1.1 GEOPHYSICAL PROFILE

1.2 LAND RESOURCE CHARACTERISTICS

1.2.1 GEOGRAPHICAL LOCATION

Angono lies 29.38 kilometers east of Manila and some 15.7 kilometers away from Pasig, the former capital of Rizal. It is situated on the south-western portion of the Province of Rizal, located approximately between 14° 31’ and 14° 33’ north latitude and between 121° 08’ and 121° 12’ east longitude. It is bounded by Taytay on the northwest; Antipolo on the north; Teresa on the northeast; Binangonan on the southeast; and Laguna de Bay on the southwest.

1.2.1.2 LAND AREA

A small town, with the total land area of 2,300 hectares, by the coastal region of Laguna de Bay, Angono belongs to the First Congressional District of Rizal. Based on the new digitized municipal map, it has a total land area of 1,467.16 hectares, which approximately comprises only 1.9 percent of Rizal Province and makes it the fourth smallest among the 14 municipalities.

<table>
<thead>
<tr>
<th>Barangay Name</th>
<th>Area (inHa.)</th>
<th>Distribution (in percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bagumbayan</td>
<td>23.384108</td>
<td>1.02</td>
</tr>
<tr>
<td>Kalayaan</td>
<td>96.734625</td>
<td>4.20</td>
</tr>
<tr>
<td>MahabangParang</td>
<td>556.748710</td>
<td>24.21</td>
</tr>
<tr>
<td>PoblacionIbaba</td>
<td>16.834117</td>
<td>0.73</td>
</tr>
<tr>
<td>PoblacionItaas</td>
<td>1.905407</td>
<td>0.08</td>
</tr>
<tr>
<td>San Isidro</td>
<td>761.033363</td>
<td>33.09</td>
</tr>
<tr>
<td>San Pedro</td>
<td>10.389128</td>
<td>0.45</td>
</tr>
<tr>
<td>San Roque</td>
<td>63.527736</td>
<td>11.46</td>
</tr>
<tr>
<td>San Vicente</td>
<td>27.218812</td>
<td>1.18</td>
</tr>
<tr>
<td>Sto. Niño</td>
<td>8.663994</td>
<td>0.38</td>
</tr>
<tr>
<td>Open spaces, municipal roads, streets and other unidentified areas</td>
<td>533.560000</td>
<td>11.74</td>
</tr>
<tr>
<td>Total</td>
<td>2,300.000000</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Office of the Municipal Assessor
Map 1. Boundary Map

Legend:
- Provincial Boundary
- River
- Road Network
- Barangay Boundary
  - Bagumbayan
  - Kalayaan
  - Mahabang Parang
  - Poblacion Ibaba
  - Poblacion Itaas
  - San Isidro
  - San Pedro
  - San Roque
  - San Vicente
  - Sto. Niño

Prepare by the Office of the MPDC
Source: Assessor's Office
Angono is composed of 10 barangays, of which the largest is San Isidro followed by Mahabang Parang, and San Roque. Based on the land area distribution data supplied by the Municipal Assessor's Office, these three barangays combined make up 87.5 percent of Angono's land area.

### 1.2.1.3 GEOLOGY

The oldest rock units found within the municipality of Angono belong to the Cretaceous Period of the Mesozoic Era (70 - 135 million years ago). Underlying most of the municipality, these consist of the stratified rocks of the Kinabuan Formation. They are mostly altered spililitic basalt flows with intercalated highly indurated sandstone, shale and chert beds.

On the eastern portion of the town, underlies a more recent formation which is that of the Guadalupe dating back to the Pleistocene Epoch 0.5 to 3 million years ago. Within Angono, the Guadalupe Formation overlies the Kinabuan Formation. It belongs to the upper member (Diliman Tuff) characterized by thin- to medium-bedded, fine textured vitric tuffs and welded volcanic breccias with subordinate amount of tuffaceous, fine- to medium-textured sandstone.

The youngest deposits, however, are the Quaternary Alluvium composed mainly of detrital deposits -- mostly silt, sand and gravel. These are found along the alluvial basin of the Angono River. With respect to its geologic structure, Angono is fortunate enough not to be traversed by any major geologic fault. However, to the west of it lies the Marikina Valley Fault System, the stability of which has yet to be fully evaluated.

