Notes on Sampling for SAVAC Assessments

# Sampling Methods

The SAVAC approach of combining a snapshot household survey with an in-depth longitudinal survey includes two different sampling approaches: a two-stage random household and children sample as well purposive focus-group samples of district, village and household representatives. Key to both of these approaches is the selection of villages, which is normally done during assessment planning and is communicated to the provincial and district authorities well before the field work is begun.

The sampling process is highly geographic in nature; it is ultimately an expression of where the field teams are going to go. South Africa is well mapped and numerous data exist that are geo-reference in some kind of way, which means that geographic information systems (GIS) are necessary for the process. The author chooses to use QGIS, which is a free and open source software, with a PostreSQL an PostGIS backend (also completely free and open source). By using these software products, valuable tax payer’s money is not squandered on expensive licenses. This approach is entirely inline with modern practice on secure and open data platforms, where public resources (such as money and inforamtion) are used with open source software that is not only free, but is scrutinised at source and has well known features (without any hidden “back doors”).

# Data Source Structure

The main data source for this work is the Enumeration Small Areas (ESAs), published by Statistics South Africa and actual population data are available through their Supercross Census Data Set. Some explanation is needed of ESAs, which differ from Enumeration Areas (EAs), the data set that is usually used in most countries as the base for estimating populations in predefined areas (such as livelihood zones).

EAs are geographical units that a single enumerator can theoretically cover in a single day while collecting data for the census. Theoretically at least, enumerators will each count the populations in each of their assigned EAs on the appointed day of the census (in real world practice, it takes a few days and there are many anomalies but this is a managed difficulty). There were 103,576 EAs in the South Africa for the 2011 census, with sizes ranging from a few hundred metres to ten kilometres. However, some parts of the country are extremely sparsely populated while other parts are dense. So some EAs may have very low population and other data counts. South African privacy laws forbid Statistics South Africa from releasing data to the public that can be “reverse analysed” to reveal information about individual citizens, so the census team are forced to combine some EAs with others to ensure that reported aggregate data disguises individual records adequately. After combining the lower-populated EAs, the resultant units are called small areas or enumeration small areas (ESAs) and are associated with all data collected in the census. However, it is key that many sparse areas cannot be geographically defined to populations, so these sparse areas are “missing” from the ESA data set, appearing as blank spaces on a map. There were 84,907 ESAs in South Africa after the 2011 census.

Statistics South Africa follows the administrative breakdown for the top three levels after national: provinces, district municipalities (referred to as “districts”) and local municipalities (referred to as “municipalities”). Thereafter, they break municipalities into main places and sub-places, which are then broken down into EAs and ESAs. Because EAs and ESAs are not identifiable as places, they have no names but are referred to by their numbers, which are seven digits long for ESAs and eight digits long for EAs. Usefully, these codes themselves also contain information on their enclosing municipalities, districts and provinces.

Livelihood zone boundaries do not respect any administrative boundaries, although they do often align coincidently. An exercise has been performed that overlays the livelihood zones onto the EAs and ESAs and attributes each EA or ESA to the livelihood zone with the biggest area overlaying it. This means that each EA or ESA has the following attributes or database table columns (the database attribute name is in Monaco font in brackets):

* EA code or ESA code (ea\_code or sa\_code);
* Sub-place code (sp\_code);
* Sub-place name (sp\_name);
* Main place code (mp\_code);
* Main place name (mp\_name);
* Local municipality code (mn\_code);
* Local municipality Municipal Demarcation Board code (mn\_mdb\_code);
* Local municipality name (mn\_name);
* District municipality code (dc\_code);
* District municipality Municipal Demarcation Board code (dc\_mdb\_code);
* District municipality name (dc\_name);
* Provincial code (pr\_code);
* Provincial Municipal Demarcation Board code (pr\_mdb\_code);
* Province (pr\_name); and
* Livelihood zone code (lz\_code).

This is in addition to the ID (gid) and geometry (the\_geom) columns, as well as a few others for EAs.

Sampling involves the concept of ‘villages’ or ‘communities’ and the nearest approximation to this in the census hierarchy above is the sub-place. Therefore, when communities are chosen, the community’s details are obtained from the census by aggregating ESA data by sub-place.

# HEA Sampling

HEA Assessments require three levels of sampling: ‘district’ (which in South Africa means local municipality), community (or village or sub-place) and households. Therefore, to get reliable results, reasonable representativeness is required at all three levels.

Usually, field teams will visit up to three local municipalities to obtain information about the general conditions of the livelihood zone they are studying: what crops are grown, livestock are kept, where the markets are, what larger towns are nearby, what other economic activities and opportunities exist and what threats or hazards prevail in the livelihood zone. This is also a chance to confirm the boundaries of the livelihood zone and to check its neighbouring zone. Municipality offices can be busy or officials difficult to locate, so usually the choice of which municipalities to visit for interviewing are made by the higher levels: the district and provincial partners. Some livelihood zones are small and only cover one or two municipalities; in this case the one or both will be visited. In an ideal world, all municipalities would be visited but this would require much extra time and funding to be practical.

The selection of villages is done on a GIS. The ESAs are loaded into view and the symbology is categorised based on the livelihood zone code (lz\_code) attribute. Villages are chosen purposively, with the following guidelines: villages should not be adjacent to urban centres, nor should they be predominantly urban themselves (there is an EA attribute that indicates this but it is not found on the ESA feature set); villages should not be on a main road nor at a main road junction and villages should not be too big or atypical of the area in any other way. To see the main roads, the appropriate road or street feature set can be added and the roads categorised (The Open Street Map dataset of roads is very good and is available from WeoGeo (www.weogeo.com). Villages can often be ‘seen’ on the ESA map as clusters of smaller ESAs, bunched together and interspersed over the zone. By clicking any ESA within the cluster after the ‘Identify Feature’ control has been activated, the sub-place name and code can be retrieved and recorded. Usually, twelve villages are chosen in each zone.

