SECTION 9

EXAMINATION OF SANGLEY AS NAIA THIRD RUNWAY

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9.1 Introduction

9.1.1 Objective

It is widely accepted that NAIA is rapidly approaching its capacity limit. In the past, several studies were carried out to seek for efficient capacity enhancement measures for NAIA including:

i) Provision of additional rapid exit taxiways to minimize the runway occupancy time of aircraft at NAIA;
ii) Extension of parallel taxiways for on both sides of RWY 13/31, etc. and expansion of the aircraft parking apron at NAIA;
iii) Improvement of nighttime operation capability at local airports in the Philippines to further utilize the runway slots during off-peak hours at NAIA;
iv) Improvement of connectivity of local international airports in the Philippines thus reducing transfer traffic at NAIA.

These measures would mitigate the serious capacity constraints at NAIA, but would not significantly increase NAIA's runway capacity. Meanwhile there is existing Major Danilo Atienza Air Base at Sangley (hereinafter referred to as "SANGLEY"), and there was an idea to utilize SANGLEY as the third runway or supplemental airport for NAIA, thus physically increasing the capacity of runway system.

In this Section a possibility to utilize SANGLEY as the supplemental airport for NAIA has been examined from airspace utilization as well as physical facility planning viewpoints as discussed below. As a consequence, following key findings have been identified:

i) Serving aircraft at SANGLEY should be limited to PAS-OPS aircraft categories A and B such as DHC-8-300 and ATR 72 only to avoid conflict with RP-P1;
ii) Construction of an access bridge would be necessary even for temporary operation of SANGLEY until opening of NMIA. If Sangley Point Option 2 is viable for development of NMIA, the access bridge for SANGLEY could also be utilized for access to NMIA, but the site has been found less feasible (see Section 8). Construction of an almost exclusive access bridge, in addition to improvement work of the airfield and terminal facilities, for temporary operation of categories A & B aircraft at SANGLEY is considered not cost effective.

Therefore, utilization of SANGLEY as NAIA third runway is not recommendable.

9.1.2 Existing Conditions of SANGLEY

SANGLEY is located in Cavite city approx. 15 km to the south-west from business center of Manila. Philippine Air Force (PAF) and Philippine Navy (PN) are operating at SANGLEY. PAF has a plan to transfer its base to Lumbia Airport in Mindanao Island, although no transfer plan for PN exists. SANGLEY is currently accommodating commercial general aviation activities. General information of SANGLEY is shown below.

i)	SANGLEY administrator	Philippine Air Force
ii)	Aerodrome Reference Point	14° 29' 28.74'' N, 120° 53' 37.99''E
iii)	Elevation	2.4 m
iv)	Runway 07/25	1,829 m x 45 m (physical length is 2,367 m, however, RWY 07 threshold is displaced.)

Source: Google Earth

Figure 9.1.2-1 Layout of Existing SANGLEY

1) Runway

Size of the existing runway is approx. 1,829 m long and 45 m wide with 07/25 runway orientation and the elevation at the reference point of the existing runway is approx. 2.4 m MSL. Physically, the existing runway is 2,367 m in length, however, western end part of the runway is in peril condition with about 10 cm deep puddle, during and after heavy rain, consequently RWY 07 threshold was displaced. No runway shoulders are provided. The runway pavement is concrete pavement with 23cm thickness.

Photo RWY 07

Photo RWY 25

2) Taxiway

Parallel taxiway with 16-m width exists along the runway. Distance between the runway center line and taxiway center line is approx. 60 m. Five (5) stub taxiways including end stub taxiways are provided. Width of the stub taxiway is approx. 23 m except for the east end of stub taxiway. The width of east end stub taxiway is approx. 45 m. Taxiway shoulders seem to be provided before, however, they are already damaged or lost.

Photo Parallel TWY

Photo Apron TWY

3) Apron

Aircraft parking apron for helicopters and military aircraft, etc. is located at the east side of SANGLY. General dimension of the existing apron is as shown in Figure 9.1.2-2. Area of the apron is approx. 45,500 m2.

Figure 9.1.2-2 Layout of Existing Apron

4) Control Tower and Administration Buildings

Existing control tower is located nearly equidistant from the runway ends. Distance between the runway center line and front face of the control tower is approx. 140 m. Elevation of the top of the control tower and ground level are approx. 20 m and 2.4m respectively based on hearing from PAF at site..

Photo Control Tower from Landside

Photo Control Tower from Airside

5) Rescue and Fire Fighting Facility

There exists rescue and fire-fighting facility at SANGLEY. Its location is nearly equidistant from the runway ends. Distance between the runway centerline and this facility is approx. 84m. Height of the fire-fighting building is approx. 10 m based on site investigation.

Photo Rescue & Fire Fighting Facility

6) AGL and Navigation Facilities

At SANGLEY, VFR operations only are adopted, and no aeronautical ground light is equipped. However, portable aeronautical ground light is utilized if necessary.

7) Existing Revetment Area

Currently a revetment is provided along the northern coastline of SANGLEY. Width of southwestern side of the revetment is less than that of northeastern side. The least separation distance between the existing revetment and the runway center line is approx. 50 m in transversal direction. Distance between the runway strip and existing revetment is about 45 m in longitudinal direction. Layout of the existing revetment is shown below.

Based on hearing from PAF, during high tide, water wave from ocean flows into SANGLY over the revetment.

Figure 9.1.2-3 Layout of Existing Revetment

Photo Revetment nearby RWY 07

Photo Revetment nearby RWY 07

Photo Revetment nearby RWY 07

Photo Revetment nearby RWY 25 End

9.2 Common Airspace Utilization with NAIA

9.2.1 Objective

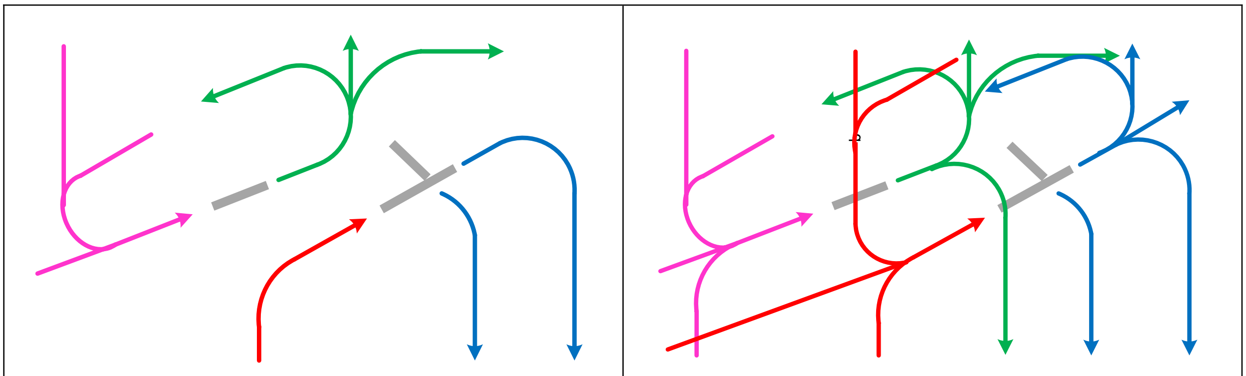
As one of outputs from the Roadmap Study, a request was for JICA Survey Team to study safety and operational viability of the scheme to utilize the existing Sangley Point Air Base (SANGLEY) as the third runway of NAIA in order to enhance aircraft operational capacity of NAIA. Responding to this request, the Survey Team conducted a study to develop a set of Instrument Flight Procedure (IFP) alternatives at SANGLEY to evaluate operational viability of those IFP alternatives, and to identify the issues for introduction of those IFP alternatives at SANGLEY in terms of the existing airspace utilization.

9.2.2 Scope

Safe and efficient aircraft operations within the Manila TMA are predicated upon the use of IFPs. These are assured airspace route structures that form flight paths to enable traffic to safely and efficiently enter from or leave to the airspace surrounding NAIA and the Manila TMA at known points and levels. The use of existing and/or new IFPs that aircraft are able to adhere will be an essential prerequisite to deliver the level of traffic movements envisaged by all the schemes being considered.

The Survey Team established IFP alternatives for the purpose of assessing the operational viability of the Simultaneous Operations on Parallel or Near-Parallel Instrument Runways (SOIR) using those of both SANGLEY and NAIA. These IFP alternatives should not be interpreted as representative of the location of future flight paths, and finalizing the IFPs alternatives will be a matter for detailed IFP design in future. Delivered study results should also be treated as data and information to be used to further consider improvements in full planning context, where airspace management needs, capital costs, operational safety assessment, legislation, and other appropriate factors help yield the best plan for the operation.