#### Fault Line

The Marikina Valley Fault System (MVFS) is mainly composed of two major northeast trending faults. They are the East Marikina Valley Fault (EMVF) and the West Marikina Valley Fault (WMVF). Both traverse the Marikina Valley and the adjoining municipalities of Rodriguez, San Mateo, Antipolo as well as some portions of Eastern Metro Manila. The EMVF extends as far north in the following locations: San Rafael, Rodriguez north of Wawa River; Gloria Vista Subdivision; eastern San Mateo; northwest Antipolo. Down south it stretches at least 8 kilometers just north of Marvi Hills Subdivision and Modesta Village. The northern end of the EMVF has not been fully determined while its southern tip is poorly defined primarily because most of the area has already been greatly modified by present-day development.

On the other hand, the WMVF extends at least 23 kilometers from lower Macabud, Rodriguez in the north down to the proximity of the Ultra Sports Complex in Pasig. The delineation of the northern as well as the southern terminus of the WMVF is also made difficult by the same constraints as that of the EMVF.

Even though the existence of the MVFS has long been acknowledged, its activity has yet to be fully evaluated. However, according to the Active Fault Mapping Group of the Philippine Institute of Volcanology (Philvolcs), field evidences deduced from topographic map and aerial photography interpretations showed previously unrecognized indications of recent activity. The geologic and geomorphic features (such as offset streams, ridges, alluvial fans, well-developed scarps and other geomorphologically young fault-related features) suggest a combination of right-lateral, as well as vertical movement in the geologically recent past (which is some 10,000 years ago).

Mapping of geomorphic features associated with active faulting and results of trenching work undertaken by Punongbayan el al. (1992) suggest that the MVFS has moved within
the last 10,000 years making the geologic structure a potential source of a major earthquake. Historical data suggest that the 1599, 1601 and 1771 quakes could have originated from the MVFS. However, based on the seismic records of the Philippine Institute of Volcanology and Seismology (Philvolcs), the Binangonan Fault did not show any seismic activity for the period 19701 to 1985 (BSWM, 1988).

**Geomorphology**

Mixed topography characterizes the Angono area. Rolling terrain made up of moderately sloped ridges characterizes the topography of the east of Angono while flat areas are on the west and situated along broad flood plains of the Marikina River Valley. A prominent topographic change from flat to sloping terrain indicates the presence of the Valley Fault. The upland represents the upthrown block while the lowland is the downthrown side of the fault. Peak elevations of ridges within the vicinity of Angono area is about 250 meters above sea level. The Angono River system is only major drainage system present within the municipality of Angono area. It is relatively short (about 5-6 kilometers in length) with relatively few tributaries. It has a dendritic drainage pattern with tributaries extended on different directions towards the neighboring municipalities. It directly drains its water to Laguna de Bay passing by the town of Angono.

1.2.1.4 SOIL

Based on the old genetic approach to soil classification, the clay soils are the dominant types found within Angono. Most notable are the Antipolo clay, San Luis clay and Baras clay soil types, which cover the greater portion of the municipality.

<table>
<thead>
<tr>
<th>Soil Types of Angono</th>
<th>% DISTRIBUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Luis Clay</td>
<td>17.60%</td>
</tr>
<tr>
<td>Antipolo Clay</td>
<td>50.80%</td>
</tr>
<tr>
<td>Baras Clay</td>
<td>14.87%</td>
</tr>
<tr>
<td>Boulevard Clay</td>
<td>10.37%</td>
</tr>
<tr>
<td>Escarpment</td>
<td>6.36%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

*Source: Bureau of Soils and Water Management*

Since they comprise most of the soil cover, their presence has various implications. Although these clay soils are generally fertile being rich in minerals, they may not be ideal for agricultural cultivation due mainly to their sticky consistency when wet and their firm nature when dry. However, this difficulty can be offset with the application of humus. Furthermore, clay soils also represent a significant obstacle to infrastructure and road construction because of their highly mutable nature. They shrink when dry and swell during wet season as they absorb moisture.

