Perth area, Western Australia—Recessive Stage of Flood began in the mid-Cretaceous and eroded kilometres of sediment from continent

Tas Walker

The geology of south-west Western Australia is characterized by exposed continental cratons, thick sedimentary deposits, vertical crustal tectonics, and widespread erosion. The timing of these features can be connected to the sequence of hydraulic and tectonic processes that occurred during the biblical Flood. The period during which the waters of Noah's Flood were rising on the earth was marked by widespread deposition of thick sediments across the continent. The following period, when the waters of the Flood receded into the newly forming oceans, was dominated by erosion that planed kilometres of sediment from the cratons. The transition between these two periods was marked by vertical tectonics, initiating the opening of the Indian Ocean, the uplift of the continent, and the return of the floodwaters into the sea. This Flood interpretation was facilitated by connecting the processes identified in a biblical geological model with published geological cross-sections and other geological data for the region.

In order to interpret the geology of any area of the earth, it is necessary to begin with a geological model that connects the events and processes of the past with the present geology. We will interpret the geology of south-west Western Australia from a biblical perspective using the biblical geological model published in 1994 at the International Conference on Creationism (figure 1).[1] This area of Western Australia is particularly interesting geologically because of the geographical association of Precambrian cratons with Paleozoic and Mesozoic sedimentation.

The biblical geological model was developed by examining the events of biblical history and envisaging which were significant for the earth's geology. Then, the processes operating at each of these geologically significant periods were considered in order to decide what geological characteristics could be expected as a result. Once we have the model, the next step to make an interpretation is to gather the relevant geological information. These days there is a wealth of information available for most areas of interest on the globe.

Figure 2 shows some of the main geologic regions of south-west Western Australia. The geology of the south west is dominated by the Yilgarn Craton, which extends some 800 km to the east, and 1,000 km from north to south. The craton is composed predominantly of crystalline rocks such as granite and gneiss, but with sub-linear (almost-linear) belts of other metamorphosed rocks including rich gold-bearing greenstone belts.

Current ideas hold that the craton assembled from a number of huge, broken 'blocks', or terranes, of crust that were sheared, metamorphosed, pushed around the earth, and accreted together.[2] Over the last few decades, ideas on the timing of this accretion have changed. In the 1980s it was considered that massive granitic intrusions welded the terranes into a stable 'fixed' craton early in earth history (3 Ga ago in evolutionary worldview).[3] More recently models have had a more plate-tectonic emphasis with the terranes accreting over a much longer period.[4] In this assessment we are looking at the relative timing of the geological units, and the model of the way the craton formed does not affect this.

West of the Yilgarn Craton is the Perth Basin which extends some 700 km north-south along the coast and onshore (figure 3). Offshore it extends even further, a total distance of some 1,300 km along the edge of the continent. The Perth Basin is separated from the Yilgarn Craton by the Darling Fault.

Geological cross-sections

Geological maps, especially the standard 1:250,000 series, with their interpreted geological cross-sections, provide an excellent tool for visualizing the big-picture overview to the geology of an area, allowing it to be interpreted within a biblical framework.[5] The Perth 1:250,000 scale geological map[6] includes two geological sections along the section lines shown in figure 3. The first, labelled A–B (figure 4), runs across the Perth Basin and the second, labelled C–D (figure 5), runs across the west side of the Yilgarn Craton.

We will begin with section C–D which displays the older rocks in the region. The section is about 92 km long and shows a depth of 17 km (figure 5). The vertical and horizontal scales are the same. The left (west) side of the section begins some 45 km north-north-west of Perth, toward the edge of the Yilgarn Craton, and the section runs from west to east. None of the later-deposited Perth Basin is shown on this section. The figure is looking toward the north. All the rock units shown on the section have been classified as Achaean. The cross-section shows graphically how the rocks of the craton are discontinuous and the degree to which they have been folded, upended, sheared, and fragmented. It also illustrates that the top of the craton has been eroded and the portion above the ground surface has been removed. This has left the sub-horizontal (almost-horizontal) land surface, as if the rocks have been cut horizontally at the ground.

Section A–B across the Perth Basin (figure 4) is about 80 km long. Like the first section, it shows a depth of 17 km, has the same vertical and horizontal scales, and is looking to the north. The left (west) side of the section begins in the ocean some 43 km west of Perth and runs to the east-north-east, ending about 37 km inland. The coastline is about halfway along the section (marked).

In contrast with the Yilgarn Craton, the Perth Basin is dominated by thick layers of sub-horizontal sediments. The arrangement of the layers suggests the sediments once formed a continuous horizontal deposit but were subsequently fractured and moved vertically (up and down) by near-vertical faults. These faults are clearly marked on the section, and extend into the 'basement' which is considered to be a downfaulted extension of the Archaean Yilgarn Craton.