In the airspace design for multi runways configuration, several possible modes of operation should be selected and considered for each set of runway configurations along with departure and arrival flight path options. There are generally two modes of operation that could be applied to airspace design; Compass Mode and Terminal Mode (refer to Figure 9.2.1-1 for detailed description of each modes of operation). IFPs within airspace should be designed based on the modes of operation to serve anticipated air traffic flows safely and efficiently within terminal airspace. Since there was no concrete plan for runway utilization on both NAIA and SANGLEY at this moment, the Survey Team treated limited airspace over NAIA and SANGLEY and its immediate control zone, i.e., approximately 15NM from the aerodrome reference point of NAIA, in this study without regarding for both departure transitions and arrival routes supporting capacity of the airspace. The issues on airspace utilization that would be caused by introduction of the IFPs alternatives on each operational mode, however, were identified in this study.



Under **Compass Mode** air traffic would be arranged to arrive and depart depending on the compass direction E.g. Aircraft departing to the north use the northern runway(s) and aircraft arriving from the south use the southern runway(s), and vice versa.
Compass mode reduces cross-overs of flight path in the air, but requires more complex ground-handling.

In **Terminal Mode**, air traffic arrives and departs on the runway(s) closest to the terminal being used.
Terminal mode requires a certain number of flight path crossing, considerable amount of airspace design effort and ATC workload.

Figure 9.2.2-1 Mode of Operation on Multi-runway Configuration

Several IFP alternatives will require changes of both existing airspace structure and IFPs of NAIA to accommodate air traffic flows on the IFPs alternatives efficiently. This study did not evaluate viability of those changes within the existing airspace environment, and the viability would be better considered in the succeeding detailed airspace design.

9.2.3 Methodology

The study comprised of i) a review of the existing airports and airspace, ii) identify operating requirements and constraints for SANGLEY, iii) develop and assess the IFPs alternatives on SANGLEY for capacity enhancement of NAIA, and iv) finding key issues for implementation of the scheme.

The following material factors were considered for assessment of the IFP alternatives:

- Location, and orientation of existing runways at both SANGLEY and NAIA, to assess what (if any) dependencies or operating restrictions that would have an impact on each IFP could exist;
- Arrival philosophy, to consider the extent to which de-confliction of crossing traffic would be required to be performed by the radar navigation service of the Manila TMA;
- Angle of flight tracks of the IFPS alternatives on SANGLEY, would have impacts on NAIA operation; and
- Impact of any necessary changes to the existing airspace.

9.2.4 Overview of Current Airspace

1) Overview of Sangley Point Air Base

Sangley Point Air Base (former ICAO airport code: RPLS) is located at the northern portion of the Cavite City peninsula, approximately 13km southwest of Manila center and 6.7 NM east of NAIA. The airport has been served by a single northeast–southwest runway (RWY07/25) by U.S. Navy patrol planes until 1971. Asphalt pavement of 2,360-m length will be sufficient to accommodate the most short haul range of aircraft operations. Both runway thresholds used displaced (inset) thresholds for unknown reasons. The runway is separated from the NAIA's 06/24 runway by 3,100m, thereby enabling independent operations subject to the requirements of SOIR being met.

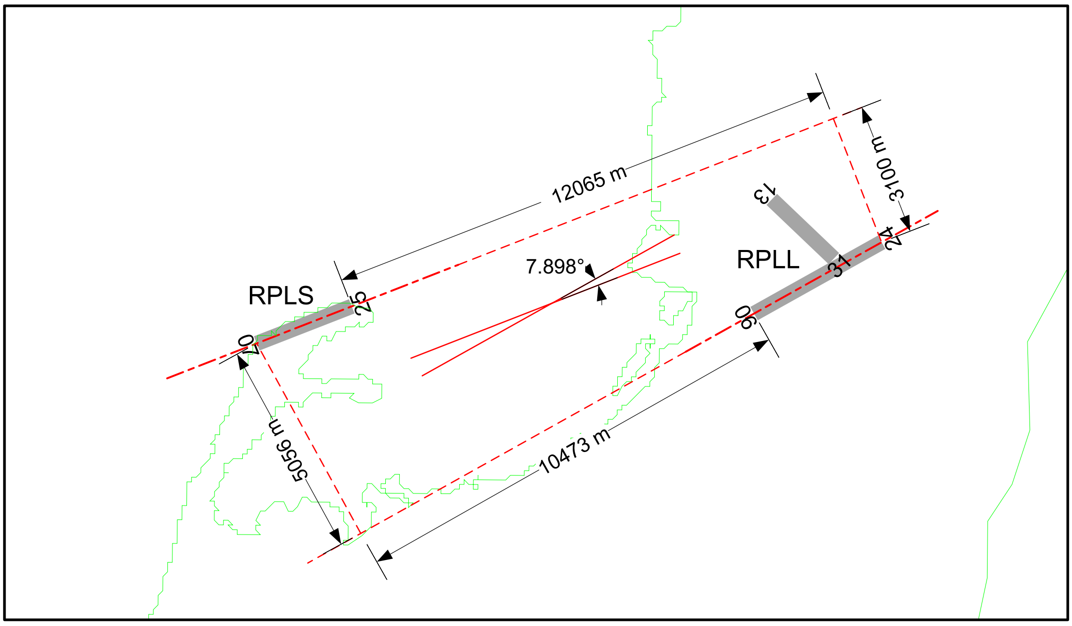


Figure 9.2.4-1 Geometric Layout of Runways at NAIA and SANGLEY

2) Overview of Current Operations at NAIA

a) Operational Runways

Ninoy Aquino International Airport (ICAO airport code: RPLL) is located approximately 10km southwest of Manila center. The airport is served by two crossing runways (RWY06/24 and RWY13/31). RWY06/24 having 3,410m length is a main runway used by the most commercial air carriers. RWY13/31 having 1,909m length serves both commercial air carriers and smaller general aviation aircraft. According to the AIP Philippines, following local flying restrictions are applied for RWY13/31 operations:

i) Only A330 or lower category aircraft are allowed take-off/landing on RWY13/31;
ii) Take-off/landing on RWY13 allowed during IMC and VMC; and

iii) Take-off/landing on RWY31 allowed day visual operations only.

Simultaneous operations on RWY06/24 and RWY13/31 are implemented during traffic congestion period. The runways are in used with aircraft taking-off/landing on either RWY06/24 and aircraft taking-off RWY13/31 respectively.

b) Instrument Approach Procedures (IAPs)

- RWY06: 2 nos. of precision approaches using the instrument landing system (ILS) with initial segments of the straight-in and of the base turn using Manila DVOR/DME (MIA) respectively, 1 no. of approach procedure with vertical guidance (APV) using the global navigation satellite system (GNSS), and 2 nos. of non-precision VOR approaches with initial segment of the straight-in and of the procedure turn respectively are currently in place.
- RWY24: 2 nos. of precision approaches using ILS with initial segments of the straight-in and of the base turn using MIA respectively, 1 no. of APV using GNSS, and 2 nos. of non-precision VOR approaches with initial segments of the straight-in and of the procedure turn respectively are currently in place.
- RWY13: 1 no. of non-precision VOR approach with base turn is currently in place.
- RWY24: No instrument approach procedure is promulgated.

c) Standard Instrument Departure Procedures (SIDs)

- Conventional SIDs, which utilizes ground-based navigation facilities, connecting to 17 exit points of Manila TMA from RWY 06, 24 and 13 at NAIA are in place. Take-off from RWY13 is allowed during daytime only. The SIDs from RWY06 follow an initial leg of RWY HDG to turn initiation altitude of 3,000ft, then turn to intercept MIA radials and then on to airway. SIDs from RWY24 follow an immediate turn to left (dominant)/right within 5NM to intercept MIA radials and then on to airway, or follow straight-out departure to 3,000ft then turn right to intercept MIA radials. SIDs from RWY13 mostly follow immediate left turn on heading 110º to 3,000ft, then climbing turn to left or right to intercept MIA radials.
- RNAV1 (GNSS) SIDs for 10 exit points at the boundary of Manila TMA from RWY 06, 24 and 13 are in place.

d) Radar Navigation

Radar service is currently provided within Manila TMA and often used as the primary mean of navigation for arrival and departure aircraft. According to the flight procedures of AIP Philippines, IFR traffic radar vector to final approach of RWY06/24 shall maintain 3,500ft prior to entering the IFR climb/descend area. Descent shall be made without violating the

Minimum Vector Altitude (MVA) appeared in the figure below.

