STAGE 4 GEOGRAPHY

Stream Order

FOCUS AREA- Water in the World

Outcomes explored

A student:

- Locates and describes the diverse features and characteristics of a range of places and environments GE4-1
- Acquires and processes geographical information by selecting and using geographical tools for inquiry GE4-7
- Communicates geographical information using a variety of strategies GE4-8

Key inquiry question

- How do natural and human processes influence the distribution and availability of water as a resource?
- What effect does the uneven distribution of water resources have on people, places and environments?
- What approaches can be used to sustainably manage water resources and reduce water scarcity?

Content:

- Water Resources
- Australia's water resources
- Water scarcity and water management

Content focus

Students:

- Examine water as a resource and the factors influencing water flows and availability of water resources in different places
- Investigate the nature of water scarcity and assess ways of overcoming it.

Australian Syllabus Links:

- ACHGK037
- ACHGK039
- ACHGK040

STREAM ORDER

Mangrove Creek Dam is a large dam on the Central Coast that can hold approximately 190,000 million litres of water or 76,000 Olympic size pools in volume or 93,137 rugby fields that have 30cm of standing water on them. This dam is primarily a storage dam for collecting water. This location is a great spot to build a dam based on the geology of the area, undeveloped land in the catchment and the narrow valley allowing for a high dam wall. This is a key part of water security for the Central Coast acting as a safety net to provide fresh water in times of need.

Mangrove Dam

Mangrove Dam location

When water demand on the Central Coast increases, water can be released from Mangrove Dam into Mangrove Creek and taken out at Mangrove Creek Weir. The water is then piped to Somersby Treatment Plant for treatment before entering the supply system for household consumption. Water can be released from Mangrove Dam and sent into Wyong River via the Mangrove to Mardi pipeline. This uses gravity to move the water towards Mardi Dam for treatment. Water can also be pumped the other way from Mardi Dam back to Mangrove Dam when Mardi Dam reaches maximum capacity. This can occur during heavy rains. For the water to be moved up the pipeline, high lift pumps are utilised.

Water fills Mangrove Dam naturally in three ways:

1. Rainfall - direct water falling into the dam
2. Creeks - water being transported into the dam via a network of creeks or rivers
3. Runoff - water that rolls off the land directly into the dam.

Creeks or rivers in the catchment area are a vital source of water for the Mangrove Creek Dam. The Strahler System is a classification method that determines the hierarchy or significance of streams (including creeks and rivers) as they make their way to the ocean. It is important to understand how streams can merge to create larger and larger systems thus bringing more water with them. Using the catchment map and implementing Strahler System you will be able to see how streams merge and increase their water volume in the Mangrove Creek Catchment. The smallest creeks start at a value of one and progressively become larger and larger. Globally, the Amazon River tops the chart at a stream order of 12 before it enters the Pacific Ocean. What is the stream order of Mangrove Creek as it enters Mangrove Creek Dam?

The Mangrove Creek Dam catchment area is 101 square kilometres with many streams providing water to the dam. Notice in the example on the Stream Order map below (Figure 8) that order one streams are starting points and haven't merged with any others thus far making them an order one.

How do stream orders increase?