Of particular interest is that these horizontal sediments terminate abruptly at the east (right) side of the section against the Darling Fault (labelled Darling Fault Zone on the section). The rocks of the basement to the west (left) of the fault are labelled as Archaean, which are the same 'age' as the rocks of the Yilgarn Craton to the east (right) of the fault. The detailed geology of the basement beneath the thick horizontal sediments ocean is not known so it is simply shown as undifferentiated Archaean. From the section it is clear that movement on the fault has lowered the rocks to the west (left) of the Darling Fault by some 15 km.

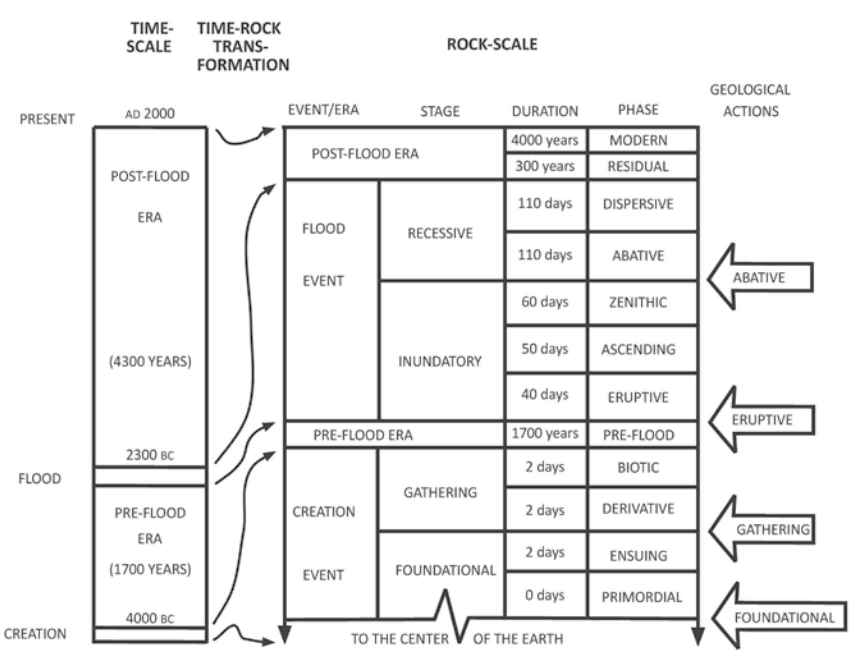

Figure 1. Biblical geological model (modified from Walker[1]).

Beginning at the continental surface

Interpretation involves linking a historical event described in the Bible with a physical location on the ground. An obvious and unambiguous place to start is the time when the whole world was covered with water (Genesis 7:20). This occurred at around Day 150 of the Flood. So we can begin our interpretation of the geological section by envisaging a sea level sufficiently high to cover the entire section.

Computer simulations into the effects of higher sea levels on ocean circulation patterns show that the earth's rotation would generate circulating currents above the flooded continents.[7] Some simulations indicated flow velocities ranging from 40–80 m/s, while others suggested lower velocities in the mid-20 m/s range.[8] Such high-velocity circulating currents are enough to achieve water cavitation which would rapidly erode the land surface. It is possible that the surface at the top of the geological section has been eroded by such circulating flows, although it is unknown whether such circulating cells would have been established over this part of Western Australia.

After reaching their peak, the floodwaters covering the continents began to recede, and continued to do so for seven months until the earth was dry (Genesis 8:14). Initially the waters would have receded in wide, continuous sheets, and these also would have eroded the surface of the continents, producing wide, flat areas. We would expect the direction of water flow would be perpendicular