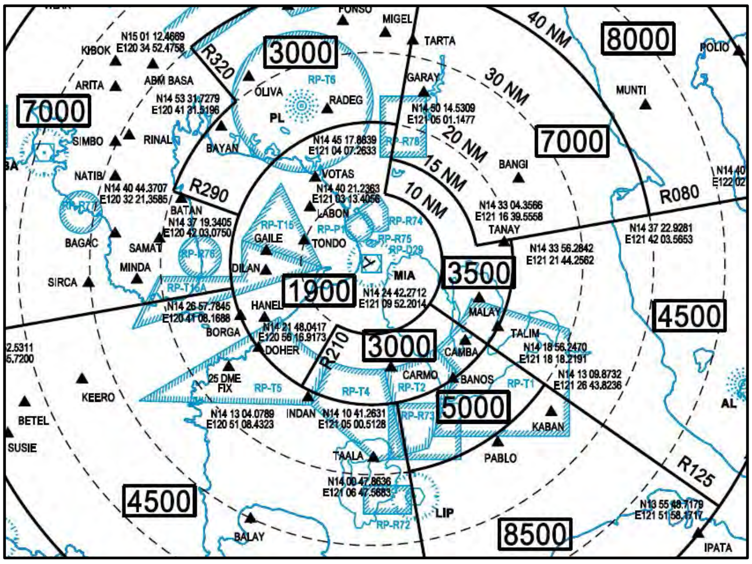


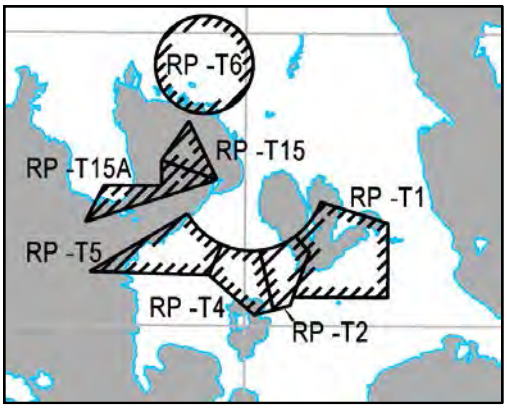
Figure 9.2.4-2 Minimum Vector Altitude at NAIA

e) Airspace

In addition to the Prohibited and Restricted Airspace shown in Table 8.3.1-1, the following Flight Training Areas exist around Manila CTR.

Table 9.2.4-1 Flight Training Areas around Manila CTR

Identification	Name	Upper limit / Lower limit	Remarks
RP/T-1	CAMBA	3000FT ALT / SFC	Active: HJ daily.
RP/T-2	CARMO	3000FT ALT / SFC	Active: HJ daily.
RP/T-4	INDAN	2500FT ALT / SFC	Active: HJ daily.
RP/T-5	NASUGBU	2500FT ALT / SFC	Active: HJ daily.
RP/T-6	PLARIDEL	3000FT ALT / SFC	Active: HJ daily.
RP/T-15	MANILA BAY (SANGLEY VFR TEST AREA)	5000FT ALT / SFC	Military maneuvering exercises. To be activated by NOTAM.
RP/T-15A	MANILA BAY	8000FT ALT / SFC	Military maneuvering exercises. To be activated by NOTAM.



Source: AIP Philippines

Figure 9.2.4-3 Flight Training Areas around Manila CTR

9.2.5 Operational Requirements and Constraints

One of the first steps to designing any new IFP is to fully analyze operational requirements and constraints on which the new procedure will be deployed to ensure efficient traffic flow within the airspace. The following specific elements were considered to design the IFP alternatives for SANGLEY:

1) Navigation System

Considering aircraft and operational capabilities of commercial airlines currently serving at NAIA, the localizer only (LOC) approach procedure and the required navigation performance (RNP) approach procedure were selected as potential approach procedures for the IAP alternatives of SANGLEY in this study (refer to Table 9.2.5-1 for consideration on applicable navigation system for the IFP alternatives). The SID alternatives were established based on conventional (VOR) navigation system since SIDs of both conventional and RNP have the same extent of protected area at initial phase of the flight.

Table 9.2.5-1 Consideration on Applicable Navigation System for the IFP Alternatives

Approach Type	Possibility	Description
VOR	No	VOR approaches, which are non-precision approach procedures, require wider protected area compared to LOC approaches and do not provide sufficient flexibility on approach flight path layout. The location of existing MIA does not allow a straight-in approach for RWY25. Installation of new VOR/DME at SANGLEY for IFP alternatives seems to be unrealistic in terms of cost-effectiveness.
LOC	Yes	LOC approaches, which are non-precision approach procedures, require the narrowest protected area and can be operated by the majority of modern aircraft. Lateral extent of required protected area for LOC, ILS (precision approach procedures), and LDA (non-precision approach procedures with off-set aligned) are all the same. Note that arrival procedures with conventional navigation means connecting from enroute segment should be established as alternative procedures for the situation of surveillance radar failure.
RNP	Yes	RNP approaches require no ground-based navigation facilities and give great flexibility to consider approach layout which can satisfy various potential conflicting constraints, while ensuring a constant descent-angle vertical path. Note that RNP approaches is predicated on operational capability of the aircraft's on-board equipment.
RNP AR	No	Required navigation performance authorization required (RNP AR) approach procedure was included as one of possible IFPs for SANGLEY in the Roadmap Study. However, the aircraft and air crew conducting RNP AR operation must be certified and approved by relevant authorities to prove technically capable of the operation and such approval process put financial burden on the aircraft operators. In the time frame of introduction of new IFPs at SANGLEY it is likely that the number of aircraft operators having the operational approval for RNP AR will be still minority.

2) Runway Operational Mode

An independent mixed mode, whereby both runways are used for departures and approaches, for multiple runways with NAIA sufficiently spaced to operate in mixed mode was considered in this study to be capable of handling anticipated aircraft movements.

3) Separation

To achieve lateral/vertical separation for independent operation and/or SOIR with NAIA runways, the parameters described in 8.3.1.1 must be met. Separation between the IFP alternatives and all of existing IFPs, except VOR approach procedures that are rarely used for both RWY06/24 at NAIA, should be maintained.

4) Orientation of Tracks for the IFP Alternatives

To the maximum extent possible final approach tracks of the IFP alternatives were set to align with the extended runway centerline. Where (if any) lateral or vertical distance between adjacent IFPs' flight paths had not met with the separation criteria, the orientation of the final approach track was altered to be offset azimuth of the final approach track.

5) FAP/FAF Location

When the terminal mode is anticipated as the operational mode of multi-runway system, there will be inevitably crossing point(s) of flight paths on the IAP alternative and the vertical separation of 1,000ft should be maintained at the crossing point. In another words, the Final Approach Point (FAP) or the Final Approach Fix (FAF) of adjacent localizers should have vertical separation of 1,000ft between each other. Supposing 1,000ft of the vertical separation set against the GP intercept altitude (i.e., 2,500ft) of the existing ILS approach procedures, FAF altitude of the IAP alternatives for SANGLEY will be too low for arriving aircraft to join the final via the radar vectoring, or FAF/FAP location will be too far to comply with PANS-OPS criteria. Thus, the GP intercept altitude of existing ILS approach procedures at NAIA need to be changed to implement SOIR. A conceptual image for SOIR at SANGLEY and NAIA appears in Figure 9.2.5-1

