

INTRODUCTION

Located along the western coast of Kauai, the Mana Drag Racing Strip (MDRS) at the Kauai Raceway Park was originally constructed in 1971. This 40+ year old track, once home to taro fields and agricultural lands, was developed to help take racing off the streets and promote a safe environment for people to drag race their vehicles. The project site is owned by the Department of Land and Natural Resources (DLNR) and leased to the Garden Isle Racing Association (GIRA), a non-profit organization, who manages, maintains, and hosts events with the help of volunteers and donations. Races held at MDRS are family oriented community events that draw families and individuals both young and old from across the island to watch and participate in drag races. Junior drag racing competitions allow youths between the ages of 8 and 17 to get involved and learn about drag racing while Top Gun races provide a place for the fastest cars in the state to show off their muscle. As one of the few drag racing strips left in Hawaii and one of only two NHRA member tracks in the state, the MDRS is an important part of the motorsports community, Kauai, and the State of Hawaii.

EXISTING TRACK CONDITION

MDRS is a 3/4 mile long Asphalt Concrete (AC) track including a 100’ long concrete launch pad located at the starting line. The original asphalt pavement constructed in 1971 still composes a majority of the track surface. With 40+ years of racing and no repaving done to the track, the pavement showed its age with areas of raveling aggregate and large cracks on both the concrete launch pad and asphalt pavement. To ensure that the track was drivable, volunteers would burn grass and weeds growing through the cracks in the pavement prior to each race. Several areas were also patched with concrete pavement to repair settlement issues throughout the years.



Figure 1 – Existing Track Condition: Grass/Weeds growing through numerous cracks.



Figure 2 – Existing Track Condition: Concrete patches along track length.

THE ISSUES

The MDRS was originally designed with a typical 2% crowned roadway pavement section. As a sanctioned NHRA track, the 2% cross slope exceeded the NHRA guidelines which allowed for a maximum 1% cross slope. At top speeds in excess of 120 MPH, the 2% cross slope created uneven traction conditions pulling drivers toward the edge of the track. Racers unaware or not used to these conditions were at high risk of crashing.

Throughout its 40+ year life, the track also experienced pavement settlement in several locations. Concrete patches used to repair the areas created varying pavement conditions. At high speeds, the change in pavement conditions could potentially cause vehicles to lose traction or move erratically. Drivers put in those situations where required to make sharp corrections which could cause them to veer into the barriers or adjacent lane putting the other driver or public at risk.

In addition to the safety conditions of the track, the 40+ year old pavement showed its age. Pavement cracking accelerated by the hot and dry climate at Mana was prevalent throughout the track. Grass and weed growth through the cracks required continues maintenance and promoted wear and tear and at times damage to vehicles.

Experience, skill and education of new drivers help minimize accidents on the track. However, to ensure the ongoing safety of both spectators and participants and allow GIRA to continue promoting safe and legal motorsports, improvements to the track surface at MDRS were necessary.

PROJECT OBJECTIVES AND CHALLENGES

The Limtiaco Consulting Group (TLCG) was tasked to develop an economic and timely solution that would allow for the maximum length of track to be repaired meeting NHRA regulations. Working closely with GIRA and the Department of Land and Natural Resources (DLNR), TLCG was able to identify the following project challenges:

- Limited construction budget and schedule;
- Strict specifications to maintain NHRA sanctioning status; and
- Land use approvals.

The Mana Drag Racing Strip Improvements project was a state funded project awarded after many years of petitioning by the community. Appearing as a non-essential state improvement, budget for the project was very limited and well below estimates required to repair the entire drag strip. In addition, as a non-profit organization managing the track, GIRA relied heavily on the monthly races to maintain their operating budget. Schedule and budget would play a big role in the design approach taken.

As a sanctioned NHRA track, strict requirements governed not only the rules of the race track and its operations; it also provided stringent design requirements to adhere to. Pavement gradients not typical to industry standards (maximum 1% slopes) posed a concern to the end product. Other requirements such as clear spaces and safety barriers were made more challenging given the existing site conditions.

The MDRS located along the west shore of Kauai also required a number of land use permits and environmental clearances. In addition to an Environmental Assessment required for State funding, the project was located along the shoreline and was in the Special Management Area and Conservation District. The project site was also in proximity of the flight path for endangered birds and adjacent to areas with historical archaeological finds.

DESIGN APPROACH

Design of the Mana Drag Racing Strip Improvements project incorporated the use of AutoCAD Civil3D; a 3D modeling and drafting program. Civil3D was used to create a 3D model of the existing race track and any proposed track improvements. Modeling allowed for immediate evaluation of proposed design scenarios; providing impacts to material quantities and the construction budget.