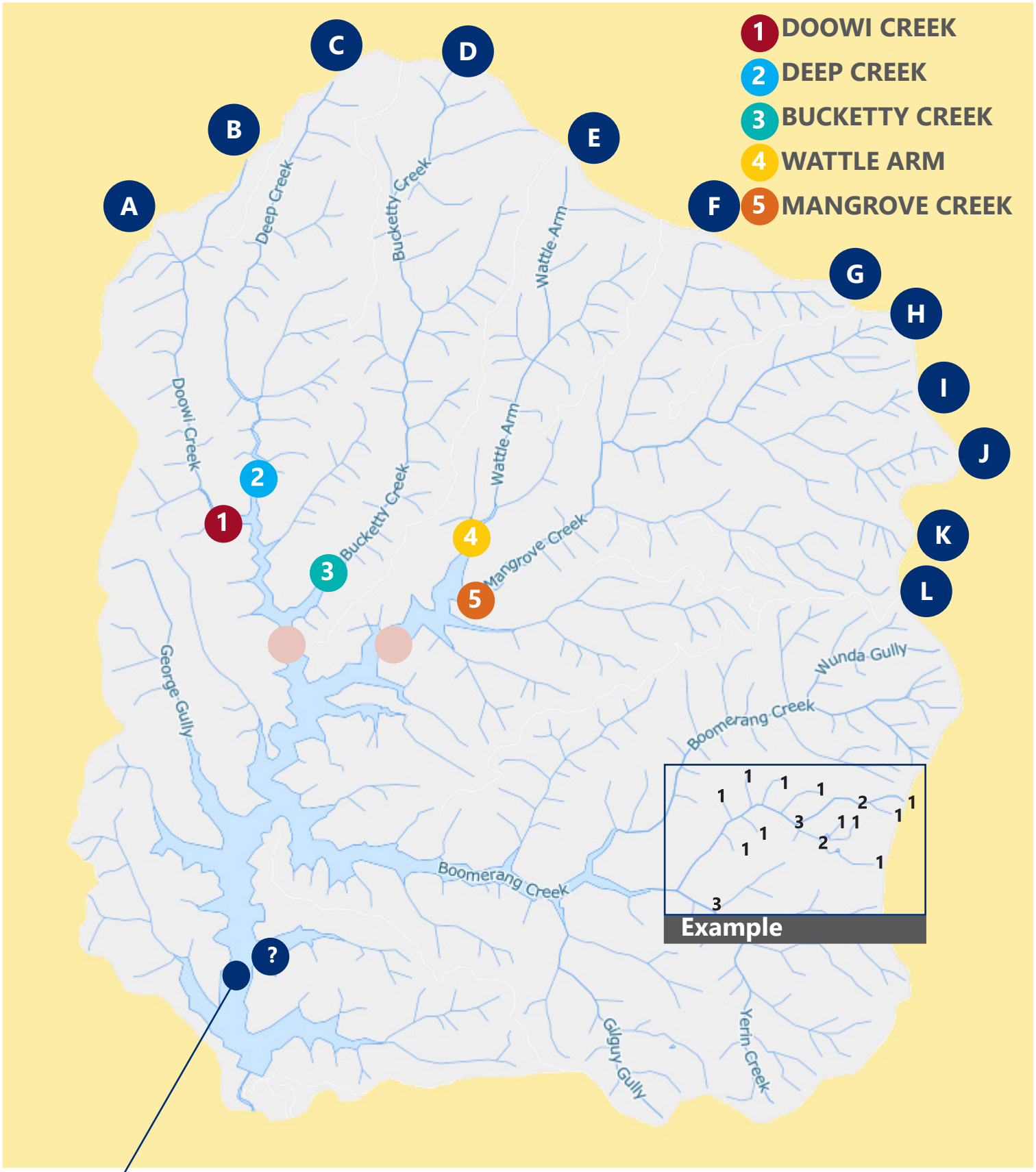
- When **two** order one streams merge, they turn into an order two stream.
- When **two** order two streams combine, they turn into an order three stream.
- When an order one stream merge with an order two it stays an order two.
- Stream orders **only** increase when they meet an equivalent stream order. Otherwise the stream stays at the highest stream order after the merging point.

Stream Order Map Instructions

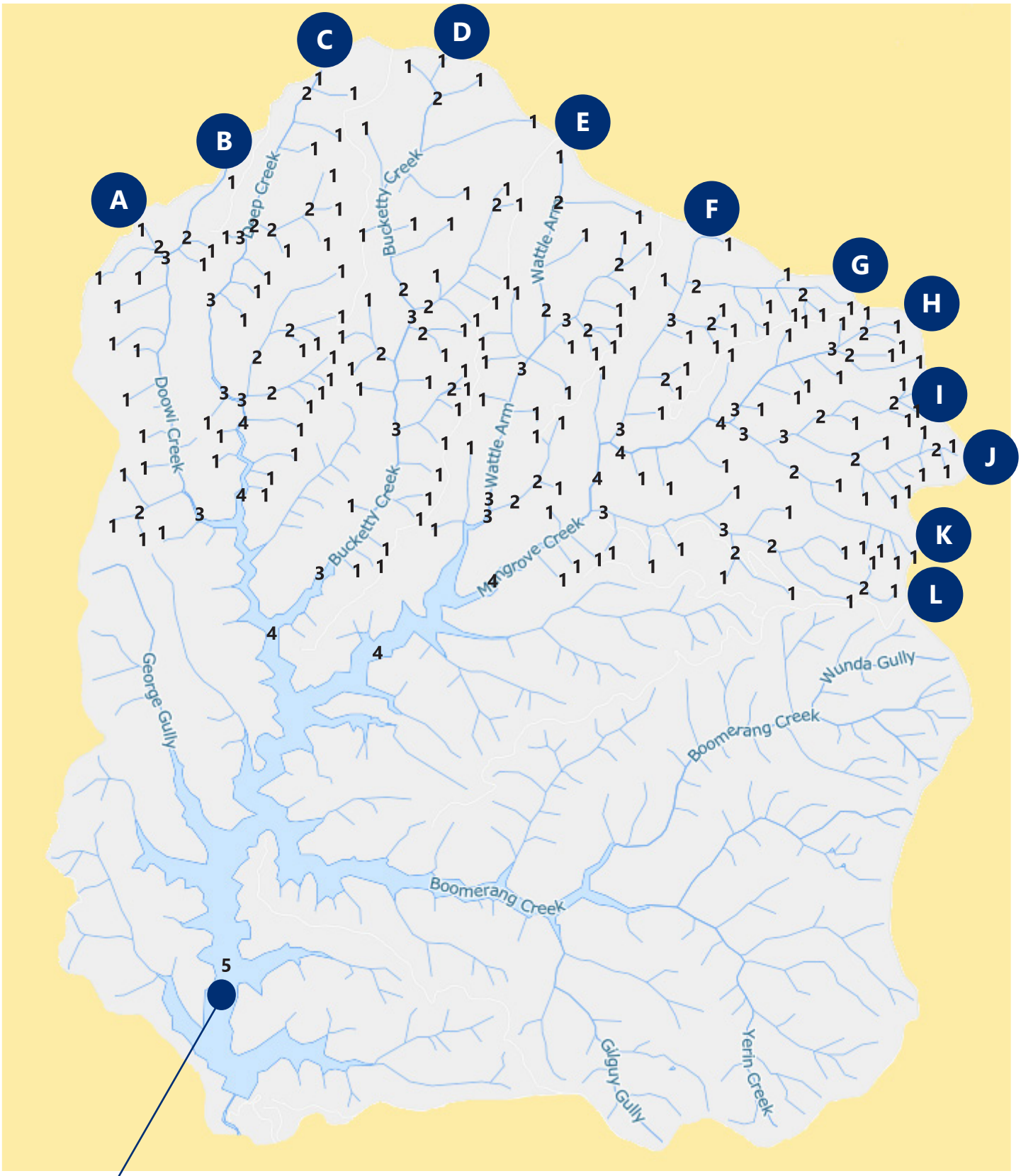
Using the catchment map, use the Strahler System to fill in the missing number with the correct stream orders as shown in the example.