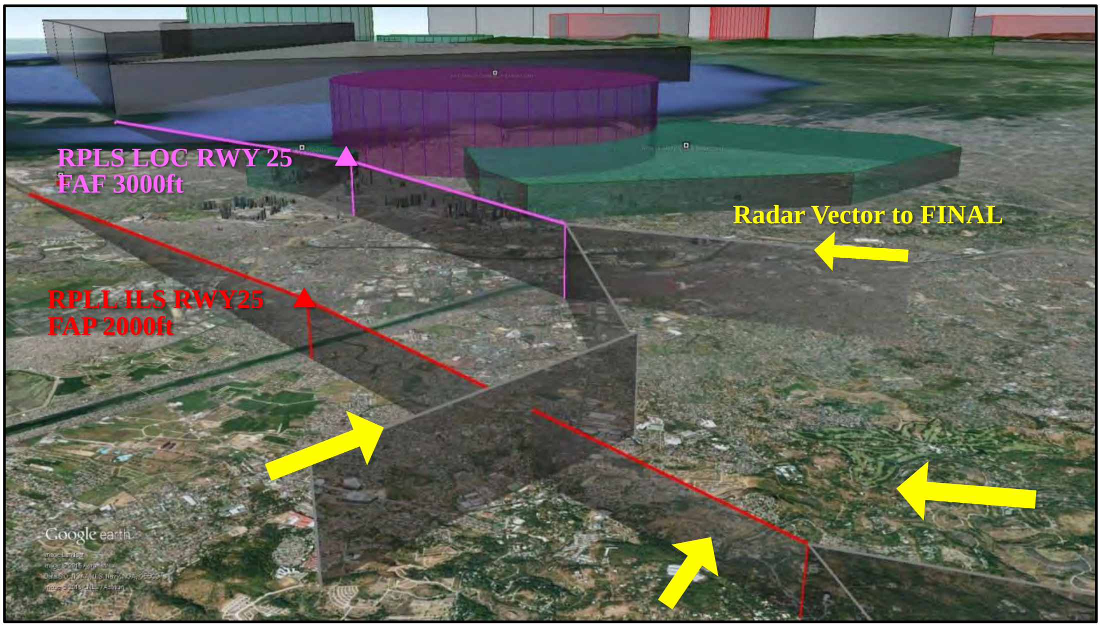


Figure 9.2.5-1 Conceptual Image for SOIR at SANGLEY and NAIA

6) Holding Procedures

Location of holding procedure is tactically determined in accordance with the mode of operation for designated airspace described in Section 9.2.2 in above to deliver efficient queuing operations. Since there were no concrete strategy to utilize the multi-runways at SANGLEY and NAIA, this study did not deal with holding procedures for the IFP alternatives.

7) Published IFPs for NAIA

Existing IFPs for NAIA remained as it was where possible. Inevitable changes on existing IFPs were identified for succeeding airspace design in details.

8) Airspace Restrictions

All of airspace restrictions, such as restricted airspace and flight training areas were incorporated into the IFP alternative development. Inevitable changes on existing airspace were identified for succeeding airspace design in details.

9.2.6 Capacity Enhancement Alternatives

1) Development of the IFP Alternatives for SANGLEY

Indicative flight paths and associated protected areas for three types of the IFP alternatives for SANGLEY, i.e., two IAPs (for LOC and RNP) and a SID, and all existing IFPs for NAIA except for conventional SIDs were depicted in accordance with the procedure design criteria described in Section 8.3.1.1 above. The missed approach (M/A) routes of the IAP alternatives were linked into existing holding patterns for preliminary assessment purpose. As the SID alternatives, the

Survey Team also depicted indicative and initial departure routes supporting the multi-runways operation mode.

2) Assessment of the IFP Alternatives

The IFP alternatives were assessed in accordance with required clearance for obstacles and terrains within the protected areas, and required lateral and vertical separation between the IFP alternatives for SANGLEY and existing airspace including the IFPs for NAIA. Assessment results of the IFP alternatives for RWY07 and RWY25 are shown in Figures 9.2.6-1 through 9.2.6-4 and summarized in Table 9.2.6 respectively. The tables show the possibility of simultaneous operation on each combination of flight procedures with three grade; High, Medium and Low. Brief descriptions of the assessment result on IFPs for each runway appear below.

a) Instrument Approach Procedures for RWY07

All of combinations between IAP alternatives for RWY07 at SANGLEY and all IFPs for RWY06 at NAIA will be viable for the SOIR on condition that existing IAPs at NAIA are altered so as to maintain adequate lateral or vertical separation between each other. An IAP for RWY13 at NAIA, however, will need to be suspended during operation of IAP alternatives for RWY07 at SANGLEY due to insufficient separation. No obstacle and terrain issue was identified on all IAP alternatives for RWY07.

b) Instrument Approach Procedures for RWY25

Since there would be conflicting traffic on the adjacent LOC approach when on-set aligned IAP alternative for RWY25 at SANGLEY were established, off-set IAP alternatives for both LOC and RNP were established for SOIR with RWY24 at NAIA. Offset angle of 4 degrees on the final approach track was determined so as to avoid interference between required protected area of the IAP alternative and the prohibited airspace RP-P1. Although the most combinations between IAP alternatives for RWY25 at SANGLEY and IAPs for RWY24 at NAIA will be viable for SOIR; one combination of between LOC RWY25 and RNP RWY24 will be inviable due to insufficient separation of adjacent flight paths. A LOC approach using the base turn from over the MIA also needs to be prohibited for SOIR. No obstacle and terrain issue was identified on all IAP alternatives for RWY25.

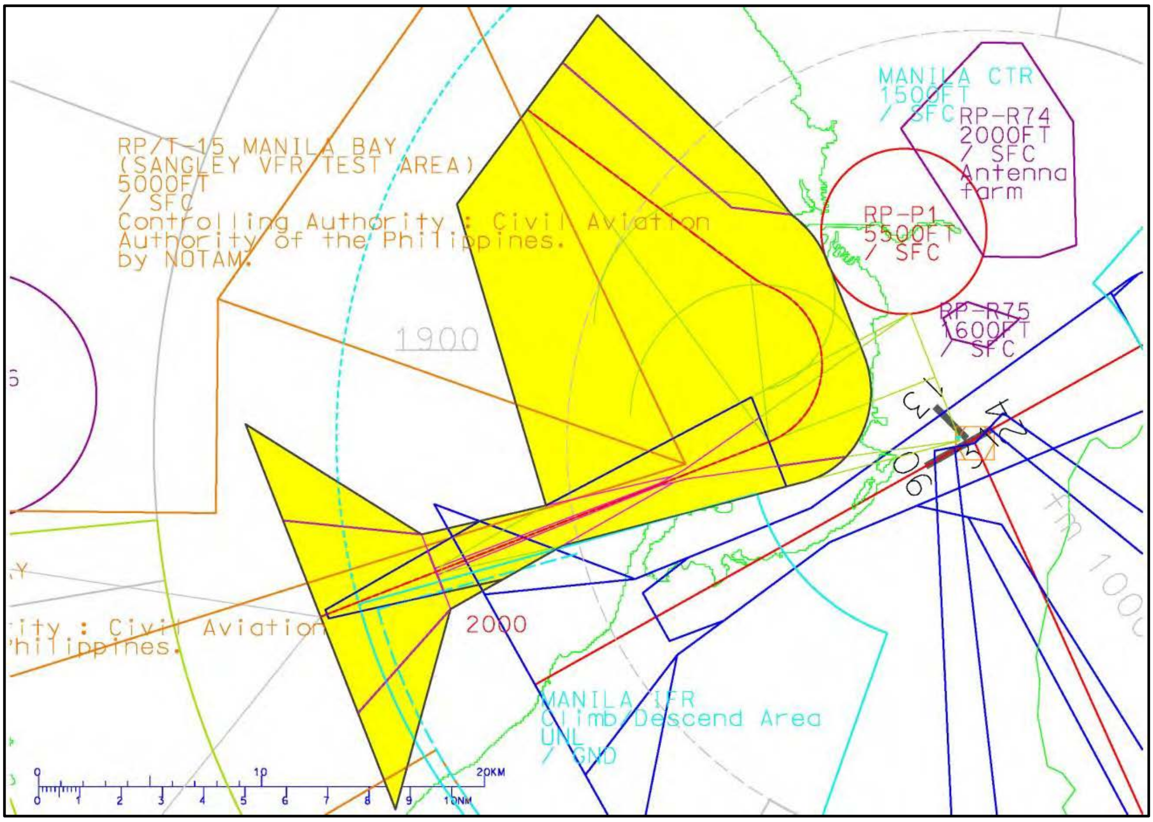
c) Standard Instrument Departures for RWY07

Since departure tracks flying over the RP-P1 from RWY07 at SANGLEY will require extremely steep climb gradient, the SID alternatives were developed to be laterally de-conflicted from the RP-P1. However, only limited extent of airspace exist between the departure end of RWY07 at SANGLEY and the boundary of the RP-P1. Accordingly, a waiver will be required for the SID alternatives for limiting the operational aircraft classified with PANS-OPS's aircraft categories A and B, such as DHC-8-300, ATR72-500 and Fokker 50, etc. No obstacle and terrain issue was identified on all SID alternatives for RWY07.