Given the limited construction budget, TLCG worked closely with GIRA and DLNR to ensure efficient use of the funding. An approach was developed creating a base scope of work which included GIRA's minimum requirements (reconstruction of the launch area and repaving the first ¼ mile). The construction documents were also prepared to allow for additional work including additional pavement resurfacing should the bid and budget allow.

Soil borings were taken along the track surface to determine the existing subsurface conditions and develop a specific pavement restoration design. Through discussions with GIRA, the starting launch area would be reconstructed with concrete having a 0% slope. This would provide a flat, even, and durable surface allowing for safe and controlled launches. The track would then transition to an asphalt concrete surface with a 1% crown slope. TLCG worked with GIRA to determine the appropriate length of the concrete launch pad to ensure that the pad and transition lengths were long enough to allow for the vehicle to gain full traction after their launch and ease them into the 1% crowned slope.

CONSTRUCTION CHALLENGES

During construction, a known layer of sand and clay provided a challenge for the contractor to create a stable subgrade for the new concrete launch pad. Clay layers were removed to expose the underlying sand, but maintaining compaction and moisture proved difficult. Working together to find a solution, a quick and efficient work flow of subgrade compaction and base course installation was established to ensure a good foundation for the concrete slabs.



Figure 3 – Pouring of concrete launch Pad



Figure 4 – Checking loose AC with 3-foot digital level prior to rolling.

To eliminate perpendicular cold joints and the possibility of dissimilar movement of the concrete slabs, each lane of the concrete launch pad was designed to pour monolithically. Given Mana’s hot and dry climate, the contractor quickly discovered that pouring concrete during the day would be difficult. Under the collaboration with DLNR and TLCG, the contractor adjusted his schedule to pour all concrete slabs at night. Preparation for the pours started in the late night hours with the concrete pour occurring through early morning to ensure workability of the concrete. Work lights were necessary for the contractor to complete their work, but location of the project near the flight path of endangered birds posed a potential risk. TLCG coordinated with the U.S. Fish and Wildlife service to ensure proper precautions were taken and minimize the possibility of injuring the seabirds.

QUALITY CONTROL

With the strict NHRA guidelines and tight tolerances not typically found in roadway pavement construction, the contractor needed to implement additional quality control measures. Topographic surveys were conducted during multiple stages of construction to ensure the strict tolerances were met. Surveys of the subbase, base course, and finished pavement were assessed in 3D models to ensure design specifications were met. Verification with a 3-foot digital level and 10-foot straight edge was also done to meet specification requirements.



Figure 5 – Pavement installed using the tried and true “String Line” method



Figure 6 – Verifying pavement thickness prior to rolling.

Paving to meet a 1% maximum cross slope is not the industry standard and is difficult at best. The paving contractor decided to utilize the tried and true “string line” method of pavement installation. In addition, checks during various stages of the paving process were done. A straight edge and tape measure was used intermittently to check the asphalt concrete lift before compacting. The contractor also used the 3-foot digital level as he laid the asphalt concrete to ensure that even the loose layer was close to the required finish specification.

To minimize the impact on the vehicle traction and ride and to help promote longevity of the pavement, the asphalt concrete pavement was laid with joints at mid-lane.



Figure 7 – Good practices result in a good product. Contractor cleans the edge of the pavement joints before rolling.



Figure 8 – AC pavement joints kept at mid-lane to minimize impact of vehicle tires.

CONCLUSIONS

Prior to the project, the aging track surface was in dire need of repairs and posed safety concerns for the racers and public spectators. The track improvements at MDRS were a success. The concrete and asphalt pavements were installed and met the strict NHRA requirements. MDRS was able to retain its NHRS member track designation.

On the weekend of July 4, 2014, the Mana Drag Racing Strip was reopened to the public and the first race of the season was a success. The improvements garnered complements from seasoned race goers as the flatter, smoother, and ultimately faster track surface was a stark contrast to the previously aging track. Successful completion of the project attracted the attention of not only local drag racers but the NHRA, with Kauai Raceway Park receiving an award for the Most Improved Facility in the Pacific region.

With the completion of the improvements, GIRA hopes to continue with their mission to promote safe motor sports, host family oriented community events, and to educate and encourage safe driving practices for another 40+ years.



Figure 9 – Completed Track Improvements
(Concrete Launch Pad)



Figure 10 – On Your Mark, Get Set,...
Governor Abercrombie gives the green light