E-Drone Logistics Datasets Description

1 INTRODUCTION

This document describes logistics datasets generated as part of the E-Drone research project. There are four datasets described:

 i.   Pathology sample generation (Section 2).

 ii. Patient transfer service (Section 3).

 iii. Courier rounds (Section 4).

 iv. Donated blood transport (Section 5).

All four sets of data concern transport in and around Southampton, a city on the South coast of the United Kingdom (UK) with a population of ~250,000. The locations of places in the datasets are representative of the real-world situation, but have been altered so as to be fictitious and do not describe actual activity, except for the dataset about donated blood (Section 5), which was obtained through a Freedom Of Information request and so is publicly available.

2 PATHOLOGY SAMPLE GENERATION

2.1 Summary

This dataset concerns pathology samples taken from patients at doctors' offices (i.e., GPs' surgeries). Vans collect these samples and transport them to a pathology laboratory at Southampton General Hospital (SGH) for analysis. The data detail where and when samples were generated, and the van routes used to transport them.

2.2 Notes

- **Dataset filename: Path sample gen v6a.xlsx.**
- There are two worksheets: 'Sample Generation' and 'Vehicle Routes'. 'Sample Generation' details the location, date and time when each sample is generated; and 'Vehicle Routes' details the van journeys to collect the samples.
- Each row in 'Sample Generation' represents one sample taken from a patient.
- Each row in 'Vehicle Routes' represents one stop on a van route.

- Ten vans are used each day to collect samples, with each van servicing a different route (RTE01 to RTE10 shown in 'Vehicle Routes').

- The data are for weekdays (i.e., Monday to Friday) in March 2021.

- The destination for all samples is the SGH pathology laboratory. The postcode for this location is SO16 6YD.

- Samples are delivered to the laboratory on the same day that they are taken from the patient at the doctors' office, i.e., before midnight on the day the sample was taken.

- Staff at the doctors' office put the samples in special containers called 'Versapaks' (Figure 1) ready for collection by the vans. The containers can hold up to 125 samples, and each container takes up 0.036 cubic metres (m^3) of space in the van.

- The vans have a maximum carrying capacity of 5.3 m^3.

- Van routes start and finish at the SGH pathology laboratory.

Figure 1. Medium Versapak Container.
External dimensions of 460 x 255 x 305 mm. Source: https://www.versapak.co.uk/

2.3 Column Header Descriptions

Sample Generation Worksheet

- Index: row number.

- Source Surgery: the doctors' office where the sample was taken from the patient.

- Source Postcode: the postcode of the doctors' office.

- Date/Time of Specimen: the date and time when the specimen was taken from the patient at the doctors' office.

Vehicle Routes Worksheet

- Index: row number.

- Route ID: specific route identification.

- Target Time: the estimated time of day when the vehicle should arrive at a specific stop.

- Time to Next Stop: the estimated travel time to the next stop on the route.

- Stop: the name of the stop.

- Postcode: the postcode of the stop.

3   PATIENT TRANSFER SERVICE

3.1   Summary

This dataset concerns the transportation of patients to and from their non-emergency medical appointments at different care units (e.g., hospitals, medical centres, doctors' offices, dialysis units, nursing homes). The data detail where and when each patient is collected and dropped-off.

3.2   Notes

- **Dataset filename: Patient transfer service v9a.xlsx.**
- There are two worksheets: 'Journeys' and 'Vehicle Type & Capacity'. 'Journeys' details the journey of each patient; and 'Vehicle Type & Capacity' details the types and capacities of the different vehicles used.
- Each row in 'Journeys' represents the journey of one patient from starting point to their destination.
- Each row in 'Vehicle Type & Capacity' provides the vehicle type for one vehicle. There are 33 vehicles (Veh_01 to Veh_33) of four different types (Typ_1 to Typ_4 shown in 'Vehicle Type & Capacity'), and capacity information is provided for each type as well.
- The data are for all days (i.e., including weekends) in March 2021.
- Vehicles start and finish each day at a depot in a location with a postcode of SO53 4ND.
- Each row in 'Journeys' describes a single patient journey, but multiple patient journeys can be part of a single vehicle round where multiple patients are picked up or dropped off by the same vehicle.

3.3   Column Header Descriptions

Journeys Worksheet

- Index: row number.
- Origin Postcode: postcode where the patient's journey begins.
- Origin: where the patient starts their journey (care unit or home).
- At Origin Time: date and time the vehicle arrives at the origin.
- Left Origin Time: date and time the vehicle departs from the origin.
- Dest. Postcode: postcode of the patient journey destination.
- Dest.: where the patient is going (care unit or home).
- At Dest. Time: date and time when the vehicle arrives at the destination.
- Left Dest. Time: date and time when the vehicle departs from the destination.
- Vehicle ID: a unique identification number for the specific vehicle being used for the journey.
- Vehicle Type: the type of vehicle being used for the journey.

- Patient Mobility: four categories that describe patient requirements when travelling in the vehicle: (i) Walker – travels in a vehicle seat; (ii) Wcr_Std – travels in a standard wheelchair; (iii) Wcr_XL – travels in an extra-large wheelchair; and (iv) Stretcher – travels on a stretcher. Different vehicles can accommodate different categories of patient mobility.
- Direction: inward indicates an inbound journey to an appointment, and outward indicates an outbound journey from an appointment.