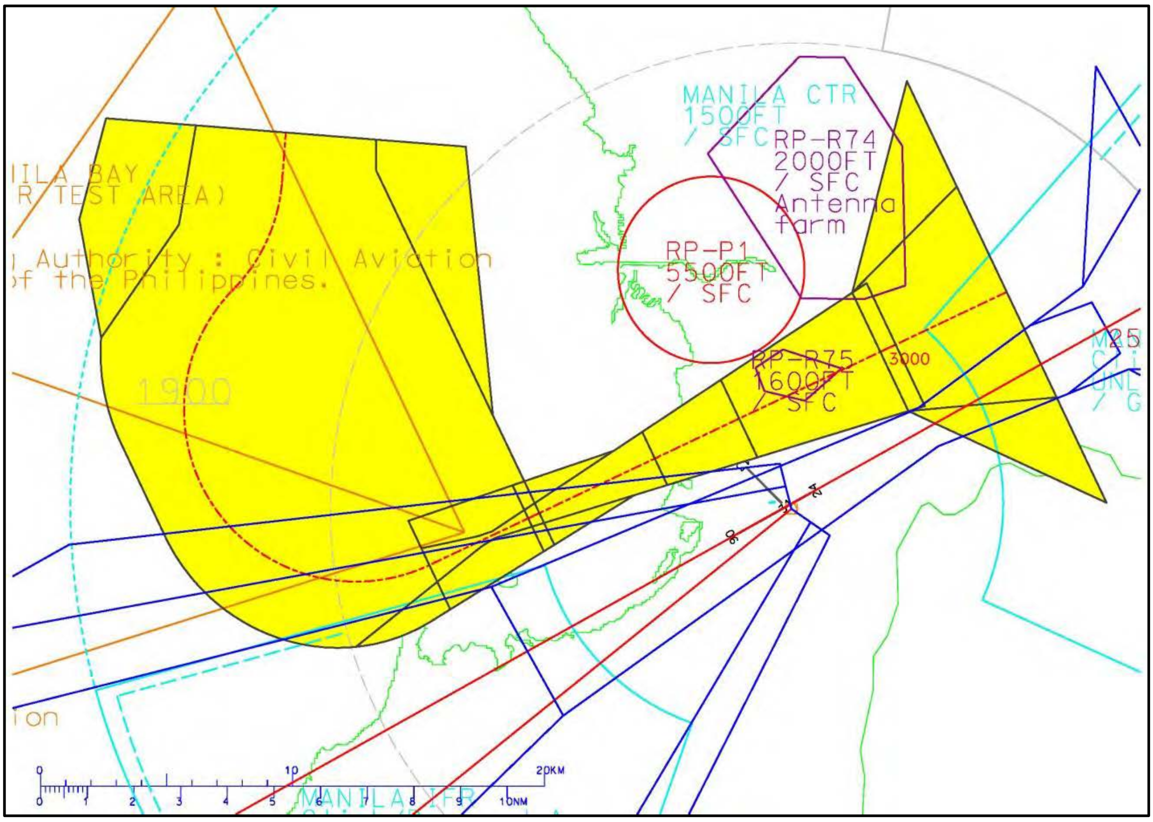
Departure tracks to the southbound from RWY07 at SANGLEY will incur extra track mileage since the procedure will require immediate turn to the north after airborne from RWY07. Applying vertical separation will also require overfly or undergo a number of departure tracks from RWY06 at NAIA and may significantly increase complexity of departure streams within the Manila TMA.

d) Standard Instrument Departures for RWY25

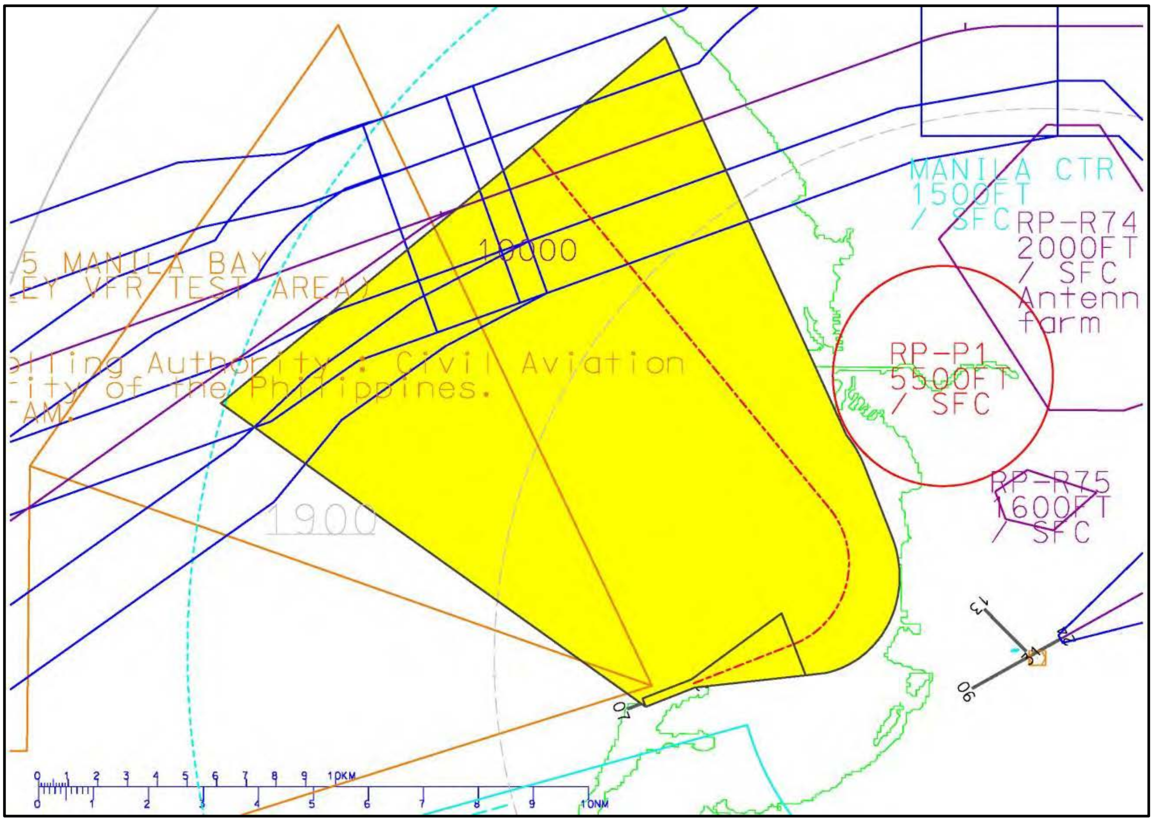
For departures of SOIR, flight paths must diverge by at least 15° immediately after take-off. Since there is no requirement of an immediate turn after take-off on SIDs in use at NAIA, initial departure tracks of all SIDs for RWY24 at NAIA will need to be altered for SOIR with RWY25 at SANGLEY. For the IAP in use for RWY24 at NAIA, an alteration will exist to make a turn immediately after passing the missed approach point to avoid conflicting traffic with adjacent SID alternatives on RWY25 at SANGLEY. No obstacle and terrain issue was identified on all SID alternatives for RWY25.