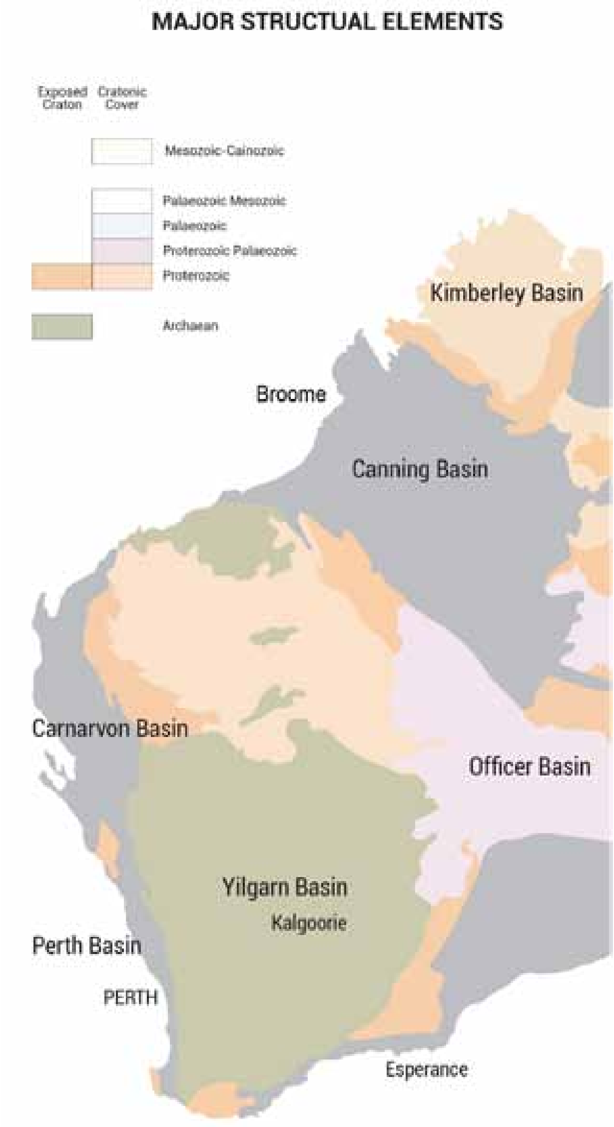

Figure 2. Main geologic regions of Western Australia with Yilgarn Craton and the Perth Basin shown.

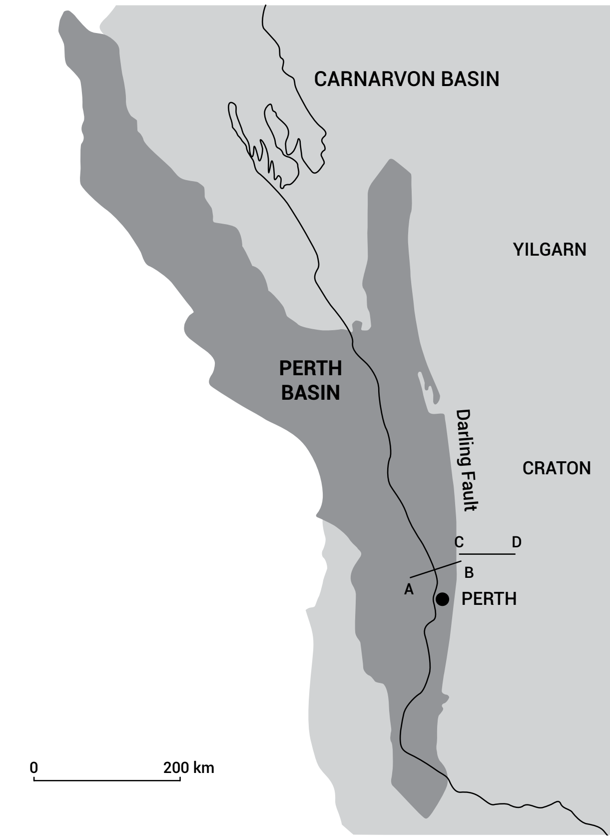

Figure 3. Geographical extent of the Perth Basin (dark grey). Lines for the geological cross-sections are shown.

to the present coastline, although this direction would have been affected by any large-scale topography, including the shape of the coastline, as well as by any circulating cells above the land. This flow of water over the surface of the continent toward the coast would likely have been along the sections flowing from east to west (right to left).

Flat horizons have been produced by water erosion at earlier times during the energetic Eruptive and Ascending phases of the Flood, before the waters covered the earth. These erosional surfaces are usually evident on geological sections, such as the contact between the Archaean basement and the thick horizontal sediments in figure 4.

The most helpful large-scale erosion surface for establishing the interpretive link is the current land surface formed during the Recessive Stage of the Flood, when floodwaters receded into the oceans, eroding the landscape. It is widely recognized that an incredible thickness of rock material has been eroded from the continental surface all over the world.[9] Geologists of the nineteenth century called this process a period of denudation.[10] A well-known area that exhibits such a flat erosional surface is the area around the Grand Canyon, and it has been called the Great Denudation.[11] In trying to explain these flat erosion surfaces without the global Flood, uniformitarians have invoked a concept of a peneplain, the final stage of a hypothetical landscape erosion cycle, developed by W.M. Davies, that is now largely discounted.[12] However, such flat erosion surfaces are expected from and explained by the Recessive Stage of the Flood.[13]

As the level of water over the land dropped during the Recessive Stage, the land surface eventually would have emerged in places, confining the receding flow to wide channels. This flow would continue to overtop the low areas of ranges and escarpments, eroding wide channels through