Vehicle Type & Capacity Worksheet

- Vehicle ID: a unique identification number for the specific vehicle.
- Vehicle Type: the type of vehicle.
- For 'Vehicle Capacity' columns (text in brackets indicates associated patient mobility category):
    - Vehicle Type: the type of vehicle
    - Patients Travelling in Vehicle Seats (Walker): maximum number of patients travelling in vehicle seats.
    - Patients Travelling in Standard Wheelchairs (Wcr_Std): maximum number of patients travelling in standard wheelchairs.
    - Patients Travelling in Extra-Large (or Standard) Wheelchairs (Wcr_XL or Wcr_Std): maximum number of patients travelling in extra-large (or standard) wheelchairs. Where a vehicle can carry extra-large wheelchairs, assume it can carry either size of wheelchair (i.e., extra-large or standard).
    - Patients Travelling on Stretchers (Stretcher): maximum number of patients travelling on stretchers.

4   COURIER ROUNDS

4.1   Summary

This dataset describes the schedules of a small, local courier service operating in and around the Southampton area. The data detail the tasks carried-out by the courier vans.

4.2   Notes

- **Dataset filename: Courier rounds v6a.xlsx.**
- Each row in the data represents a stop on a courier van round.
- Five vans are used each day (Veh_01 to Veh_05 shown in the data) by the courier service, with each van servicing a different round (Rnd_01 to Rnd_05 shown in the data).
- The data are for weekdays (i.e., Monday to Friday).
- Times of day for stops are approximate.

- There are some periods of spare time in the round schedules (identified by the term 'Spare time' in the 'Location' and 'Task' columns) where the vans are available to do additional collections/deliveries. The location of a van at the start of a period of spare time is the last visited postcode (i.e., postcode of the stop location shown in the preceding row of data).

- The courier vans have a maximum carrying capacity of 5.3 m^3.

- The cargo volumes associated with each of the five different tasks involving collection and/or delivery shown in the data are as follows:

   i)   Deliver/Collect post = delivery and collection of one container of 0.036 m^3.

   ii)   Collect dinners = collection of one container of 1 m^3.

   iii)   Deliver dinners = delivery of one container of 1 m^3.

   iv)   Collect samples = Collection of one container of 0.036 m^3.

   v)   Deliver samples = delivery of one container of 0.036 m^3.

   Note: (x2) by a dinners collection or delivery = collection or delivery of two containers of 1 m^3 each.

4.3   Column Header Descriptions

- Index: row number.

- Round ID: the unique identifier for each courier round.

- Vehicle ID: the unique identifier for each courier vehicle.

- Time: approximate time of day for stops.

- Location: location of stops (the term 'Spare time' in this column means the van is idle and available for additional work).

- Postcode: postcode of stop locations.

- Task: description of the task to be performed at stops (the term 'Spare time' in this column means the vehicle is idle and available for additional work).

5   DONATED BLOOD TRANSPORT

5.1   Summary

This dataset concerns the transport of units of donated blood to/from hospitals across the UK from/to the storage facility located at the Southampton Donor Centre. Additionally, there's a snapshot of the vehicle movements involved during one week of activity.

5.2   Notes

- **Dataset filename: Blood storage_hospital v5a.xlsx.**

- There are two worksheets: 'Units Del & Coll' and 'Vehicle Movements'. 'Units Del & Coll' details the blood units transported to/from different hospitals; and 'Vehicle Movements' details a one-week snapshot of typical vehicle journeys to transport the blood units.

- Each row in 'Units Del & Coll' represents the number of blood units delivered and/or collected from a specific hospital on a specific date.

- Each row in 'Vehicle Movements' represents one stop on a vehicle route. There are two different vehicle types (Ford Focus Estate Car and Ford Transit Van shown in 'Vehicle Movements'), and capacity information is provided for each type as well.

- Six vehicles are available for use each day (Veh_01 to Veh_06 shown in 'Vehicle Movements') for transporting donated blood.

- The data are for 01 November 2018 to 30 November 2019.

- Assume that deliveries and collections can be made at any time on the date specified.

- The postcode for the Southampton Donor Centre (central storage facility) is SO16 5AF.

- One unit of blood has a volume of 0.0005 m^3.

- To transport the units, containers of the same size (0.036 m^3) as the ones used to transport pathology samples are used (Section 2). These containers have an <u>internal</u> volume of 0.018 m^3 and therefore can hold up to 36 units of blood (0.018/0.0005 = 36).

5.3 Column Header Descriptions

Units Del & Coll Worksheet

- Index: row number.

- Hospital Name: the name of the hospital.

- Postcode: the postcode of the hospital.

- Date: date of transport.

- Units Delivered to Hospital: number of blood units delivered to the hospital from the central storage facility.

- Units Collected from Hospital: number of blood units collected from the hospital for return to the central storage facility. Units returned to the central storage facility from a hospital will be transported on to other hospitals eventually.

Vehicle Movements Worksheet

- Index: row number.

- Vehicle ID: the unique identifier for each vehicle.

- Location: the place where the vehicle stops to deliver and/or collect blood units. Blood units are not delivered at locations marked as 'Unspecified_XX'. At the location labelled as 'Red Jet IoW

Ferry, Town Quay, Southampton', blood units are delivered to personnel who then take the blood on the ferry to the Isle of Wight.

- Postcode: the postcode of a stop.

- Arr. Date: the date of arrival at a stop.

- Dep. Date: the date of departure from a stop.

- Arr. Time: the time of arrival at a stop.

- Dep. Time: the time of departure from a stop.

- For 'Vehicle Capacity' columns:

    o Vehicle ID: the unique identifier for each vehicle.

    o Vehicle Type: the vehicle make, model and fuel type.

    o Volume (m³): the vehicle maximum carrying capacity in cubic metres.