Villages are added to the selection by inserting the recorded sub-place code into the village code (village\_code) column, along with the sub-place name (village\_name column), sampling date (sample\_date column), livelihood zone code (lz\_code column) and survey type (‘hea’, ‘continuum’ or ‘both’ into the survey column) of the Postgres Sampled Villages table (zaf.tbl\_sampled\_villages). There is a SQL query that does this automatically, village\_addtosample.sql. The user must just change the sample date (all sampled villages should be selected on the same date for a single assessment exercise) and enter in the required sub-place codes. It is probably wise to do them in batches of four or six villages. Using this query, if the village does not lie in the livelihood zone (perhaps because of a mistake with the code), then it will not get added.

Erroneously added villages, or villages that are not to be visted, can be deleted using another query, villages\_deletefromsample.sql.

Once the villages have been selected, village authorities can be informed. Normally, ward councillors and traditional authorities are contacted, along with other local functionaries and luminaries. See the section below on compiling the data and presenting it for obtaining village coordinates.

Household sampling is always done in the villages, after the community representatives’ wealth breakdown during the actual field assessment. This is because the wealth breakdown defines the household representatives’ focus groups required for household livelihood strategy interviews. It is key that household representatives are not from the wrong wealth group. Therefore, them team conducting introductions in the villages before the assessment must request the village leaders and community elders key informants to meet at an appointed time but must not specify the household representatives as these groups have not been defined. One method used by teams in the field is to conduct all the community-level interviews in each village first and then to revisit the villages for a round of household-level interviews.

# Continuum Sampling

Continuum sampling, by its nature, is done differently, since the continuum used randomly drawn samples of individual households and children (the latter for anthropometric measurements). Instead of choosing villages purposively on a map, a list of villages and their attendant populations is put into the sampling algorithm, which carries out a random selection that is weighted for population (i.e, villages with a larger population have a higher probability of being selected, which gives an equal chance for any one household of being selected). The selected villages and their codes can be returned for presentation and to provide information to the local authorities.

Household sampling relies on a spatial sampling algorithm, combined with EA orthophotographs for the selection of dwellings. The exact coordinates of the dwellings can be recorded, along with marks on the photographs to help the enumerators find the correct selected household.

It is important to note that, once a village or household is selected, this cannot easily be changed (the entire selection algorithm should be run again to guarantee a random sample). With the purposive sampling used in HEA, minor re-selections can be made, as long as they are well motivated.

# Compilation of the Sampling Data and its presentation

Once the villages have been inserted into they zaf.tbl\_sampled\_villages, they need to be linked to a map, so that users can find them. A further difficulty is that the sub-place name and the real colloquial name for the village often differ, making it impossible to find some villages. The solution is to obtain coordinates of the intended village and, since the village was actually chosen based on its geographical location and not its name, this is actually the most correct way to identify it.

To do this a Postgres view[[1]](#footnote-2) is created, zaf.vw\_sampled\_centroids, that creates a list of points representing the centroids of the village ESA polygons. These points all have the attributes of the villages in zaf.tbl\_sampled\_villages, and are filtered to the most recent sampled\_date. The resultant centroids can be plotted on a map and the coordinates used with any smart device to find the basic location of the village. They do not necessarily point to the administrative centre of the villages but that can be located easily by the field staff once they have reached the centroid.

Appendix B has a livelihood zone map example, with the selected village centroids shown as stars, coloured blue for continuum, red for HEA and yellow for both.

Appendix C shows the query used to create zaf.vw\_sampled\_centroids.

The query that creates this view is sampled\_village\_centroids.sql. The query also creates a CSV file that lists the villages, including details on their municipalities and locations. The CSV file has been be imported into MS Excel and a pivot table generated from it, which is finally presented in Appendix D.

# Appendix A

SQL query: village\_addtosample.sql

INSERT INTO zaf.tbl\_sampled\_villages (

village\_name,

village\_code,

lz\_code,

survey,

sampled\_date

)

SELECT DISTINCT

sp\_name,

sp\_code,

lz\_code,

'hea' AS survey,

-- NB: Place your required sample date in here in yyyy-mm-dd format!

date '2016-10-04' AS sampled\_date

FROM

zaf.demog\_sas

WHERE

lz\_code IN (

VALUES (59101), (59104), (59201), (59205), (59303)

)

AND

sp\_code IN (

-- NB: Place your required sub-place (sp\_code) values in here!