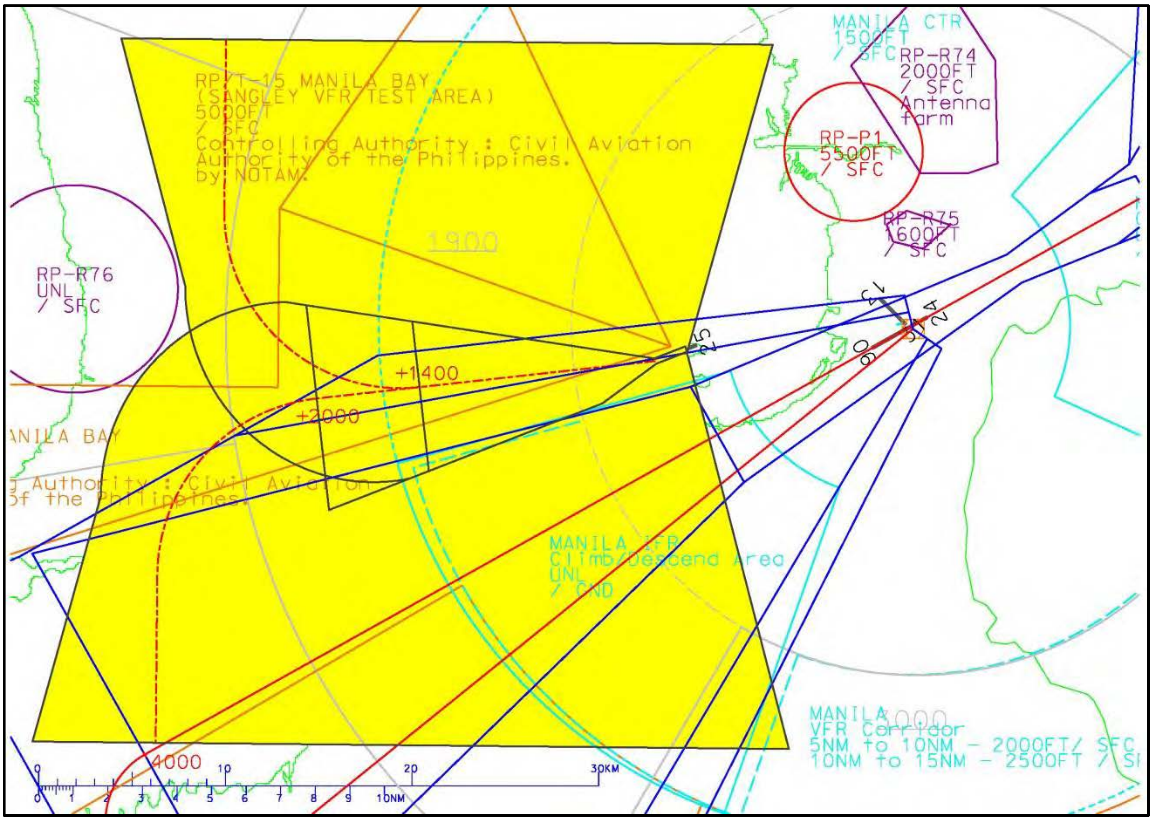
- Figure 9.2.6-1 Protected Area of an IFP Alternative (RPLS LOC RWY07 / RPLL ILS RWY06)



- Figure 9.2.6-2 Protected Area of an IFP Alternative (RPLS LOC RWY25 / RPLL ILS RWY24)



- Figure 9.2.6-3 Protected Area of an IFP Alternative (RPLS SID RWY07 / RPLL SID RWY06)



- Figure 9.2.6-4 Protected Area of an IFP Alternative (RPLS SID RWY25 / RPLL SID RWY24)

- Table 9.2.6-1 Assessment Results of IFP Alternative for SANGLEY - RWY07 Operation

New IFPs for SRA / IFPs for NAIA	IAP (LOC) RWY07	IAP (RNP) RWY07	SID RWY07
ILS RWY06 (Straight-in)	MEDIUM Existing IAP may need to be altered to maintain vertical separation (G/P intercept altitude will be changed to 3000FT).	MEDIUM Existing IAP need to be altered (FAP will be moved to maintain vertical separation).	HIGH
ILS RWY06 (Base Turn)	MEDIUM Existing IAP may need to be altered to maintain vertical separation (G/P intercept altitude will be changed to 3000FT).	MEDIUM Existing IAP need to be altered (FAP will be moved to maintain vertical separation).	HIGH
RNAV(GNSS) RWY06	MEDIUM Existing IAP need to be altered (FAF will be moved at 10NM from THR to maintain vertical separation).	MEDIUM Existing IAP need to be altered (FAF will be moved at 10NM from THR to maintain vertical separation).	HIGH Careful detailed design may be required to maintain separation to existing M/A segment and a holding procedure.
RNAV SIDs 06	HIGH	HIGH	HIGH
VOR RWY13	LOW M/A segment of the new IAP will interfere. Dependent operation will be only allowed.	LOW M/A segment of the new IAP will interfere. Dependent operation will be only allowed.	LOW New SID will interfere entire segments of existing IAP. Dependent operation will be only allowed.
RNAV SIDs 13	HIGH	HIGH	HIGH
Existing Airspace	MEDIUM Entire segments of the new IAP will interfere RP/T-15 & RP-T15A.	MEDIUM Entire segments of the new IAP will interfere RP/T-15 or RP-T15A.	LOW SIDs for up to CAT-B aircraft can only be established due to RP-P1. New IAP will interfere RP/T-15.
Minimum Vector Altitude	MEDIUM Vector to the final from the east (MVA +4500FT) will be limited due to steep descent.	MEDIUM Vector to the final from the east (MVA +4500FT) will be limited due to steep descent.	HIGH

- Table 9.2.6-2 Assessment Results of IFP Alternative for SANGLEY – RWY25 Operation

New IFPs for SRA / IFPs for NAIA	IAP (LOC-Offset) RWY25	IAP (RNP-Offset) RWY25	SID RWY25
ILS RWY24 (Straight-in)	MEDIUM Existing IAP need to be altered (FAP will be moved to maintain vertical separation, M/A segment should be altered to the left turn ASAP).	MEDIUM Existing IAP need to be altered (FAP will be moved to maintain vertical separation, M/A segment should be altered to the south).	MEDIUM Existing IAP need to be altered (M/A segment should be altered to the left turn ASAP).
ILS RWY24 (Base Turn)	LOW Entire segments of the new IAP will interfere. Dependent operation will be only allowed.	LOW Entire segments of the new IAP will interfere. Dependent operation will be only allowed.	MEDIUM Existing IAP need to be altered (M/A segment should be altered to the left turn ASAP).
RNAV(GNSS) RWY24	LOW Final segments of the new IAP will interfere. Dependent operation will be only allowed.	MEDIUM Existing IAP need to be altered (Altitude restriction will be required on IAF & IF, M/A segment should be altered to the south).	MEDIUM Existing IAP need to be altered (M/A segment should be altered to the south).
SIDs 24	MEDIUM All existing SIDs need to be altered (offset to the south from extended RWY C/L).	MEDIUM All existing SIDs need to be altered (offset to the south from extended RWY C/L).	HIGH Careful detailed design may be required to maintain the separation to existing SIDs.
RNAV SIDs 13	HIGH	HIGH	HIGH
Existing Airspace	MEDIUM M/A segments of the new IAP will interfere RP/T-15 & RP-T15A.	MEDIUM M/A segments of the new IAP will interfere RP/T-15 & RP-T15A.	MEDIUM New SIDs will interfere RP/T-15 & RP-T15A. Direction of departure track will be limited due to RP-R76.
Minimum Vector Altitude	MEDIUM Initial segments of the new IAP will extended to make aircraft descent from MVA +7000FT.	MEDIUM Initial segments of the new IAP will extended to make aircraft descent from MVA +7000FT.	HIGH

3) Summary of Assessment Results

As an output from a series of assessment, the Survey Team realized that the SOIR between SANGLEY and NAIA will be permitted with following conditions:

1. Serving aircraft at SANGLEY should be limited to the PANS-OPS's aircraft categories A and B, such as DHC-8-300, ATR72-500 and Fokker 50.

2. Track guidance on the final approach for RWY07 at SANGLEY should be provided by an on-set LOC or GNSS.
3. Track guidance on the final approach for RWY25 at SANGLEY should be provided by a 4° off-set LOC or GNSS.
4. Track guidance on the final approach for each RWY06/RWY24 at NAIA should be provided by an on-set localizer.
5. Radar surveillance shall be provided during SOIR operation. A Precision Runway Monitor (PRM) and the No Transgression Zone associated for SOIR should be provided for each end of the runways at SANGLEY to enhance the operational safety of aircraft.
6. Two localizers, one T-DME, appropriate visual aids and weather observatory system for LOC approach procedure must be installed at SANGLEY.
7. Detailed design for new IAPs, SIDs, and Holding procedures for SANGLEY must be carried out.
   Almost all of the existing IFPs for NAIA shall be reviewed and re-designed to accommodate new IFPs for SANGLEY into the Manila TMA.
8. Two numbers of flight training area, i.e., RP/T-15 and RP-T15A, should be released. The architecture of entire airspace and surrounding the SANGLEY and NAIA, including Manila Control Zone and Manila IFR Climb/Descend Area, should be also restructured.
9. VOR approach for RWY13 should be suspended during RWY07/25 operation at SANGLEY.
10. Flight operational safety assessment for SOIR, including qualitative and quantitative analysis should be carried out in accordance with ICAO Annex-11.
11. Training for ATS personnel prescribed in ICAO Doc 9643 should be conducted.

