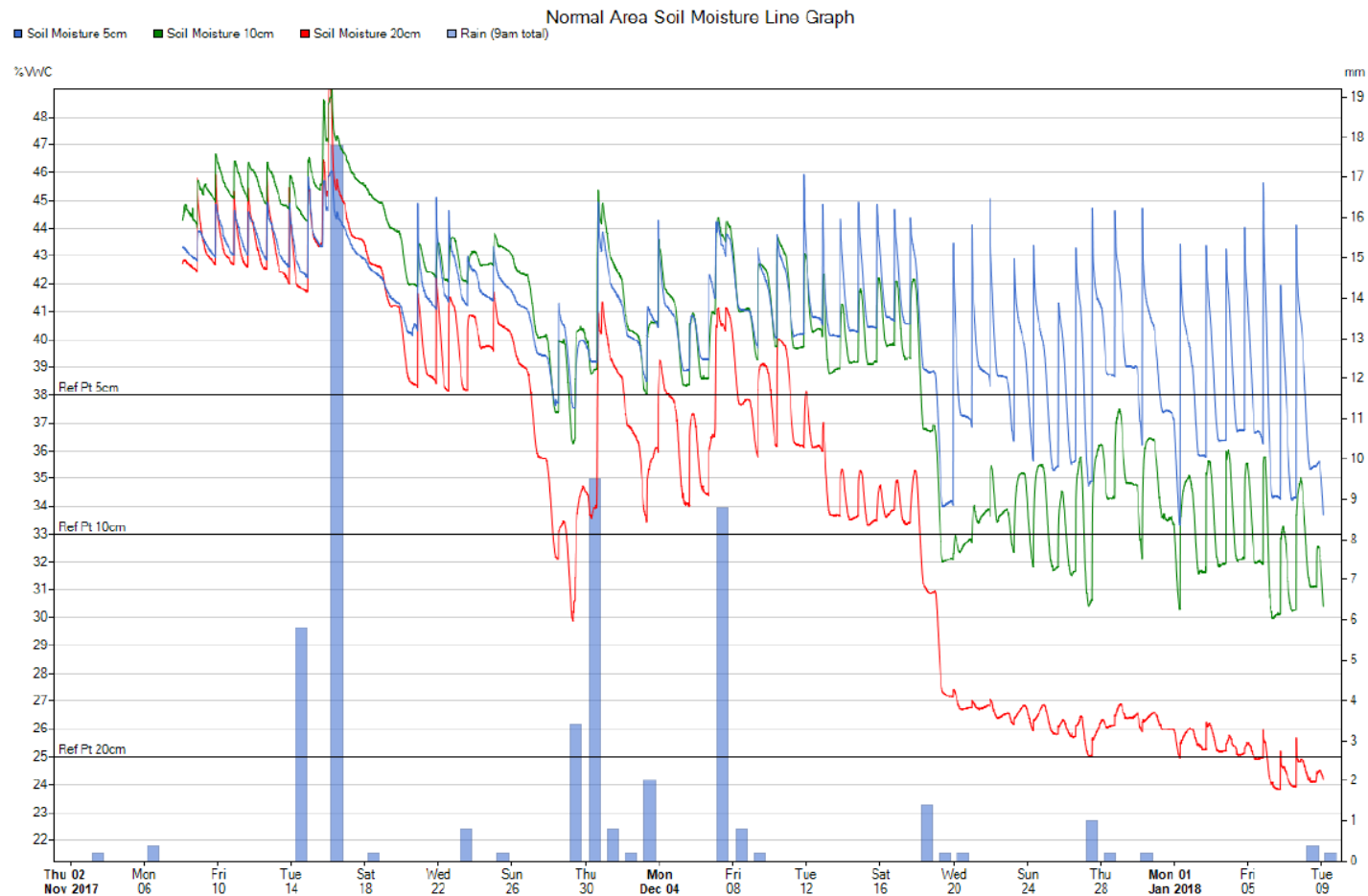
There is a lot of soil moisture data from this site, given that sensors are located in a dry, normal and wet area of the centre pivot. A summary chart is shown below for each location (thanks to Kylie), with comments below it. At Eight Mile Creek the irrigation is scheduled by physical examination and monitoring of soil moisture (digging holes) and the sensors are just measuring what happens, rather than determining the irrigation intervals.