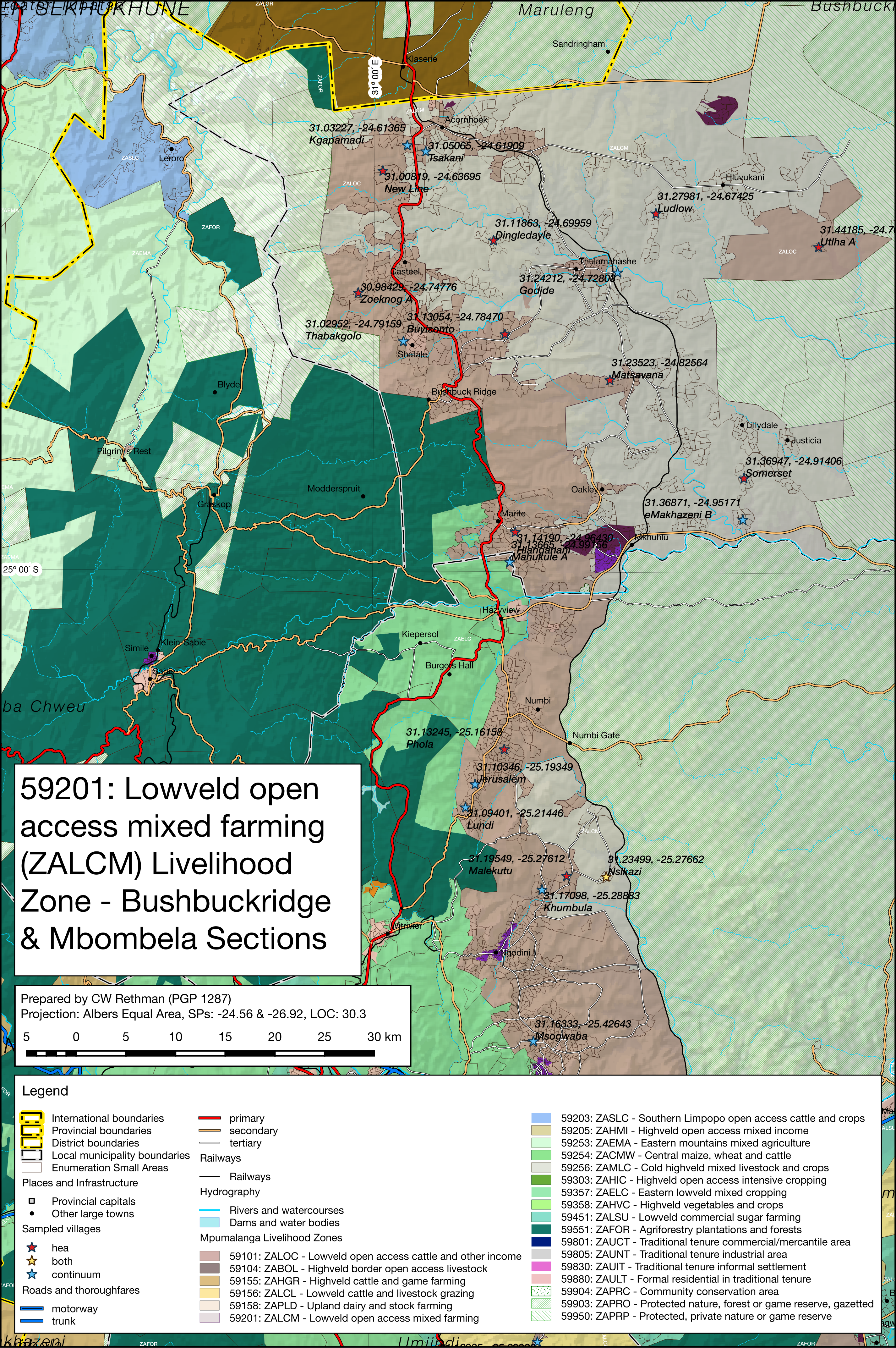
VALUES (862005001), (863005003)

)

;

# Appendix B

Example of a livelihood zone map showing the selected villages.



# Appendix C

SQL query that creates the selected villages centroids view, zaf.vw\_sampled centroids.

DROP VIEW IF EXISTS zaf.vw\_sampled\_centroids;

CREATE VIEW zaf.vw\_sampled\_centroids AS

SELECT

village\_code,

the\_geom,

village\_name,

main\_place\_name,

main\_place\_code,

municipality\_name,

municipality\_code,

district\_name,

district\_code,

province\_name,

province\_code,

centroid,

SUBSTRING(centroid from (POSITION('(' in centroid) + 1) for 8) || ', ' ||

SUBSTRING(centroid from (POSITION(' ' in centroid) + 1) for 9) AS approx\_coord,

survey,

sampled\_date

FROM (

SELECT

ST\_Centroid(ST\_Union(the\_geom)) AS the\_geom,

ST\_AsText(ST\_Transform(ST\_SetSRID(ST\_Centroid(ST\_Union(the\_geom)),201100),4326)) AS centroid,

village\_name,

village\_code,

main\_place\_name,

main\_place\_code,

municipality\_name,

municipality\_code,

district\_name,

district\_code,

province\_name,

province\_code,

survey,

sampled\_date

FROM (

SELECT

village\_code,

village\_name,

main\_place\_code,

main\_place\_name,

municipality\_code,

municipality\_name,

district\_code,

district\_name,

province\_code,

province\_name,

sampled\_date,

survey,

ST\_Centroid(the\_geom) AS the\_geom

FROM

zaf.vw\_sampled\_villages

) AS g

GROUP BY

village\_code,

village\_name,

main\_place\_name,

main\_place\_code,

municipality\_name,

municipality\_code,

district\_name,

district\_code,

province\_name,

province\_code,

survey,

sampled\_date

) AS h

ORDER BY

village\_code

;

COPY

(

SELECT

lz\_code || ': ' || lz\_name || ' (' || lz\_abbrev || ')' AS lz,

r.survey,

r.sampled\_date,

province\_name,

province\_code,

district\_name,

district\_code,

municipality\_name,

municipality\_code,

main\_place\_name,

main\_place\_code,

village\_name,

r.village\_code,

pop,

num\_sas,

SUBSTRING(coord from (POSITION(' ' in coord) + 1) for 8) || ', ' || SUBSTRING(coord from (POSITION('(' in coord) + 1) for 7) AS approx\_coord,

r.survey || ' - ' || village\_name || ': ' || SUBSTRING(coord from (POSITION(' ' in coord) + 1) for 8) || ', ' || SUBSTRING(coord from (POSITION('(' in coord) + 1) for 7) AS village\_and\_coord

