

## CASE STUDY: Aviation

### → Key Project Elements

- ACN/PCN assessment
- Visual inspection
- Geotechnical investigation
- FWD testing

### → Client Requirements

Barcoo Shire Council commissioned Pavement Management Services to undertake a technical assessment of the existing pavement assets and provide design options for future runway requirements.

### → Objectives

- Assess the current structural condition of the pavement assets.
- Provide a technical ACN/PCN assessment based on current traffic patterns.
- Include the Dash 8-300.
- Identify and rectify localised areas of poor performance.
- Prepare a pavement design strategy to cater for future traffic and include possibility of expanding operations to accept the Dash 8-400 operations.



Photo Airlines Airports

# WINDORAH AERODROME

May-Jun 2019

## Methodology

- Falling Weight Deflectometer (FWD) structural testing of existing pavement structure.
- Geotechnical investigation, including three boreholes on the runway, to confirm thickness of the pavement layers and profile.
- Back calculation of the existing pavement deflection for pavement engineering properties (elastic moduli, inferred CBR and nonlinearity), using the ELMOD 6 software.
- Mechanistic-empirical ACN/PCN analysis (ACR/PCR).
- Confirm the current PCN rating, using a traffic fleet mix of Dash 8 Q-300, SAAB 340 and King Air 350i.
- Prepare a pavement treatment strategy, taking into account indications of future growth and including the Dash 8 Q-400.
- Provide design options for future runway requirements, using a traffic mix of C130, King Air 350i, Dash 8 – Q400 and SAAB 340.

# Windorah Aerodrome

## Outputs

- Documented description of existing pavement condition, including a thematic map of the runway
- Remaining Life estimation.
- Confirmation of pavement layer stiffness.
- A proposed pavement treatment and rehabilitation strategy, aiming to: remediate areas of urgent need, then provide localised treatments and rehabilitation actions to assure a pavement structure to provide the half design life; and to provide structural adequacy to carry greater loads in the second half life, after applying an asphalt overlay.
- Pavement treatment details, using the materials specified by the client.
- Confirmed ACN/PCN ratings for the existing runway, utilising traffic information as provided, with the inclusion of the Dash 8 Q-300.
- Design options for future runway expansion and use; the options being:
  1. Minimum requirements: heavy patching.
  2. Address functional issues: in situ milling and reforming.
  3. Fixing seal/surface anomalies: mill and reseal.
  4. Structural improvement: asphalt overlay.
  5. New granular pavement on natural subgrade: airport expansion / upgrade.

**To assess the strength and performance of existing pavement and to design any changes to that pavement, it is critical to identify the existing pavement structure, subgrade conditions and material qualities. Doing so requires a suitable level of data sampling. The existing pavement profile is a critical parameter required to model the pavement layer modulus. The pavement profile can vary across any given area and hence samples should be taken from a range of pavement sections.**



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## ➔ Recommendations Provided

- To perform additional geotechnical testing to include a greater selection of areas for this large asset.
- Prioritise the taxiway for rehabilitation activities.
- The pavement seal is to be replaced. Widespread cracking deems the seal to be ineffective at providing a watertight, wearing course.
- The exercise showed that the current pavement structure is (structurally) fit for current operations with a satisfactory average ACN/PCN ratio of 0.6 and a 10% overload scenario based on the lowest 10th percentile values.
- If operations move to include aircraft with a higher ACN rating than the airfield currently serves, then regular inspections should take place.
- For GA parking, aircraft should be limited to 5,700 kg. The surface irregularities are to be rectified.
- Reseal all existing pavement seals, after structural treatments are completed.
- Undertake another structural evaluation and structural improvements, when the aerodrome will be opened to accept Dash 8-400 flights.
- Consider accepting aircraft with a slightly higher ACN, to observe pavement performance, before continuing with additional works.
- Before proceeding with the repair phase of asphalt overlay, complete an assessment/investigation, to assess the pavement structure and suitability for an overlay.

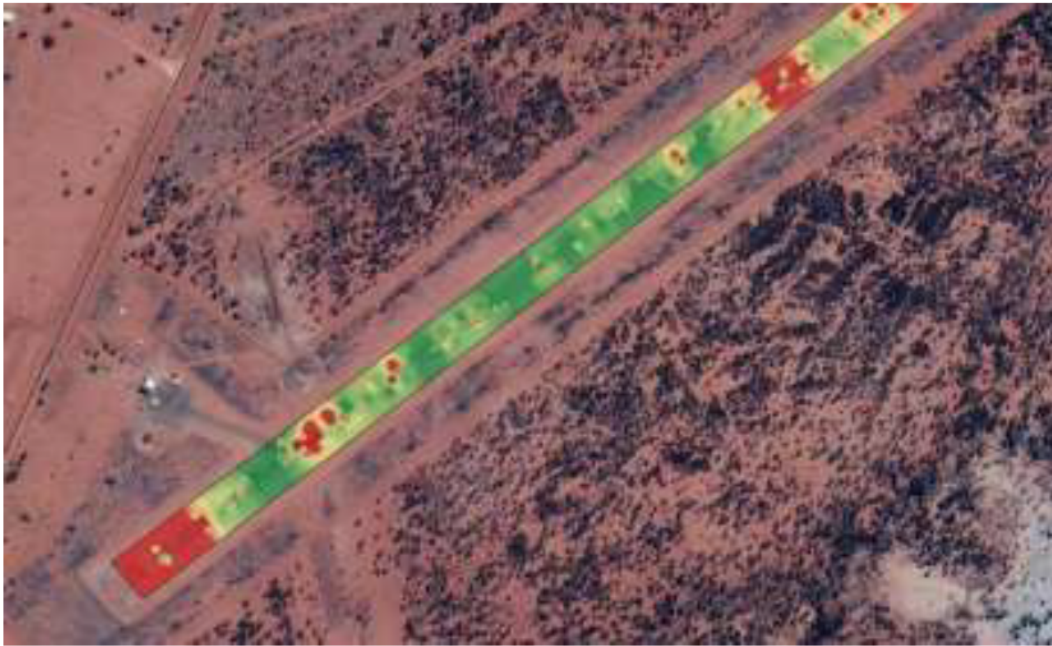
## ➔ Benefit to the Client

- Confirmation of the runway rating (ACN/PCN) based on current pavement condition, allows the client to comply with the relevant air safety standards.
- Identification of areas to be rehabilitated, including areas of urgent shortfalls.
- A pavement treatment strategy, divided into 5 phases, aiming for a 20-year design life and two possible traffic loading scenarios.
- A staged approach to pavement treatment.

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The ACN/PCN Using Fleet Mix method considers the damaging effect of each aircraft type and related traffic volume and utilises the material models as defined with normal mechanistic-empirical pavement design. The Fleet Mix method is more accurate and is consistent with the industry change to ACR/PCR.



## **PANS doc 9981 describes the replacement of ACN and PCN with ACR and PCR:**

*"...the ICAO indicates occasional movements by aircraft with an ACN not exceeding 10% of the PCN (ACN/PCN ratio of 1.1) may be acceptable. Furthermore, the Advisory Circular 139-25(0) indicates aircraft pavement usage up to an ACN/PCN ratio of 1.25 may also be considered, provided regular pavement inspections are carried out to assess the impact on the pavement condition. Greater overloadings may also acceptable, however, increased levels of pavement scrutiny and assurance is required."*