Dry Area



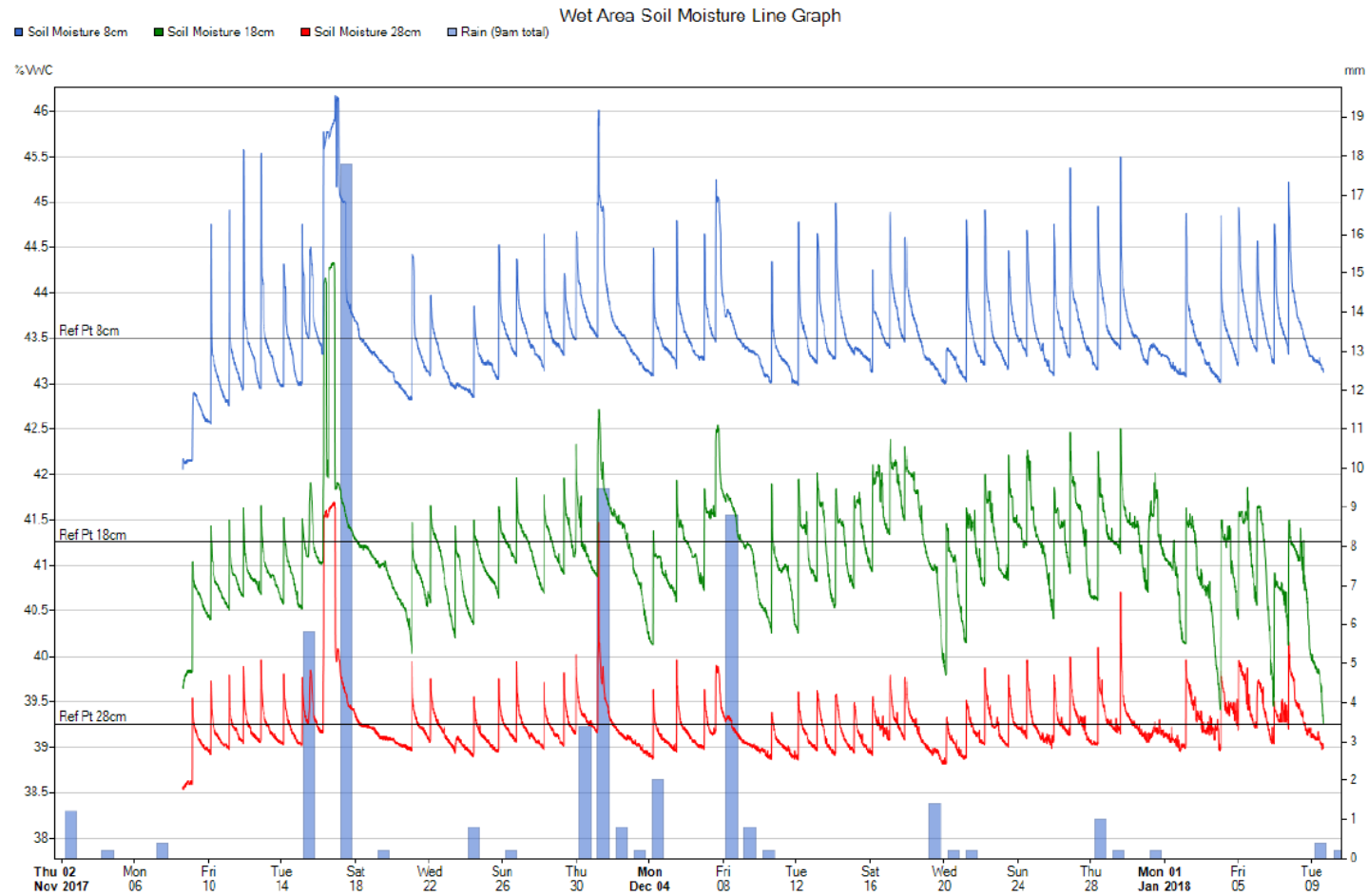
There is a lot to look at here. Firstly, the baselines (reference points) for each sensor seem *reasonably* stable, compared to the other locations. By this I mean the lowest parts of each peak, where the soil moisture drops back to after each irrigation. Even so, it seems a bit difficult to interpret, given the lack of soil moisture suction (kPa) as per the other sites.