FROM

(

SELECT

village\_code,

survey,

sampled\_date,

COUNT(k.sa\_code) AS num\_sas,

SUM(total) AS pop

FROM

zaf.tbl\_sampled\_villages AS i,

zaf.tbl\_pop\_agegender\_12y AS j,

zaf.demog\_sas AS k

WHERE

k.sa\_code = j.sa\_code

AND

i.village\_code = k.sp\_code

GROUP BY

village\_code,

survey,

sampled\_date

) AS l,

(

SELECT

village\_code,

m.lz\_code,

lz\_name,

lz\_abbrev,

sampled\_date

FROM

zaf.tbl\_sampled\_villages AS m,

zaf.tbl\_livezones\_list AS n

WHERE

m.lz\_code = n.lz\_code

) AS p,

(

SELECT

village\_code,

village\_name,

main\_place\_code,

main\_place\_name,

municipality\_code,

municipality\_name,

district\_code,

district\_name,

province\_code,

province\_name,

survey,

sampled\_date,

ST\_Centroid(ST\_Union(the\_geom)) AS centroid\_geom,

ST\_AsText(ST\_Transform(ST\_SetSRID(ST\_Centroid(ST\_Union(the\_geom)),201100),4326)) AS coord

FROM

(

SELECT

village\_code,

village\_name,

main\_place\_code,

main\_place\_name,

municipality\_code,

municipality\_name,

district\_code,

district\_name,

province\_code,

province\_name,

sampled\_date,

survey,

ST\_Centroid(the\_geom) AS the\_geom

FROM

zaf.vw\_sampled\_villages

) AS q

GROUP BY

village\_code,

village\_name,

main\_place\_code,

main\_place\_name,

municipality\_code,

municipality\_name,

district\_code,

district\_name,

province\_code,

province\_name,

survey,

sampled\_date

) AS r

WHERE

p.village\_code = l.village\_code

AND

p.village\_code = r.village\_code

AND

p.sampled\_date = r.sampled\_date

ORDER BY

province\_name,

lz\_code,

district\_name,

municipality\_name,

main\_place\_name,

village\_name

)

TO

'/Users/Charles/Documents/hea\_baselines/south\_africa/baselines\_surveys/2016\_lp\_mp/sampling/sampled\_villages\_centroids.csv'

WITH

(

FORMAT CSV, DELIMITER ',', HEADER TRUE

)

;

# Appendix D

List of villages from the Mpumalanga-Limpopo assessment in October 2016.