From the aforementioned classification system, there are four types of soils which cover Angono:
a. ANTIPOLO CLAY. The largest single type of soil overlying the province of Rizal, it covers more than half of the land area of Angono. It occupies the northern portion of Barangay San Isidro and the eastern part of San Roque. This soil type is characterized by a surface soil that is reddish brown in color, very friable and finely granular clay. The subsoil contains various types and sizes of concretions depending on the depth. Rice and corn can be cultivated on this soil if terraced. Cashew and duhat thrive best on this soil especially on the upper slopes. Pineapple can also be grown on the lower slopes.

b. BARAS CLAY. This type is found in the southern portion of the town, along the banks of the Angono River. It covers portions of Barangays San Roque, San Isidro, and San Pedro. It is also suitable for agriculture, being located in the valleys.

c. BOULEVARD CLAY. This type of soil is commonly found along the shores of Laguna de Bay. Its fine grained surface materials are deposited by the lake water. This soil is fine textured and friable when dry but sticky when wet. Suitable for rice cultivation, it is found along the lakeshore portions of Barangays Kalayaan, San Vicente, PoblacionIbaba, PoblacionItaas, Bagumbayan and San Pedro.

d. SAN LUIS CLAY. This soil is found in Barangay MahabangParang. It is dark brown to nearly black clay, coarse granular to cloddy when dry and sticky when wet. Rice and corn could be cultivated on this soil but since it straddles a mountainous terrain, terracing is necessary to minimize soil erosion.

Another relatively newer morphological soil classification system can also be used to characterize those found in the municipality. This system developed by the Soil Survey Staff of the U.S. Department of Agriculture was originally referred to as the 7th Approximation (mainly because it is the 7th version of the system). Now it is simply known as the Soil Taxonomy. This generic system is organized systematically based on observable and distinct soil characteristics. In this classification, a different nomenclature is used in labelling the various types of soil based on Latin and Greek root words. The names convey exact information concerning their characteristics and every syllable has an exact meaning. This makes the soils easily identifiable and the classification system readily understood.

1.2.1.5 SLOPE AND ELEVATION

The elevations of the area are quite low (Map 3), the highest point being only 232 meters. In fact, about one-tenth of the town along the lake is flood-prone. However, there is an increasing trend with respect to altitude toward the northeast. Low-lying coastal zones on the southwest have elevations of 1-8 meters above mean sea level. The central portion of the land is less than 100 meters high, although terrain elevation gradually increases to 200 meters north-eastward.

<table>
<thead>
<tr>
<th>SLOPE CLASS</th>
<th>DISTRIBUTION (IN %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00-18</td>
<td>74.36%</td>
</tr>
<tr>
<td>18-50</td>
<td>24.28%</td>
</tr>
<tr>
<td>00&gt;50</td>
<td>1.35%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>99.99%</strong></td>
</tr>
</tbody>
</table>

*Source: NAMRIA*
SOIL MAP

Municipality of ANGONO
Province of Rizal
Region IV-A
As of 2016

Legend:
- River
- Road Network
- Provincial Boundary
- Soil Type
  - ANTIPolo CLAY (745.15 ha.)
  - BARAS CLAY (133.18 ha.)
  - BARAS CLAY (84.82 ha.)
  - BOULEVARD CLAY (54.63 ha.)
  - BOULEVARD CLAY (97.54 ha.)
  - ESCARPMENT (93.48 ha.)
  - SAN LUIS CLAY (10.53 ha.)
  - SAN LUIS CLAY (247.58 ha.)

Prepare by the Office of the MPDC
Source: BSWM
Map 3. Elevation Map
Prepared by the Office of the MPDC
Source: NAMRIA
1.2.1.6 LAND CLASSIFICATION

a. RESIDENTIAL USE. A taxable area within a city or municipality intended primarily for residences, home, abode, dwelling and the like wherein houses were built for the purpose of family’s and other person’s safety against calamities, oppression, natural occurrences and others.

b. AGRICULTURAL USE. A taxable area within a city or municipality intended primarily for integrated farm operations, other related product processing activities such as plantation and cultivation of rice and other staple crops, cash crops and vegetables, and animal raising such as cattle, hog, poultry and fish culture.

c. INDUSTRIAL USE. A taxable area within a city or municipality intended primarily for manufacturing or processing raw materials into products for the consumption of the public, such as canned goods, clothing, electronic devices and others.