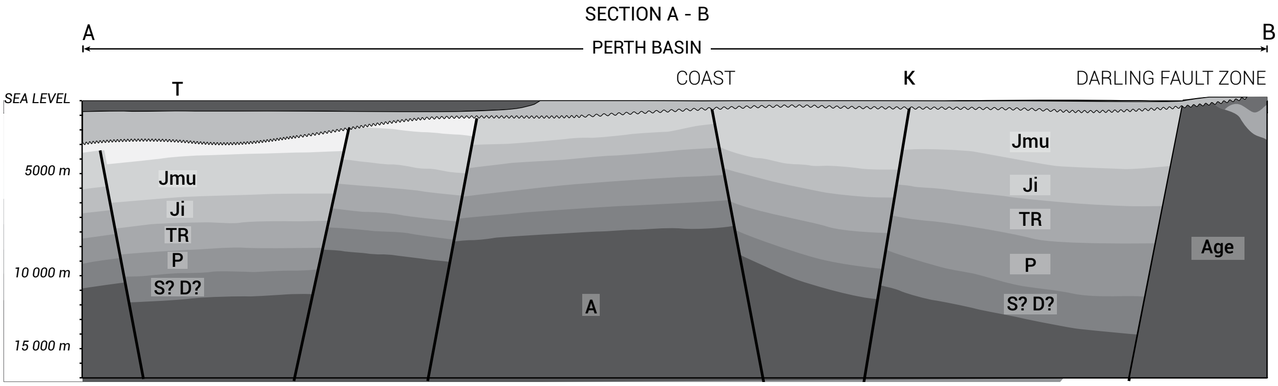

Figure 4. West-east geological cross-section A–B across the Perth Basin. The lowest horizontal layer has been labelled S? D? meaning it could be Silurian or Devonian. The next layers moving up are labelled P, TR, Jl, Jmu, K, and T, meaning Permian, Triassic, Lower Jurassic and Middle to Upper Jurassic, Cretaceous and Tertiary. The sediments sit on the basement labelled as Archaean A. (Redrawn from ref. 6.)

them directly toward the oceans. We would expect to find such evidence visible on the continent.

It is not considered that the area was glaciated during the post-Flood (Pleistocene) Ice Age,[14] so we do not need to consider the erosive effects of glaciers. This means there would have been minimal erosion on the landscape in the 4,500 years since the Flood.

Deposition and erosion

The way the thick horizontal sediments of the Perth Basin are shown on the cross-section suggests they once formed a continuous horizontal deposit across the basin. The near-vertical faults shown on the section (figure 4) extend through most of the thickness of the sediments and into the 'basement'. This suggests the movement on the faults occurred *after* the sediments were deposited, moving the blocks of crust with their overlying sediments vertically (up and down). It does not appear that there was any significant syntectonic deposition (deposition while the faults were moving) of the sediments because there is no obvious thickening or curvature of the sediments closer to fault planes. This is also the case for the sediments abutting the Darling Fault. The cross-section (figure 4) does not show any curvature or thickening of the sediments closer to the Darling Fault. Of course this is an interpreted section that involves some simplification of the situation, but we would still have expected these features to have been shown if they were known to be present.

The fact that the sediments of the Perth Basin terminate abruptly at the Darling Fault suggests that, in accordance with the principle of lateral continuity, they once extended across the Darling Plateau to the east across the top of the Yilgarn Craton. Because the sediments are so thick it would seem that they extended to the east for a long distance.

However no sediments are shown on the Yilgarn Craton on the cross-sections (figures 4 and 5). So, if they were present then they have been removed. Within the biblical framework, it would appear that these sediments, kilometres thick, were eroded from the plateau during the Recessive Stage of Noah's Flood.