9.2.7 Key Issues for Implementation

- The airspace infrastructure surrounding NAIA is the most complex and heavily trafficked in the Philippines. The integration of any new IFPs for SANGLEY into the airspace and air traffic environment will be one of the primary constraints for utilization of SANGLEY as the third runway of NAIA. For instance, all of the north bound traffic routes must be diverted to the south for SOIR. Such changes will adversely affect air traffic routes that are currently flown by the majority of air traffic volume to/from NAIA and increase the complexity of the south side of the airspace. Potential benefit of the utilization of SANGLEY must be evaluated against the risk of airspace capacity deterioration and air traffic congestion issues.
- The IFP alternatives that will follow a substantially different path from the current IFPs for NAIA being flown will be highly disruptive to the existing IFPs and traffic flows, and require a complete redesign of the entire airspace of Manila TMA, especially when the terminal mode of the operation will be adopted for the concept of multi-runways

operation. One of the driving factors for the implementation of SOIR at Sangley and NAIA will be the desire to segregate air traffic flow of SANGLEY and NAIA. This can be accomplished through the design and implementation of the compass mode of multi-runways operation. The operational mode of multi-runways should be determined with discretion in accordance with justification from qualitative and qualitative analysis of the airspace.

- Since protected areas of the IFP alternatives illustrated above will largely contain the existing flight training areas, the Survey Team expect that changes on the flight training areas will cause significant effect on military operations. The CAAP must contact with military stakeholders; the key operating requirements of military airspace users should be considered and accommodated.
- With regard to IAP with the GNSS, work is under way by ICAO to evaluate the systems for the purpose of supporting SOIR. Thus, SOIR using GNSS approach shall be only effective after a safety assessment has demonstrated that an acceptable level of safety would be met and users have been consulted.

9.3 Airport Access Plan

Looking at the existing/planned road network around Sangley Air Base, there is no optimal road to be used as the access road to the air base during temporary operation of Sangley Air Base as the 3rd runway of NAIA. At the vicinity of the area, Manila-Cavite Road is the only distributer road but is just a 2-lane rural road and this road would not be able to be utilized as a temporary access road to Sangley. Therefore, a new airport access road is necessary to be constructed prior to the operation of the 3rd runway. A possible route of the access road traverses the swampy area in the southern part of Cavite City and be connected with Manila-Cavite Expressway. This route will also contribute to improve the accessibility from Cavite City to the city center of Metro Manila with a provision of an interchange to/from the local road in the peninsula.

Construction of the above mentioned new access road (5.5 km from the end of CAVITEX to Sangley Point) would require at least 3 years (excluding the period of design stage) and the operation of the 3rd runway would be after completion of the access road construction. The distance between existing NAIA and the 3rd runway at Sangley Point would be 22.5 km through the proposed access road, CAVITEX and NAIA Expressway.

The structural length and construction cost of the Access Road are roughly estimated as follows:

Temporary access road for Sangley as the third runway of NAIA (4-lane):	Viaduct:	L = 5.5 km	PhP 11.6 Billion
	Interchange:	Not applicable	-
	Total:		PhP 11.6 Billion

9.4 Facility Improvement Plan

9.4.1 Planning Parameters

1) Design Aircraft and Applicable ICAO Code Number and Letter

As discussed in 9.2 above, the SANGLEY would be able to accommodate PANSOPS categories A and B aircraft only. These categories of aircraft include small single and twin engines, of which the largest types currently operating at NAIA are DHC-8-300, ATR72-500 and Fokker F50. These aircraft are categorized into Code 3C in accordance with ICAO Annex 14. In facility planning, the critical aircraft has been chosen from these three types in terms of the wing span, length, tail height, wheel base and outer wheel truck according to a purpose of examination. Fokker F50 is not operated at NAIA, and it is expected that local airlines will be unlikely to operate Fokker F50 in the future. Hence, Fokker F50 is not regarded as a design aircraft in this Study.

Table 9.4.1-1 Physical Characteristics of Design Aircraft

	ICAO Code	Wing Span (m)	Length (m)	Height (m)	Wheel Base (m)	Wheel Track (m)	Outer Track (m)	Fuselage (m)	Engine	Seat
ATR72-500	C	27.05	27.17	7.65	10.77	4.10	-	-	Propeller	68-74
DHC8-300	C	27.43	25.68	7.64	10.01	7.88	8.57	2.69	Propeller	50-56

Source: Airline Characteristics and JCAB Manual

2) Approach Category of Runway

Utilization of SANGLEY as a supplemental runway of NAIA is one of the measures to address the airport capacity constraint of NAIA until the first phase of NMIA development is completed. As such, the plan should not be time and money consuming. To meet this requirement, non-precision instrument approach has been proposed for the SANGLEY. Although a 300-m wide strip is to be provided even for a non-precision instrument approach runway according to ICAO Annex 14, this would require considerable area to be reclaimed, resulting in significant amount of cost and time. In Japan, there are several airports whose runways are categorized as non-precision instrument approach while 150-m wide runway strip is provided. Examples include Toyama, Nanki-Shirahama and Izumo Airports all having 2120 m x 150 m strip and equipped with a Localizer. Considering the fact that aircraft operations at these airports have been conducted safely and efficiently, a 150-m wide runway strip has been proposed for SANGLEY.

3) Target Demand

According to the airport traffic demand forecast, the annual aircraft movements of TP/RJ class (equivalent to PANSOPS categories A & B) at NAIA would be around 30,000 in 2020 and 32,000 in 2025. The target demand of SANGLEY has been assumed to be annual movements of 31,000 by turboprop aircraft. Hourly aircraft movements have been estimated to be eight (8), based on estimated peak day ratio of 334, and peak hour ratio of 0.0758 in 2020 and 0.0738 in 2025 respectively described in Section 3 of Table 3.5.1-2 and 3.5.2-1. Based on the assumed seat capacity of 65 (74 seats of ATR72-500 multiplied by 85%), the peak hour passenger movements have been estimated to be 510 passengers for two ways.

4) Cargo Volumes

Design aircraft such as DHC-8-300 and ATR72-500 are categorized into turbo-prop aircraft, and in general, belly cargo volume is very limited due to the size of aircraft. Hence, independent cargo facility is not considered in facility improvement plan.

5) Aircraft Parking Stands

Aircraft parking stand requirements have been estimated based on the forecast peak hour aircraft arrivals as well as stand occupancy time plus allowance. Stand occupancy time for domestic Code C turbo prop aircraft has been set at 30 minutes based on the turnaround time measured from the time table. Allowance factor of 1.2 has also been used to ensure the flexible use of aircraft parking stands.

Required number of aircraft parking stands has been estimated by the following formula.

$N=\Sigma A_i \times T_i \times 1.2/60+S$
Where
N: Number of parking stands required
Ai: Number of peak-hour aircraft arrivals
Ti: Aircraft stand occupancy time
S: Number of reserve stands

Following table shows the aircraft parking stand requirements for the domestic operations in year 2025.

Table 9.4.1-2 Summary Requirements of Aircraft Parking Stands

Item	Aircraft	Description	2025
Domestic	ATR72-500, DHC8-300	Peak hour aircraft movements	8
		Peak-hour landings	4
		Parking Stands	3
		Reserve Parking Stands	1
Total		Required No. of Parking Stands	4

9.4.2 Evaluation of the Existing Facilities and Facility Requirements

1) Runway Length

Existing runway dimension at SANGLEY is physically 2,367 m in length and 45 m in width according to report of Ministry of Land, Infrastructure, Transport and Tourism (MLIT). However, actual runway length for operation has been reduced to 1,829 m due to water puddle during and after heavy rain.

Assuming that the runway would be utilized for domestic use by LCC airlines, preliminary runway length requirement has been examined as follows.

a) Range Payload Examination

For the purpose of obtaining possible destinations in relation with the runway length, following runway length has been chosen.

i) Runway length 1,600 m
ii) Runway length 1,800 m
iii) Runway length 2,000 m

b) Existing Runway Condition

Existing runway condition has been assumed as follows.

i) Elevation; 2.4m
ii) Temperature; 34.7 degrees (AIP for NAIA)
iii) Longitudinal slope; 0.3% (Assumption)

c) Correction Factors

Runway length should be corrected by its elevation, temperature compared with temperature in standard atmosphere values, and longitudinal slope in accordance with ICAO Annex 14. Standard atmosphere values are shown as follows.