| Row Labels | Column Labels | | | | | |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Livelihood zone code: name (abbreviation)  Province  District  Municipality  Main place | Population by survey | | | No. of villages by survey | | | Total population | Total No. of Villages |
| Survey – Village: latitude, longitude | both | continuum | hea | both | continuum | hea |  |  |
| 59101: Lowveld open access cattle and other income (ZALOC) |  | 61533 | 110433 |  | 11 | 12 | 171966 | 23 |
| Limpopo |  | 2325 | 25728 |  | 1 | 1 | 28053 | 2 |
| Mopani |  | 2325 | 25728 |  | 1 | 1 | 28053 | 2 |
| Ba-Phalaborwa |  | 2325 | 25728 |  | 1 | 1 | 28053 | 2 |
| Ga-Mashishimale |  | 2325 |  |  | 1 |  | 2325 | 1 |
| continuum - Mohlabeng: -23.9324, 30.9964 |  | 2325 |  |  | 1 |  | 2325 | 1 |
| Majeje |  |  | 25728 |  |  | 1 | 25728 | 1 |
| hea - Humulani: -23.8723, 31.0641 |  |  | 25728 |  |  | 1 | 25728 | 1 |
| Mpumalanga |  | 59208 | 84705 |  | 10 | 11 | 143913 | 21 |
| Ehlanzeni |  | 59208 | 84705 |  | 10 | 11 | 143913 | 21 |
| Bushbuckridge |  | 10962 | 43941 |  | 2 | 6 | 54903 | 8 |
| Buyisonto |  |  | 10467 |  |  | 1 | 10467 | 1 |
| hea - Buyisonto SP: -24.7847, 31.1305 |  |  | 10467 |  |  | 1 | 10467 | 1 |
| Hlanganani |  |  | 21540 |  |  | 1 | 21540 | 1 |
| hea - Hlanganani SP: -24.9643, 31.1419 |  |  | 21540 |  |  | 1 | 21540 | 1 |
| Kgapamadi |  | 5049 |  |  | 1 |  | 5049 | 1 |
| continuum - Kgapamadi SP: -24.6136, 31.0322 |  | 5049 |  |  | 1 |  | 5049 | 1 |
| Matsavana |  |  | 5157 |  |  | 1 | 5157 | 1 |
| hea - Matsavana SP: -24.8256, 31.2352 |  |  | 5157 |  |  | 1 | 5157 | 1 |
| New Line |  |  | 1836 |  |  | 1 | 1836 | 1 |
| hea - New Line SP: -24.6369, 31.0081 |  |  | 1836 |  |  | 1 | 1836 | 1 |
| Thabakgolo |  | 5913 |  |  | 1 |  | 5913 | 1 |
| continuum - Thabakgolo SP: -24.7915, 31.0295 |  | 5913 |  |  | 1 |  | 5913 | 1 |
| Utlha A |  |  | 876 |  |  | 1 | 876 | 1 |
| hea - Utlha A SP: -24.7035, 31.4418 |  |  | 876 |  |  | 1 | 876 | 1 |
| Zoeknog A |  |  | 4065 |  |  | 1 | 4065 | 1 |
| hea - Zoeknog A SP: -24.7477, 30.9842 |  |  | 4065 |  |  | 1 | 4065 | 1 |
| Mbombela |  | 37902 | 24024 |  | 5 | 2 | 61926 | 7 |
| Jerusalem |  | 8853 |  |  | 1 |  | 8853 | 1 |
| continuum - Jerusalem SP: -25.1934, 31.1034 |  | 8853 |  |  | 1 |  | 8853 | 1 |
| Khumbula |  | 6729 |  |  | 1 |  | 6729 | 1 |
| continuum - Khumbula SP: -25.2888, 31.1709 |  | 6729 |  |  | 1 |  | 6729 | 1 |
| Lundi |  | 4509 |  |  | 1 |  | 4509 | 1 |
| continuum - Lundi SP: -25.2144, 31.0940 |  | 4509 |  |  | 1 |  | 4509 | 1 |
| Mahukule A |  | 234 |  |  | 1 |  | 234 | 1 |
| continuum - Mahukule A SP: -24.9915, 31.1366 |  | 234 |  |  | 1 |  | 234 | 1 |
| Malekutu |  |  | 7539 |  |  | 1 | 7539 | 1 |
| hea - Malekutu SP: -25.2761, 31.1954 |  |  | 7539 |  |  | 1 | 7539 | 1 |
| Msogwaba |  | 17577 |  |  | 1 |  | 17577 | 1 |
| continuum - Msogwaba SP: -25.4264, 31.1633 |  | 17577 |  |  | 1 |  | 17577 | 1 |
| Phola |  |  | 16485 |  |  | 1 | 16485 | 1 |
| hea - Phola SP: -25.1615, 31.1324 |  |  | 16485 |  |  | 1 | 16485 | 1 |
| Nkomazi |  | 8727 | 16740 |  | 2 | 3 | 25467 | 5 |
| KwaZibukwane |  | 5298 |  |  | 1 |  | 5298 | 1 |
| continuum - KwaZibukwane SP: -25.6892, 31.8039 |  | 5298 |  |  | 1 |  | 5298 | 1 |
| Madaneni |  |  | 4989 |  |  | 1 | 4989 | 1 |
| hea - Madaneni SP: -25.8079, 31.7903 |  |  | 4989 |  |  | 1 | 4989 | 1 |
| Magogeni |  |  | 7386 |  |  | 1 | 7386 | 1 |
| hea - Magogeni SP: -25.7920, 31.6066 |  |  | 7386 |  |  | 1 | 7386 | 1 |
| Middelplaas |  |  | 4365 |  |  | 1 | 4365 | 1 |
| hea - Middelplaas SP: -25.7170, 31.5531 |  |  | 4365 |  |  | 1 | 4365 | 1 |
| Ntunda |  | 3429 |  |  | 1 |  | 3429 | 1 |
| continuum - Ntunda SP: -25.7315, 31.7538 |  | 3429 |  |  | 1 |  | 3429 | 1 |
| Umjindi |  | 1617 |  |  | 1 |  | 1617 | 1 |
| Bonanza Gold Mine |  | 1617 |  |  | 1 |  | 1617 | 1 |
| continuum - Bonanza Gold Mine SP: -25.6992, 31.1693 |  | 1617 |  |  | 1 |  | 1617 | 1 |
| 59104: Highveld border open access livestock (ZABOL) | 2514 | 588 | 29181 | 1 | 1 | 11 | 32283 | 13 |