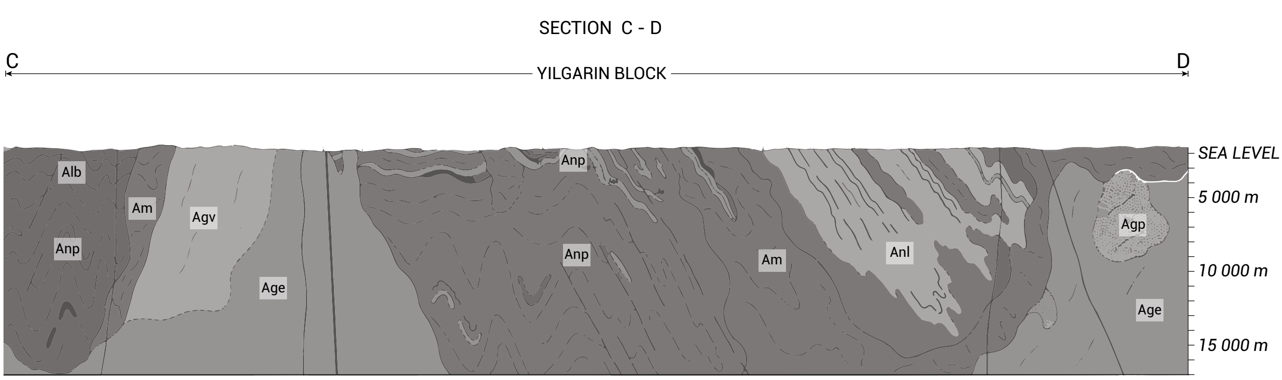

Figure 5. West-east geological cross-section C–D on the edge of the Yilgarn Craton. All geological units have been classified as Archaean. (Redrawn from ref. 6.)

Erosional remnants

If the thick and extensive sedimentary deposits in the Perth Basin once covered the craton and have subsequently been eroded, as would appear from the cross-section, is there other direct supporting evidence? It is not uncommon for erosional remnants to be left on landscapes that have experienced widespread erosion by flowing water. Do any such remnants exist on the Yilgarn Craton?

Remnants of Cretaceous sedimentation are found on the Yilgarn Craton but Cretaceous sediments are not what we are looking for. We are looking for remnants where the sediments at the base in contact with the craton are classified of a similar 'age' as the sediments at the base of the Perth Basin where they also contact the basement. In other words, we would be looking for sediments classified as Silurian, Devonian or Permian, not as Cretaceous or Tertiary.

Of course, sediments are classified according to their contained fossils, a process that assumes the depositional environments were localized and persisted for millions of years. However, this situation is not valid for the Flood framework because the water flows were of a continental scale and of short time duration. Similar fossils need not represent an exact time correlation for sediments deposited in widely separated geographical areas. Because of the short time duration, sedimentary deposits do not represent *in situ* environments but areas of deposition from water flowing energetically over a wide area for long distances during the Inundatory Stage of the Flood. Nevertheless, fossil correlation would be expected to have limited application, but requires care as to how it is applied.

Indeed, there are some impressive sedimentary deposits preserved on the plateau. Three well-known deposits are called the Collie, Wilga and Boyup basins, which are located toward the edge of the craton, just 45 km east of the Darling Fault and 100 km south of Perth (figure 6a).[15] These deposits are classified as Permian[16] which is similar to the strata near the base of the sediments in the Perth Basin, which is what we are looking for.

The Collie Basin consists of two sub-basins joined as shown in figure 6b.[17,18] It is about 26 km long and 15 km wide with a maximum thickness of 1.4 km. The Permian strata are confined within downfaulted blocks (a graben) of the Archaean Yilgarn Craton. They are covered uncomformably by a thin veneer of Cretaceous sediments. The coal seams within the sedimentary strata are mined for power generation, and most of the seams worked vary in thickness from 1.5 m to 5 m.

The cross-section of the Collie Basin (figure 7) indicates that the strata terminate abruptly at the faults. As with the sediments in the Perth Basin, there is no indication on the section that the sediments curve or thicken toward the faults, which rules out syntectonic deposition within a localized basin. In addition the section shows that the sediments have