d. COMMERCIAL USE. A taxable area within a city of municipality primarily engaged in retail or wholesale and/or retail trade, professional financing, recreational industries and other services for the public’s consumption.

c. INDUSTRIAL USE. A taxable area within a city or municipality intended primarily for manufacturing or processing raw materials into products for the consumption of the public, such as canned goods, clothing, electronic devices and others.

d. COMMERCIAL USE. A taxable area within a city of municipality primarily engaged in retail or wholesale and/or retail trade, professional financing, recreational industries and other services for the public’s consumption.

e. MINING. A taxable area within a city of municipality intended primarily for mining activities.

f. SPECIAL USE. A taxable area, in a lower or discounted value, within a city or municipality intended for cultural use, scientific use, hospitals and office of government-owned and controlled corporations within a locality.

g. EXEMPT. A non-taxable area intended for the use of the government such as Barangay Halls, religious use for churches and other place of worship, Charitable and Educational.

Table 4. LAND CLASSIFICATION OF ANGONO

<table>
<thead>
<tr>
<th>Land</th>
<th>Assessment Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>20%</td>
</tr>
<tr>
<td>Agricultural</td>
<td>40%</td>
</tr>
<tr>
<td>Commercial</td>
<td>50%</td>
</tr>
<tr>
<td>Industrial</td>
<td>50%</td>
</tr>
<tr>
<td>Mineral</td>
<td>50%</td>
</tr>
<tr>
<td>Special</td>
<td>10%</td>
</tr>
<tr>
<td>Timberland</td>
<td>20%</td>
</tr>
</tbody>
</table>

Source: Local Government Code

1.2.1.7 EXISTING LAND USE

Residential use, summing to 491.92370 hectares, comprised the biggest portion of Angono’s land use followed by Agricultural use in the near second by the measure of 197.30820 hectares. This was followed by areas used for mining, special usage, industrial use, timberland areas and commercial use.

Table 5. ANGONO LAND USE DISTRIBUTION, YEAR 2015

<table>
<thead>
<tr>
<th>Land Use Category</th>
<th>Land Area (Ha.)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRICULTURAL</td>
<td>82.40970</td>
<td>6.76%</td>
</tr>
<tr>
<td>CEMETERY/ MEMORIAL PARK</td>
<td>6.88780</td>
<td>0.57%</td>
</tr>
<tr>
<td>COMMERCIAL</td>
<td>10.21430</td>
<td>0.84%</td>
</tr>
<tr>
<td>GRASSLAND</td>
<td>197.30820</td>
<td>16.19%</td>
</tr>
<tr>
<td>INDUSTRIAL</td>
<td>38.48340</td>
<td>3.16%</td>
</tr>
<tr>
<td>INFRASTRUCTURE/ UTILITIES</td>
<td>140.70450</td>
<td>11.54%</td>
</tr>
<tr>
<td>INSTITUTIONAL</td>
<td>22.35580</td>
<td>1.83%</td>
</tr>
<tr>
<td>MINING</td>
<td>176.01220</td>
<td>14.44%</td>
</tr>
<tr>
<td>PARK AND RECREATIONAL</td>
<td>43.10040</td>
<td>3.54%</td>
</tr>
<tr>
<td>RESIDENTIAL</td>
<td>491.92370</td>
<td>40.35%</td>
</tr>
<tr>
<td>RIVER</td>
<td>9.64910</td>
<td>0.79%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,219.04910</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

Source: Office of the Municipal Assessor

Graph 1. Existing Land Use

Source: Office of the Municipal Assessor
EXISTING LAND USE MAP

Municipality of ANGONO
Province of Rizal
Region IV-A
As of 2016

Legend

- ANGONO BOUNDARY
- barangay
- EXISTING LAND USE OLD
  - RESIDENTIAL
  - COMMERCIAL
  - INDUSTRIAL
  - AGRICULTURAL
  - INSTITUTIONAL
  - LIGHT INDUSTRIAL
  - MINING
  - PARKS AND RECREATION
  - CEMETERY/MEMORIAL PARK
  - GRASSLAND
  - RIVER
  - INFRASTRUCTURE/UTILITIES