| Mpumalanga | 2514 | 588 | 29181 | 1 | 1 | 11 | 32283 | 13 |
| Gert Sibande | 2514 | 588 | 29181 | 1 | 1 | 11 | 32283 | 13 |
| Albert Luthuli | 2514 | 588 | 29181 | 1 | 1 | 11 | 32283 | 13 |
| Betty's Goed |  |  | 1476 |  |  | 1 | 1476 | 1 |
| hea - Betty's Goed SP: -26.2533, 30.9154 |  |  | 1476 |  |  | 1 | 1476 | 1 |
| Dundonald |  |  | 4770 |  |  | 1 | 4770 | 1 |
| hea - Dundonald SP: -26.2294, 30.8360 |  |  | 4770 |  |  | 1 | 4770 | 1 |
| Embhuleni |  | 588 |  |  | 1 |  | 588 | 1 |
| continuum - Embhuleni SP: -26.0215, 30.7713 |  | 588 |  |  | 1 |  | 588 | 1 |
| Enkhaba |  |  | 528 |  |  | 1 | 528 | 1 |
| hea - Enkhaba SP: -26.0866, 30.9038 |  |  | 528 |  |  | 1 | 528 | 1 |
| Etjelembube |  |  | 2172 |  |  | 1 | 2172 | 1 |
| hea - Etjelembube SP: -26.1873, 30.9164 |  |  | 2172 |  |  | 1 | 2172 | 1 |
| Fernie |  |  | 15693 |  |  | 1 | 15693 | 1 |
| hea - Fernie SP: -26.4046, 30.7862 |  |  | 15693 |  |  | 1 | 15693 | 1 |
| Holeka | 2514 |  |  | 1 |  |  | 2514 | 1 |
| both - Holeka SP: -26.2314, 30.8746 | 2514 |  |  | 1 |  |  | 2514 | 1 |
| Kalwerskraal |  |  | 96 |  |  | 1 | 96 | 1 |
| hea - Kalwerskraal SP: -26.1303, 30.9924 |  |  | 96 |  |  | 1 | 96 | 1 |
| Mafumulo |  |  | 1074 |  |  | 1 | 1074 | 1 |
| hea - Mafumulo SP: -26.2980, 30.8418 |  |  | 1074 |  |  | 1 | 1074 | 1 |
| Malahleka |  |  | 336 |  |  | 1 | 336 | 1 |
| hea - Malahleka SP: -26.0059, 30.7719 |  |  | 336 |  |  | 1 | 336 | 1 |
| Mbejeka |  |  | 384 |  |  | 1 | 384 | 1 |
| hea - Mbejeka SP B: -25.9705, 30.8584 |  |  | 384 |  |  | 1 | 384 | 1 |
| Nhlaba |  |  | 786 |  |  | 1 | 786 | 1 |
| hea - Nhlaba SP: -26.0800, 30.9980 |  |  | 786 |  |  | 1 | 786 | 1 |
| Tjakastad |  |  | 1866 |  |  | 1 | 1866 | 1 |
| hea - Los-my-cherry: -26.0031, 30.8063 |  |  | 1866 |  |  | 1 | 1866 | 1 |
| 59201: Lowveld open access mixed farming (ZALCM) | 777 | 81990 | 47031 | 1 | 19 | 11 | 129798 | 31 |
| Limpopo |  | 58203 | 13869 |  | 15 | 6 | 72072 | 21 |
| Capricorn |  | 657 |  |  | 1 |  | 657 | 1 |
| Molemole |  | 657 |  |  | 1 |  | 657 | 1 |
| Tshitale |  | 657 |  |  | 1 |  | 657 | 1 |
| continuum - Tshitale SP: -23.3586, 29.9951 |  | 657 |  |  | 1 |  | 657 | 1 |
| Mopani |  | 23832 | 11157 |  | 7 | 4 | 34989 | 11 |
| Ba-Phalaborwa |  | 1821 |  |  | 1 |  | 1821 | 1 |
| Mahale |  | 1821 |  |  | 1 |  | 1821 | 1 |
| continuum - Mahale  SP: -23.6968, 30.9643 |  | 1821 |  |  | 1 |  | 1821 | 1 |
| Greater Giyani |  | 6654 | 6513 |  | 2 | 3 | 13167 | 5 |
| Basani |  | 2208 |  |  | 1 |  | 2208 | 1 |
| continuum - Basani SP: -23.3520, 30.5327 |  | 2208 |  |  | 1 |  | 2208 | 1 |
| Botshabelo |  |  | 1485 |  |  | 1 | 1485 | 1 |
| hea - Botshabelo SP: -23.4309, 30.5166 |  |  | 1485 |  |  | 1 | 1485 | 1 |
| KaMakoxa |  | 4446 |  |  | 1 |  | 4446 | 1 |
| continuum - KaMakoxa SP: -23.2567, 30.7437 |  | 4446 |  |  | 1 |  | 4446 | 1 |
| KaMatsotsosela |  |  | 1035 |  |  | 1 | 1035 | 1 |
| hea - KaMatsotsosela SP: -23.6075, 30.8303 |  |  | 1035 |  |  | 1 | 1035 | 1 |
| KaMininginisi |  |  | 3993 |  |  | 1 | 3993 | 1 |
| hea - KaMininginisi SP1: -23.1498, 30.8032 |  |  | 3993 |  |  | 1 | 3993 | 1 |
| Greater Letaba |  | 3582 |  |  | 2 |  | 3582 | 2 |
| Phongololo |  | 2610 |  |  | 1 |  | 2610 | 1 |
| continuum - Phongololo SP: -23.4104, 30.2592 |  | 2610 |  |  | 1 |  | 2610 | 1 |
| Shamfana |  | 972 |  |  | 1 |  | 972 | 1 |
| continuum - Shamfana SP: -23.4578, 30.6637 |  | 972 |  |  | 1 |  | 972 | 1 |
| Greater Tzaneen |  | 11775 | 4644 |  | 2 | 1 | 16419 | 3 |
| Ka-Xihoko |  |  | 4644 |  |  | 1 | 4644 | 1 |
| hea - Ka-Xihoko SP: -23.6638, 30.5007 |  |  | 4644 |  |  | 1 | 4644 | 1 |
| Mavele |  | 4824 |  |  | 1 |  | 4824 | 1 |
| continuum - Mavele SP: -23.6757, 30.4227 |  | 4824 |  |  | 1 |  | 4824 | 1 |
| Motupa |  | 6951 |  |  | 1 |  | 6951 | 1 |
| continuum - Motupa SP: -23.6810, 30.2874 |  | 6951 |  |  | 1 |  | 6951 | 1 |
| Vhembe |  | 33714 | 2712 |  | 7 | 2 | 36426 | 9 |
| Makhado |  | 21552 | 1665 |  | 3 | 1 | 23217 | 4 |