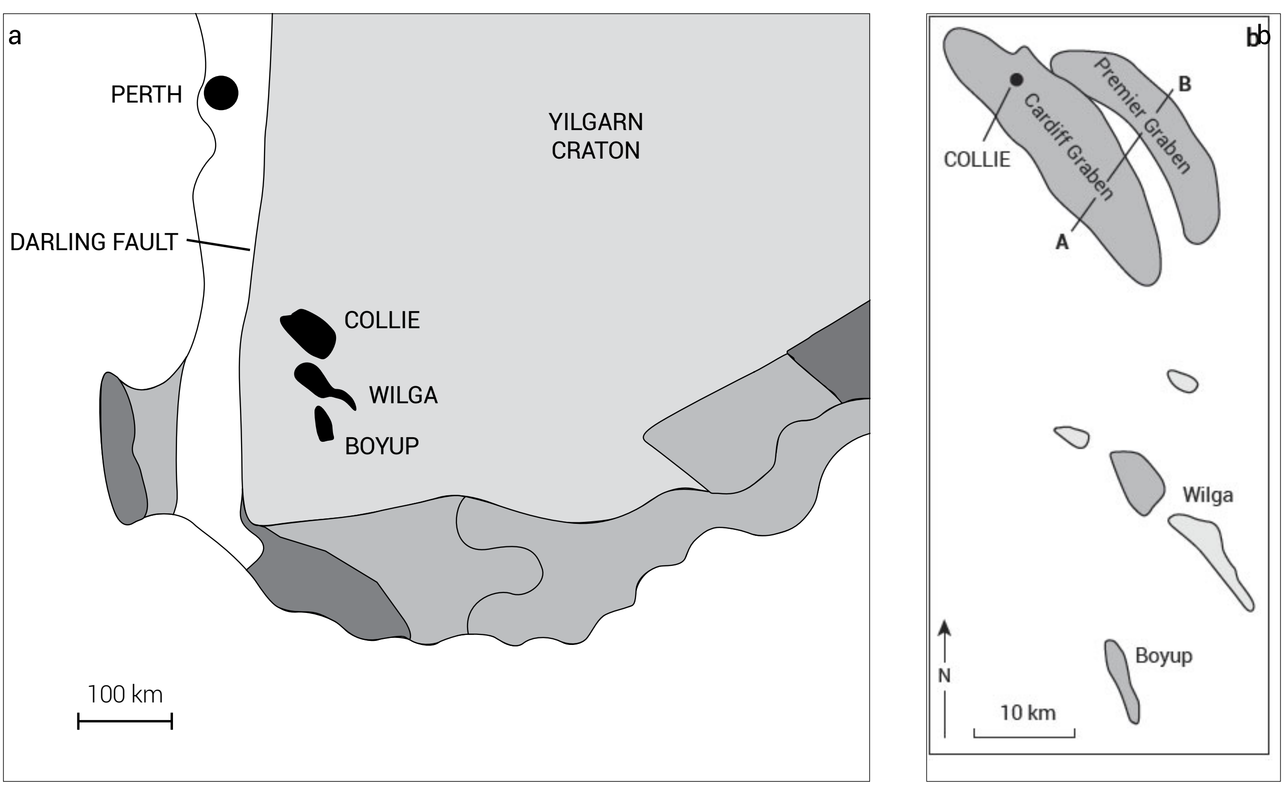

Figure 6. Location of Collie, Wilga and Boyup basins, Western Australia.

been planed off at the ground surface. All this suggests that these sediments were once part of a much larger sedimentary deposit that covered a significantly greater area of the Yilgarn Craton. After deposition, faults within the Yilgarn Craton dropped the sediments vertically and erosion on the craton removed the surrounding sediments. Sediments in the downfaulted graben were preserved.

Interestingly, the 1.4 km thickness of the Permian sediments within the Collie Basin is a similar thickness to the Permian sediments shown in the cross-section of the Perth Basin (figure 5). Millar *et al*. comment that significantly more sediment was deposited on top of the Collie Permian sediments. Estimates based on the vitrinite reflectance of the coal, an indirect method, indicate a post-Permian thickness at Collie of less than 2,000 m.[19] Although this is less than the 6 km of post-Permian sediments shown in the Perth Basin (figure 5), it is of the same order of magnitude and likely within the bounds of estimating accuracy for the vitrinite method.

Similar sediments are also found in the Wilga and Boyup basins which, respectively, lie 30 km and 45 km south of the Collie Basin. One publication says of these basins that they, "like the Collie coalfield, are relics of an aerially extensive Permian succession that has been preserved in fault-bounded grabens on the Yilgarn Craton".[20] More recent publications describe them not as basins, but as outliers,[15] which is more appropriate given that much of the surrounding sediment has been removed by erosion.

Thus, the sediments within the Collie, Wilga, and Boyup basins confirm the expectations drawn from the Perth geological cross-section. We conclude that the thick sediments within the Perth Basin once extended across the top of the Yilgarn Craton. They were eroded away by the receding waters of Noah's Flood. However, the downfaulted grabens preserved a remnant of these sediments on the craton.

Timing of continental uplift

For the waters to have covered the whole earth, the continents must have been *lower* relative to the ocean basins in the middle of the Flood. Then, for the water to recede, the continents must have *risen* relative to the ocean basins. The floodwaters would have started to recede when the continents began to rise.

The Perth geological section (figure 4) provides evidence for uplift of the Australian continent. In the section the thick deposits within the Perth Basin have been broken by near-vertical faults that run through the Archaean Yilgarn Craton. The largest movement is of the order of 15 km on the Darling Fault to the east (right) of the section.

The timing of the uplift can be estimated from the extent to which the faults penetrate the strata. On the section the faults extend upward into Lower Cretaceous strata, whereas the Upper Cretaceous sediments run continuously across the faults, as do the Tertiary sediments. This suggests the ocean basins began to lower after the Lower Cretaceous sediments were deposited and before the Upper Cretaceous. This means that the Lower Cretaceous sediments were deposited as the floodwaters were rising and that the Upper Cretaceous strata were deposited while the floodwaters were receding. In other words, the middle of the Cretaceous in this section is somewhere near the peak of the Flood.