1. Choose a starting point from A-L where you will enter your first stream order on your way to the blue dots.
2. Streams will always begin as an order one Label all the initial streams with a 1 and then progress down towards the blue dot.
3. As streams converge, add new numbers below the intersection point so you know the new stream order as shown in the example.
4. Using the Strahler System, determine the five creeks orders as they enter into Mangrove Dam.

Determine Stream Order in the Mangrove Creek Catchment



Teacher Key - Determine Stream Order in the Mangrove Creek Catchment



STREAM ORDER IN THE MANGROVE CREEK CATCHMENT

Teacher Debrief Q&A Ideas

1. **The catchment at Mangrove Dam has lots of creeks spread throughout. Why is this advantageous when the collecting water for the dam?**

   Creeks in the catchment act like a big net to receive water that hasn't been absorbed into the ground. When it rains, runoff from the land flows downhill with gravity into the creeks. As the creeks merge, they become bigger, bringing water into the dam.

2. **What do you think the topography of the catchment looks like? How does that aid in collection of water?**

   Typically when you see lots of creeks in an area this indicates a very steep, hilly or mountainous terrain. Waterways in the Mangrove Creek Catchment exist because of the steep land formations which divert water to the bottom of the valley. Extreme topography does not allow much time for water to be absorbed into the ground. This same principle happens in the Mangrove Creek Catchment area where water quickly moves down in elevation into the creeks which feed the dam.

3. **Mangrove Dam can not only hold water for future use, but can prevent what type of natural hydrological disaster downstream?**

   Heavy rains can create flooding in towns or cities near creeks and rivers. A large storm may deliver lots of rain far away from a town, yet the town still floods. It may take some time before a river brings the rain water downstream and floods low-lying areas. Mangrove Dam can help mitigate flooding downstream by collecting water in the catchment and filling up the dam. The amount of water that is released downstream can be carefully controlled by the dam controllers.

4. **What are some of the factors that were considered when choosing this location for the dam?**

   The main factors in choosing to put the dam in this location are:
   - the rocky foundation of the site is suitable for dam construction,
   - the narrow valley allowed an 80m dam wall to be built thus creating a deep dam,
   - natural, undeveloped areas in the catchment provide clean, fresh water to the dam
   - location is relatively close to the community, minimising the costs of transferring the water using pipelines and pumping stations.

5. **Why would Central Coast Council want to limit access, development and human activity in the catchment area?**

   To limit the potential for pollutants to enter dam and contaminate the drinking water supply. E.g. example, fertilizers can encourage blue green algae growth which can make the water unsafe to drink.

6. **Why is it important to have a pipeline that allows water be transported between Mardi Dam and Mangrove Dam?**

   The pipeline allows Mardi Dam to transfer excess water to Mangrove Dam to make room for water being extracted from the Wyong River or Ourimbah Creek during heavy flows. The inverse is that Mangrove Dam can send water to Mardi Dam when water levels are low and the demand for potable water increases.