| Bungeni |  | 6660 |  |  | 1 |  | 6660 | 1 |
| continuum - Bungeni SP: -23.1941, 30.1840 |  | 6660 |  |  | 1 |  | 6660 | 1 |
| Chavani |  | 7524 |  |  | 1 |  | 7524 | 1 |
| continuum - Chavani SP: -23.1977, 30.1502 |  | 7524 |  |  | 1 |  | 7524 | 1 |
| Masakona |  |  | 1665 |  |  | 1 | 1665 | 1 |
| hea - Sereni: -23.2714, 30.1784 |  |  | 1665 |  |  | 1 | 1665 | 1 |
| Mpheni |  | 7368 |  |  | 1 |  | 7368 | 1 |
| continuum - Tshitale: -23.1405, 30.0614 |  | 7368 |  |  | 1 |  | 7368 | 1 |
| Mutale |  | 2793 | 1047 |  | 1 | 1 | 3840 | 2 |
| Folovhodwe |  | 2793 |  |  | 1 |  | 2793 | 1 |
| continuum - Folovhodwe SP: -22.5927, 30.4298 |  | 2793 |  |  | 1 |  | 2793 | 1 |
| Tshipise |  |  | 1047 |  |  | 1 | 1047 | 1 |
| hea - Tshipise SP: -22.5315, 30.6698 |  |  | 1047 |  |  | 1 | 1047 | 1 |
| Thulamela |  | 9369 |  |  | 3 |  | 9369 | 3 |
| Hasane |  | 2733 |  |  | 1 |  | 2733 | 1 |
| continuum - Hasane SP: -23.0936, 30.4783 |  | 2733 |  |  | 1 |  | 2733 | 1 |
| Makuleke |  | 4506 |  |  | 1 |  | 4506 | 1 |
| continuum - Makuleke SP: -22.8695, 30.9188 |  | 4506 |  |  | 1 |  | 4506 | 1 |
| Mtititi |  | 2130 |  |  | 1 |  | 2130 | 1 |
| continuum - Mtititi SP: -23.0931, 30.8984 |  | 2130 |  |  | 1 |  | 2130 | 1 |
| Mpumalanga | 777 | 23787 | 33162 | 1 | 4 | 5 | 57726 | 10 |
| Ehlanzeni | 777 | 23787 | 33162 | 1 | 4 | 5 | 57726 | 10 |
| Bushbuckridge |  | 21345 | 13086 |  | 3 | 3 | 34431 | 6 |
| Dingledayle |  |  | 3396 |  |  | 1 | 3396 | 1 |
| hea - Dingledayle SP: -24.6995, 31.1186 |  |  | 3396 |  |  | 1 | 3396 | 1 |
| eMakhazeni B |  | 6126 |  |  | 1 |  | 6126 | 1 |
| continuum - eMakhazeni B SP: -24.9517, 31.3687 |  | 6126 |  |  | 1 |  | 6126 | 1 |
| Godide |  | 6309 |  |  | 1 |  | 6309 | 1 |
| continuum - Godide SP: -24.7280, 31.2421 |  | 6309 |  |  | 1 |  | 6309 | 1 |
| Ludlow |  |  | 5790 |  |  | 1 | 5790 | 1 |
| hea - Ludlow SP: -24.6742, 31.2798 |  |  | 5790 |  |  | 1 | 5790 | 1 |
| Mahlobyanini |  |  | 3900 |  |  | 1 | 3900 | 1 |
| hea - Somerset SP: -24.9140, 31.3694 |  |  | 3900 |  |  | 1 | 3900 | 1 |
| Tsakani |  | 8910 |  |  | 1 |  | 8910 | 1 |
| continuum - Tsakani SP: -24.6190, 31.0506 |  | 8910 |  |  | 1 |  | 8910 | 1 |
| Mbombela | 777 |  |  | 1 |  |  | 777 | 1 |
| Nsikazi | 777 |  |  | 1 |  |  | 777 | 1 |
| both - Nsikazi SP: -25.2766, 31.2349 | 777 |  |  | 1 |  |  | 777 | 1 |
| Nkomazi |  | 2442 | 20076 |  | 1 | 2 | 22518 | 3 |
| Mananga |  | 2442 |  |  | 1 |  | 2442 | 1 |
| continuum - Mananga SP: -25.9523, 31.8442 |  | 2442 |  |  | 1 |  | 2442 | 1 |
| Mbuzini |  |  | 9951 |  |  | 1 | 9951 | 1 |
| hea - Mbuzini SP: -25.9257, 31.9345 |  |  | 9951 |  |  | 1 | 9951 | 1 |
| Mgobode |  |  | 10125 |  |  | 1 | 10125 | 1 |
| hea - Mgobode SP: -25.8620, 31.7039 |  |  | 10125 |  |  | 1 | 10125 | 1 |
| 59205: Highveld open access mixed income (ZAHMI) |  | 18426 | 75972 |  | 4 | 12 | 94398 | 16 |
| Limpopo |  |  | 21006 |  |  | 4 | 21006 | 4 |
| Greater Sekhukhune |  |  | 21006 |  |  | 4 | 21006 | 4 |
| Elias Motsoaledi |  |  | 17196 |  |  | 3 | 17196 | 3 |
| Mpheleng |  |  | 7116 |  |  | 1 | 7116 | 1 |
| hea - Mpheleng SP: -25.2017, 29.1557 |  |  | 7116 |  |  | 1 | 7116 | 1 |
| Phukukane |  |  | 4155 |  |  | 1 | 4155 | 1 |
| hea - Phukukane SP: -25.2482, 29.1260 |  |  | 4155 |  |  | 1 | 4155 | 1 |
| Thabakhubedu |  |  | 5925 |  |  | 1 | 5925 | 1 |
| hea - Thabakhubedu SP: -25.3431, 29.2537 |  |  | 5925 |  |  | 1 | 5925 | 1 |
| Ephraim Mogale |  |  | 3810 |  |  | 1 | 3810 | 1 |
| Matlala Ramoshebo |  |  | 3810 |  |  | 1 | 3810 | 1 |
| hea - Matlala Ramoshebo SP: -25.0441, 29.1021 |  |  | 3810 |  |  | 1 | 3810 | 1 |
| Mpumalanga |  | 18426 | 54966 |  | 4 | 8 | 73392 | 12 |
| Nkangala |  | 18426 | 54966 |  | 4 | 8 | 73392 | 12 |
| Dr JS Moroka |  | 9552 | 33306 |  | 2 | 7 | 42858 | 9 |
| Allemansdrift |  |  | 7830 |  |  | 1 | 7830 | 1 |
| hea - Allemansdrift C: -25.1146, 28.9089 |  |  | 7830 |  |  | 1 | 7830 | 1 |
| Kameelpoort |  |  | 1521 |  |  | 1 | 1521 | 1 |
| hea - Kameelpoort SP: -25.2792, 28.8226 |  |  | 1521 |  |  | 1 | 1521 | 1 |