Normal Area



The soil moisture baselines at this location have changed dramatically over the irrigation season, and have dropped several times since November. Frequent assessment of previous data and updating of reference points would be needed in order to use these sensors as irrigation triggers. This would involve a lot of time and effort.

Wet Area



These sensors have probably the most consistent soil moisture traces on this centre pivot, although data from the two deeper sensors has become a bit noisy over the last few weeks. The soil moisture at all depths has been maintained in a fairly consistent range during the irrigation season.

The tensiometer-type soil moisture sensors at Allendale East and Mt Schank have the advantage of presenting soil moisture suction, which is what the plants actually see. This is working very well at Allendale East for irrigation scheduling. At Mt Schank the change of sensor location has changed the way that soil moisture readings are interpreted for irrigation scheduling. This still seems to be a usable system, as it is simple to monitor change in soil moisture over time. The sensors appear to be stable and there is the advantage of getting soil moisture data in kPa.

Three nests of capacitance-type sensors have been installed at Eight Mile Creek, and are producing volumetric soil moisture data (% volumetric water capacity). This can give a reasonable indication of trends in water content over time if the soil moisture baseline is stable. At the Wet Area, the baseline is very stable and gives a good indication of reference soil moisture. At the Dry Area the baseline has changed over time but still gives a reasonable indication of changes in soil moisture over time. At the Normal Area the baseline has changed greatly over time and this location would be very difficult to use for irrigation scheduling. A relevant point is that the soil is very shallow (rock at 20cm) and this would be a difficult location for any soil moisture sensor.

Overall, the tensiometer-type sensors seem to be easier to use for irrigation scheduling. More interpretation is required for the new Mt Schank sensor location, but the data is usable, the sensors seem stable and soil moisture suction (kPa) relates directly to plant water uptake. These sensors are more expensive than the capacitance type, but this seems to be the only drawback. The capacitance-type sensors can produce good data, but the difficulty is relating this to what the plant roots can take up. Where there is a stable baseline, the sensors are good for tracking progress of the current irrigation scheduling. However in some sites (Dry and Normal areas), changes in the reference soil moisture points makes it very difficult to interpret this data. The advantage of these sensors is that they are relatively inexpensive and easy to install.

Summary for the coming week

Warm today (max of 37°), low 20's for the next couple of days, then gradually rising to low 30's next Wednesday. Maximum ET of 7mm/day today, then reducing through the week. Light rain expected for the next few days.

Irrigators needed to have applied on average 37.4mm of irrigation water for last week. The predicted weekly pasture water use (ET minus rainfall) for the Mt Gambier area in the next week is 17mm.

* These figures are approximate and do not take into account rainfall on farm*

The intention of this service is not for the information to be used in isolation when making decisions about irrigation scheduling. ETo provides a relatively objective estimate of plant water use and provides another handy 'tool in the irrigation scheduling tool box.' Information in this email is only a guide and should only be used in conjunction with other tools including updated weather information.

For improved accuracy, the collection and use of individual farm rainfall measurements is advised.

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