SOURCE: OFFICE OF THE MPDC & OFFICE OF THE ASSESSOR

Map 5-A. Existing Land Use Map

Scale: 1:25,000

MUNICIPALITY OF ANGONO, RIZAL

[Date]
1.2.2 CLIMATE CONDITIONS

1.2.2.1 CLIMATE TYPE

The municipality of Angono experiences a tropical rainy climate with hot summers. Based on a classification system published by the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), its climate belongs to the Type I. This is characterized by two pronounced seasons which are dry from December to May and wet from June to November. Maximum precipitation extends from June to September. With the maximum rain period occurring from June to September, August is recorded as the rainiest. The climatic condition of the municipality outlined hereinafter is based on synoptic data gathered from the Science Garden climatic station which is maintained by PAGASA in Quezon City.

1.2.2.2 RAINFALL

The rainfall regime in the area is dominated by the monsoon which renders a seasonal variation in precipitation. It receives sufficiently abundant rainfall annually with total annual levels amounting to 2,406.2 millimeters. In addition, there are 151 days on the average which means that more than 40% of the year experiences rainfall. However, there is a distinct though short dry season from December to April which receives less than 60 mm of precipitation. This is compensated nonetheless by heavy rains in other months. In fact, seasonally excessively moist and brief dry conditions are characteristics of the monsoon circulation.

During the high-sun period, which is otherwise considered as the summer season, an enormous amount of rain is released in association with the monsoon. The Southwest Monsoon is prevalent in the area in this time of the year bringing wet conditions to the affected areas. The wettest months are from June to October which receives more than 200 mm of rain. This rainy season often involves thunderstorms as the aforementioned months experience more frequent occurrences of thunderstorm and lightning. Apart from the Southwest Monsoon, the town is also affected by the Intertropical Convergence Zone (ITCZ) which is also associated with rainy conditions. This further enhances the heavy summer precipitation. The rest of the year, however, has minimal precipitation. This low-sun season is dominated by the Northeast Monsoon which produces dry conditions. The rather short dry season is also due to the ITCZ, which is not overhead in this period.

1.2.2.3 PREVAILING WIND

The prevailing wind direction that occurs more frequently is the Northeasterlies, which is mostly because of the influence of the Northeast Monsoon. On the other hand, the winds are not quite strong. The annual average wind speed is only 2 meters per second (or approximately 7.2 kph).

1.2.2.4 TROPICAL CYCLONE

The typhoon season generally begins in June and ends in November, although it must be
understood that the rest of the year is likewise affected by tropical cyclones that passes over the Rizal Province. On the average, there are 22 to 26 typhoons that enter the Philippine area of responsibility, which often affect the municipality. Despite this relatively high frequency, the town is protected from the destructive effects of typhoons by the Sierra Madre Mountains.

1.2.2.5 TEMPERATURE

Because of its latitudinal location, the sun is almost always directly overhead at noontime throughout the year. The area consequently receives an enormous concentration of solar energy which contributed to uniformly high temperatures year-round. As a result, it is consistently warm with all months averaging above 20 degrees Celsius. Furthermore, there is minimal fluctuation in temperature in the various months. The annual temperature range is below 5 degrees of centigrade. The average yearly temperature is also quite high at 27.1 degrees Celsius.

Nonetheless, the hottest times occur before the summer solstice or prior to the onset of the summer monsoon, particularly during the months of April and May. Obviously, the warmest months are on the high-sun period when there is a high receipt of insulation (incoming solar radiation). These months, generally from May to September have high relative humidities (moisture content of the atmosphere) because maximum evaporation is favored by the prevailing temperature conditions. Hence, there is abundant moisture available for precipitation, which also explains the wet conditions during this season.

It can be observed that after April and May the temperature somewhat diminishes. This is because of the heavy cloud cover associated with the wet Southwest Monsoon period which keeps away some insulation. Hence, the resulting temperatures are slightly lower in summer than the immediately preceding months. Nonetheless, these months are still relatively warm compared to the rest of the year. From October to March, the municipality experience cold atmospheric conditions. The average monthly temperatures are below 27 degrees Celsius. This arises from the effect of the Northeast Monsoon which brings in cold Siberian winds.