Integrity Challenge:

Drilling through a loss zone leads to a high probability of poor cement quality and free pipe. If there is a corrosive aquifer, the possibility of external corrosion is increased drastically. It is critical to understand the integrity of the pipe across these areas. Regular logging is recommended to identify when corrosion will migrate from the outer to the inner pipes. This will enable a remedial program such as installing a scab liner to be instigated before a catastrophic failure.

Corrosion Logging Result:

One example when corrosion logging was done in a 4 barrier well (strings) and metal loss on the outer casing was detected is shown below:
The well is vertical gas lift oil producer drilled in 1991. The well was completed with a 13 3/8" surface casing, a 9 5/8" intermediate casing and a 7" production liner. A 3.5" gas lift completion string was run.
In 2005 during a workover the 9 5/8" casing was pressure tested in stages. The test indicated that the casing had failured at an interval from surface-37.70 m. A 7" scab liner was run from surface to the top of the 7" production liner. A 3.5" gas lift completion string was run.
In 2020 a subsurface integrity test (SIT) was conducted and the C annulus LOT failed, whereas the B and the A annulus tests were successful.
In 2021 and 2022 the SIT was repeated with the same results.
In 2023 EMDs corrosion logging was run. The log data indicated the presence of an extended interval of severe metal loss in the shallow section of the well in the 13 3/8" casing. The maximum metal loss was almost 100%. In addition the temperature curve showed the existance of crossflow across the corroded interval.

Conclusion:

The EMDs tool can accurately pinpoint areas of corrosion and metal loss. From the logging results future well designs should be reviewed to mitigate metal loss in the outer strings e.g. heavier grade pipe, alternative metallurgyto avoid leaks, improved cement placement such as staged cementing.
In addition to performing regular SIT's it is recommended to increase the frequency of EMDs logging to establish corrosion trends, thus allowing the client to perform timely interventions to maintain well integrity.