| Loding |  |  | 3900 |  |  | 1 | 3900 | 1 |
| hea - Loding SP: -25.1114, 28.7579 |  |  | 3900 |  |  | 1 | 3900 | 1 |
| Madubaduba |  | 5205 |  |  | 1 |  | 5205 | 1 |
| continuum - Madubaduba SP: -25.1359, 28.9491 |  | 5205 |  |  | 1 |  | 5205 | 1 |
| Mmamethlake |  |  | 7902 |  |  | 1 | 7902 | 1 |
| hea - Mmamethlake SP: -25.1044, 28.5422 |  |  | 7902 |  |  | 1 | 7902 | 1 |
| Phake |  |  | 1578 |  |  | 1 | 1578 | 1 |
| hea - Phaphamang: -25.1472, 28.4928 |  |  | 1578 |  |  | 1 | 1578 | 1 |
| Pieterskraal |  |  | 3177 |  |  | 1 | 3177 | 1 |
| hea - Pieterskraal B: -25.2020, 28.9650 |  |  | 3177 |  |  | 1 | 3177 | 1 |
| Thabana |  | 4347 |  |  | 1 |  | 4347 | 1 |
| continuum - Thabana SP: -25.0769, 29.0596 |  | 4347 |  |  | 1 |  | 4347 | 1 |
| Waterval |  |  | 7398 |  |  | 1 | 7398 | 1 |
| hea - Waterval A: -25.1707, 29.0055 |  |  | 7398 |  |  | 1 | 7398 | 1 |
| Thembisile |  | 8874 | 21660 |  | 2 | 1 | 30534 | 3 |
| Kwaggafontein |  | 3789 | 21660 |  | 1 | 1 | 25449 | 2 |
| continuum - Kwaggafontein F: -25.3433, 28.9480 |  | 3789 |  |  | 1 |  | 3789 | 1 |
| hea - Kwaggafontein A: -25.2959, 28.9430 |  |  | 21660 |  |  | 1 | 21660 | 1 |
| KwaMhlanga Crossroads |  | 5085 |  |  | 1 |  | 5085 | 1 |
| continuum - Zakheni: -25.4054, 28.7109 |  | 5085 |  |  | 1 |  | 5085 | 1 |
| 59303: Highveld open access intensive cropping (ZAHIC) | 6732 | 7413 | 74589 | 3 | 2 | 9 | 88734 | 14 |
| Limpopo | 4047 |  | 14445 | 1 |  | 4 | 18492 | 5 |
| Greater Sekhukhune | 4047 |  | 14445 | 1 |  | 4 | 18492 | 5 |
| Ephraim Mogale | 4047 |  | 14445 | 1 |  | 4 | 18492 | 5 |
| Malebitsa | 4047 |  |  | 1 |  |  | 4047 | 1 |
| both - Malebitsa SP: -24.8980, 28.9280 | 4047 |  |  | 1 |  |  | 4047 | 1 |
| Matlerekeng |  |  | 4845 |  |  | 1 | 4845 | 1 |
| hea - Matlerekeng SP: -24.9871, 29.0572 |  |  | 4845 |  |  | 1 | 4845 | 1 |
| Spitspunt |  |  | 2787 |  |  | 1 | 2787 | 1 |
| hea - Spitspunt SP: -24.9520, 28.9186 |  |  | 2787 |  |  | 1 | 2787 | 1 |
| Tshikanosi |  |  | 1782 |  |  | 1 | 1782 | 1 |
| hea - Tshikanosi SP: -24.9886, 28.9397 |  |  | 1782 |  |  | 1 | 1782 | 1 |
| Uitvlugt |  |  | 5031 |  |  | 1 | 5031 | 1 |
| hea - Uitvlugt SP: -24.9348, 28.9982 |  |  | 5031 |  |  | 1 | 5031 | 1 |
| Mpumalanga | 2685 | 7413 | 60144 | 2 | 2 | 5 | 70242 | 9 |
| Gert Sibande | 2685 |  | 38193 | 2 |  | 2 | 40878 | 4 |
| Mkhondo | 999 |  | 25035 | 1 |  | 1 | 26034 | 2 |
| KwaNgema | 999 |  |  | 1 |  |  | 999 | 1 |
| both - KwaNgema SP: -27.0205, 30.4897 | 999 |  |  | 1 |  |  | 999 | 1 |
| Saul Mkhizeville |  |  | 25035 |  |  | 1 | 25035 | 1 |
| hea - Saul Mkhizeville SP: -26.9860, 30.4363 |  |  | 25035 |  |  | 1 | 25035 | 1 |
| Pixley Ka Seme | 1686 |  | 13158 | 1 |  | 1 | 14844 | 2 |
| Daggakraal | 1686 |  | 13158 | 1 |  | 1 | 14844 | 2 |
| both - Daggakraal SP: -27.1028, 29.9961 | 1686 |  |  | 1 |  |  | 1686 | 1 |
| hea - Vlakpoort: -27.1376, 29.9660 |  |  | 13158 |  |  | 1 | 13158 | 1 |
| Nkangala |  | 7413 | 21951 |  | 2 | 3 | 29364 | 5 |
| Dr JS Moroka |  | 3633 | 21951 |  | 1 | 3 | 25584 | 4 |
| Koedoespoort |  |  | 3390 |  |  | 1 | 3390 | 1 |
| hea - Koedoespoort SP: -25.0490, 28.8583 |  |  | 3390 |  |  | 1 | 3390 | 1 |
| Lefiso |  | 3633 |  |  | 1 |  | 3633 | 1 |
| continuum - Lefiso SP: -24.9379, 28.8926 |  | 3633 |  |  | 1 |  | 3633 | 1 |
| Marapyane |  |  | 10854 |  |  | 1 | 10854 | 1 |
| hea - Marapyane SP: -25.0083, 28.7897 |  |  | 10854 |  |  | 1 | 10854 | 1 |
| Seabe |  |  | 7707 |  |  | 1 | 7707 | 1 |
| hea - Seabe SP: -25.0257, 28.6961 |  |  | 7707 |  |  | 1 | 7707 | 1 |
| Thembisile |  | 3780 |  |  | 1 |  | 3780 | 1 |
| Bhundu |  | 3780 |  |  | 1 |  | 3780 | 1 |
| continuum - Bhundu SP: -25.3083, 29.0680 |  | 3780 |  |  | 1 |  | 3780 | 1 |
| Grand Total | 10023 | 169950 | 337206 | 5 | 37 | 55 | 517179 | 97 |

1. A view is a saved query that runs automatically when called. The view contains no actual data (it derives its data from other tables) but it makes data available to another query or to the standard output. [↑](#footnote-ref-2)