This matches the timing of the faulting in the Collie Basin. Millar *et al*. report that faults appear to post-date lithification of the succession, which is what was concluded above from the way the cross-section is drawn. They say the most likely timing for the faulting is latest Jurassic–earliest Cretaceous,[21] which is similar to the timing shown for the faulting on the Perth Basin section in figure 4.

This timing also matches the timing concluded from an analysis of the Cretaceous sediments of the Great Artesian Basin, Australia.[22] Of course, considering how the waters of the Flood would have moved across the continent, eroding sediments from some areas and depositing them in others, it is unlikely that that rocks labelled Upper Cretaceous in Western Australia were deposited at *exactly* the same time as rocks labelled Upper Cretaceous in central Queensland.

Uniformitarian geologists have linked this faulting with what they call the breakup of Gondwana and the separation of Australia from India.[21,23] Thus it would appear that the breakup of Gondwana, of which mainstream geologists speak, represents the lowering of the ocean basins and the uplift of the continents mid-way through Noah's Flood. This signalled the beginning of the retreat of the floodwaters as

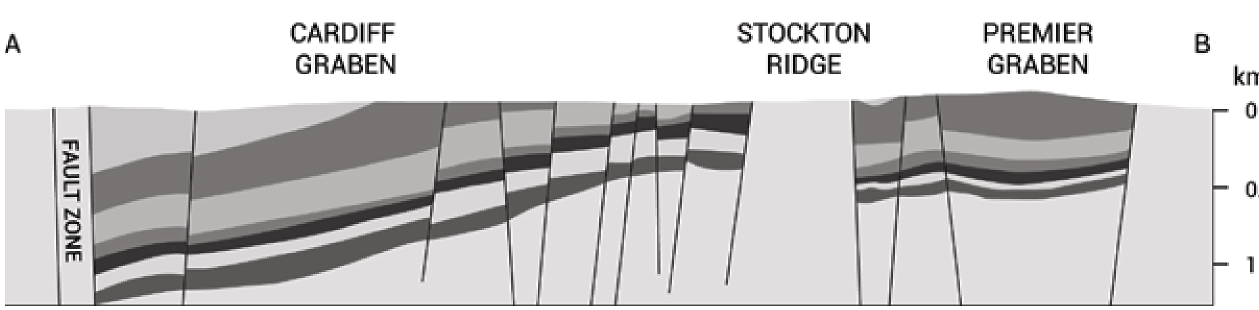

Figure 7. Cross-section of Collie Basin (after Millar *et al.*[17]).

described in Genesis 8, and makes it clear that the Flood/post-Flood boundary would not have been reached until all the waters on the continents had drained during the subsequent seven-month period. Thus the post-Flood boundary in the Perth Basin would be well after the Late Cretaceous.

This timing of the continental uplift explains the preservation of the sediments within the Perth Basin. It is the same reason the sediments of the Collie, Wilga, and Boyup basins were preserved when faulting lowered them beneath the surface of the craton, protecting them from the erosive effects of the receding floodwaters. In the same way, faulting on the edge of the craton lowered the Perth Basin such that they were preserved from erosion as the floodwaters retreated from the continent.

Conclusion

The thick sedimentary sequence within the Perth Basin was deposited during Noah's Flood toward the end of the period over which the floodwaters were rising. These thick deposits covered a large geographical area of the Yilgarn Craton, and likely extended across the Australian continent to connect with similar sedimentary blankets to the east. The waters of Noah's Flood peaked after the Lower Cretaceous sediments were deposited. The floor of the Indian Ocean began sinking relative to the Australian continent after the Lower Cretaceous sediments were deposited. This caused faulting along the edge of the Yilgarn Craton along the west coast of Western Australia. The floodwaters above the Australian continent flowed in a westerly direction into the newly forming Indian Ocean, eroding kilometres of sediment from the top of the Yilgarn Craton. Sediments west of the Darling Fault in the Perth Basin were preserved from erosion because they had dropped a significant distance before the waters had begun to recede. The Upper Cretaceous and Tertiary sediments were deposited unconformably *after* the faulting had occurred, by the floodwaters as they were receding. The biblical geological model provides a useful scenario that allows the geological history of an area to be developed.

References

1. Walker, T.B., A biblical geologic model; in: Walsh, R.E. (Ed.), *Proceedings of the Third International Conference on Creationism*, Creation Science Fellowship, Pittsburgh, PA, pp. 581–592, 1994.
2. Wilde, S.A., Crustal Evolution of the Southwestern Yilgarn Craton, Geological Society of Australia (WA Division), Excursion Guidebook No. 7, 12th Australian Geological Convention, pp. 1–12, 1994.
3. Gee, R.D., Baxter, J.L., Wilde, S.A. and Williams, I.R., Crustal development in the Archaean Yilgarn Block, Western Australia, Geological Society of Australia, Special Publication No. 7, pp. 43–56, 1981; quoted in: Wilde, ref. 2, p. 10.
4. Myers, J.S., The generation and assembly of an Archaean supercontinent: evidence from the Yilgarn Craton, Western Australia, *Geological Society, London, Special Publications* **95**:143–154, 1995, doi: 10.1144/GSL.SP.1995.095.01.09.
5. Walker, T.B., Seeing Noah's Flood in geological maps, *J. Creation* **25**(2):12–14, 2011; creation.com/flood-geological-maps.
6. Perth, Sheet SH-50-14 and part Sheet SH-50-13, Australia 1:250,000 scale geological map series, Geological Survey of Western Australia, 1978.
7. Baumgardner, J.R. and Barnett, D.W., Patterns of ocean circulation over the continents during Noah's Flood; in: Walsh, R.E. (Ed.), *Proceedings of the Third International Conference on Creationism*, Creation Science Fellowship, Pittsburgh, PA, pp. 77–86, 1994.
8. Prabhu, R., Horstemeyer, M.F., and Brewer, W., Ocean circulation velocities over the continents during Noah's Flood in: Snelling, A.A. (Ed.), *Proceedings of the Sixth International Conference on Creationism,* Creation Science Fellowship, Pittsburgh, PA, pp. 247–254, 2008.
9. Oard, M.J., Surficial continental erosion places the Flood/post-Flood boundary in the late Cenozoic, *J. Creation* **27**(2):62–70, 2013.
10. E.g.: Dutton, C., *Tertiary History of the Grand Canyon District*, 1882; Fairley, J., An Account of the Great Derbyshire Denudation, *Philosophical Transactions of the Royal Society of London* **101**:242–256, 1811.
11. Oard, M.J., The origin of Grand Canyon Part IV: the great denudation, *CRSQ* **47**(1):146–157, 2010.
12. Pitty, A.F., *The Nature of Geomorphology*, Methuen & Co, London, pp. 74–75, 1982.
13. Oard, M.J., *Flood by Design: Receding Water Shapes the Earth's Landscape*, Master Books, Green Forest, AR, pp. 66–72, 2008.
14. Colhoun, E.A. and Barrows, T.T., The glaciation of Australia; in: Ehlers, *et al.*, *Quaternary Glaciations—Extent and Chronology: A Closer Look, vol. 15*, Elsevier, pp. 1037–1046, 2011; Also, Brown, W.R., Pleistocene glaciations in the Commonwealth of Australia, *J. Glaciology* **3**(22):111–115, 123, 1956.
15. Millar, A.S., Mory, A.J., Haig, D.W. and Backhouse, J., *Collie Coalfield and Lake Clifton—a field guide*, Geological Survey of Western Australia, Record 2011/17, pp. 2,4, 2011.
16. Millar *et al.*, ref. 15, p. 2, report that early workers had assigned a Carboniferous or Permo-Carboniferous age to the succession, whereas later workers assigned a Permian classification based on plant fossils.
17. Millar *et al.*, ref. 15, p. 4.
18. Varma, S., *Hydrogeology and Groundwater Resources of the Collie Basin, Western Australia*, Water and Rivers Commission, Resource Science Division, Hydrogeological Record Series, Report **HG 5**, 2002; Quoted from: le Blanc Smith, G., *The geology and Permian coal resources of the Collie Basin*, Western Australia: Western Australia Geological Survey, Report 38, p. 86, 1993.
19. Millar *et al.*, ref. 15, p. 5.
20. *Coal: Western Australia*, Geological Survey of Western Australia, Perth, 1990.
21. Millar *et al.*, ref. 15, p. 3.
22. Walker, T.B., The Great Artesian Basin, Australia, *J. Creation* **10**(3):379–390, 1996; creation.com/great-artesian-basin.
23. Mory, A.J., Haig, D.W., McLoughlin, S., and Hocking, R.M., *Geology of the northern Perth Basin, Western Australia—a field guide*, Western Australia Geological Survey, Record 2005/9, p. 5, 2005.

Tasman Walker, *B.Sc. (Earth Science with hons), B.Eng. (Mechanical with hons), and Ph.D. (mechanical engineering), worked to plan, design and operate power stations for over 20 years, including geological assessments of coal supplies. Tas also worked to plan a large hydro-electric project including evaluation of geological conditions and their effect on dams, etc. Tas has authored many articles in Creation and Journal of Creation and is a researcher, writer and speaker with CMI, Australia.*