Table 9.4.2-1 Standard Atmosphere Values

Altitude (m)	Temperature (℃)
0	15.00
500	11.75
2.4	14.98

Correction factors and rate of correction are listed in below.

Table 9.4.2-2 Correction Factors

Factors	Parameters	Rate of Correction	Correction	Corrected RWY Length (m)		
RWY Length	-	-	-	1,600	1,800	2,000
a. Elevation	2.4m	7% per 300m	1.001	1,584	1,798	1,998
b. Temperature	34.7℃	1% for every 1℃	1.197	1,323	1,502	1,669
c. Slope	0.3%	10% for each 1% of the RWY slope	1.030	1,284	1,458	1,620

d) Runway Length and Maximum Range

Necessary runway length and maximum range for ATR72-500 and DHC8-300 have been obtained based on airline characteristics as follows.

Table 9.4.2-3 Runway Length and Maximum Range by Aircraft

	ATR 72-500	DHC8-300
RWY Length (SL, ISA conditions)	1,290	1,178
Maximum Range (NM)	890	841

Source: Airline Characteristic

Table 9.4.2-4 Distance between NAIA and Major Local Destinations

Airport	Distance (NM)	Airport	Distance (NM)
Bacolod	263	Iloilo	251
Cebu	310	Puerto Princesa	320
Davao	526	Zamboanga	465
General Santos	565	-	-

Based on the above runway length and maximum range examination results and distances to local major destinations, required runway length has been obtained at 1,600 m. It is noted that further examination should be required to obtain the required runway length in design stage.

2) Runway Width

In accordance with ICAO Annex 14, the required widths of the runway for each code aircraft are summarized as follows. For ATR72-500 and DHC8-300, 30 m of runway width is required.

Table 9.4.2-5 Runway Width Requirement

Code No	Code Letter					
	A	B	C	D	E	F
1	18 m	18 m	23 m	-	-	-
2	23 m	23 m	30 m	-	-	-
3	30 m	30 m	30 m	45 m	-	-
4	-	-	45 m	45 m	45 m	60 m

Source: ICAO Annex 14

3) Runway Strip, Runway End Safety Area and Threshold Location at Runway 27 End

Dimension of runway strip is runway length + 120m in longitudinal direction and 150 m in transversal direction. In terms of size of runway end safety area, 240m in length and 90 m in width has been adopted.

Existing threshold at runway 27 end is close to the existing revetment as shown in Figure 9.1.2-3 above, and the runway strip as well as runway end safety area are out of land area when the existing threshold location is kept. In case the runway 27 threshold location is displaced by 330 m toward west, the runway strip and runway end safety area for runway 25 could be located within land area. The runway strip and runway end safety area after displaced by 330 m toward west is illustrated below.

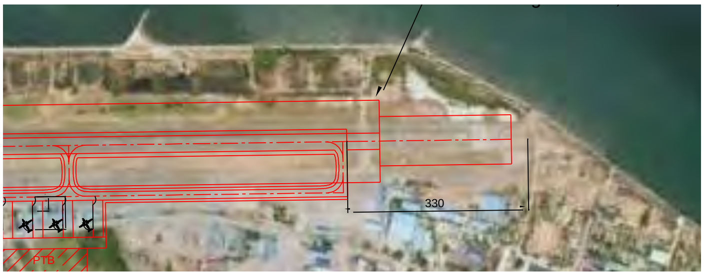


Figure 9.4.2-1 RWY Strip and RWY27 Threshold Location

Meanwhile, when 330 m displacement toward to runway 07 is carried out, the runway strip of south west end and nearby is located out of the land area as shown figure 9.4.2-2, and consequently reclamation is required with revetment. The area where required to make reclamation is approx. 4,200 m2 including 15 m space for perimeter road and so forth.

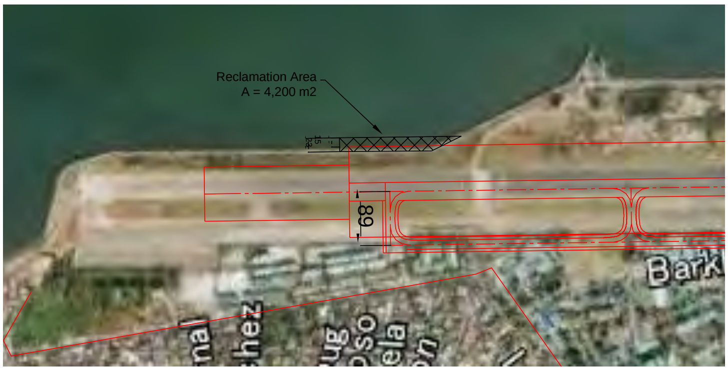


Figure 9.4.2-2 Reclamation Area in case of Threshold Offset by 330 m to RWY07

4) Runway Shoulders

Runway shoulders are required for a runway where the code letter is D, E and F in accordance with ICAO Annex 14. Aircraft to be used in SANGLEY is ATR72-500, DHC8-300 and/or smaller, hence, the shoulders are not provided to the runway taking into consideration that the locations of engines for ATR72-500 and DHC8-300 are around 4 m from the axil line of the aircraft, and it has enough margin to the edge of the runway.

5) Taxiway Systems

Based on the forecast peak hour aircraft movements, a parallel taxiway system would be justified in accordance with design manual of Japan Civil Aviation Bureau (JCAB).

6) Separation Distance Between the Runway Centerline and Taxiway Centerline

Separation distance between the runway centerline and taxiway centerline based on google earth is approx. 60m. The requirement for separation distance has been adopted as follows.

i) Runway strip 150m;
ii) Max. wing span for ATR72-500 and DHC8-300; approx. 28 m
iii) Separation distance between runway centerline and taxiway centerline 89 m

7) Width of Taxiway and Taxiway Shoulders

Width of the existing parallel taxiway is approx. 16m. Wheel bases of design aircraft are less than 18m based on physical information for ATR72-500 and DHC8-300 in table 9.4.1-1 above. In accordance with ICAO Annex 14, 15 m of taxiway is stipulated for a width of taxiway in case the wheel base of aircraft to be operated is less than 18 m, and therefore, a taxiway width has been set to 15 m. As for the taxiway shoulders, it is recommended by ICAO Annex 14 that overall width of the taxiway and its shoulder is shown in table 9.4.2-6. For protecting ingestion of foreign objects, 5 m of taxiway shoulder at both sides have been provided.

Table 9.4.2-6 Taxiway Width Requirement

Physical Characteristics	Code Letter					
	A	B	C	D	E	F
Min. Width of Taxiway Pavement	7.5 m	10.5 m	18 m[a] 15 m[b]	23 m 18 m	23 m	25 m
Taxiway Pavement and Shoulder	-	-	25 m	38 m	44 m	60 m

a: Taxiway intended to be used by aircraft with a wheel base equal to or greater than 18 m.
b: Taxiway intended to be used by aircraft with a wheel base less than 18 m.

Source: ICAO Annex 14

8) Apron

Four (4) aircraft parking stands for ATR72-500 and DHC8-300 have been provided. For the use of turbo prop aircraft such as ATR72-500 and DHC8-300, taxi-in/taxi out procedure has been adopted.

9) Obstacle Limitation Surfaces and Existing Control Tower

As discussed 9.3.3.1 planning parameters, the runway strip has been set up 150m in width. For safety aircraft operation, ICAO Annex 14 stipulates that following Obstacle Limitation Surfaces (OLS) shall be maintained.

i) Conical surface;
ii) Inner horizontal surface;
iii) Approach surface; and
iv) Transitional surfaces

Distance between the runway center line and front face of the control tower is approx. 140m by google earth. Height of the Control Tower (CT) is assumed approx. 15m.

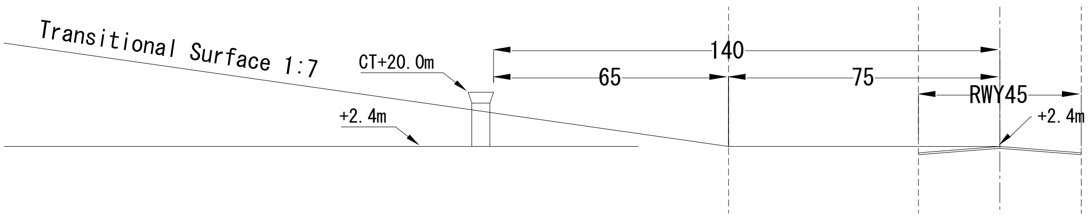


Figure 9.4.2-3 OLS and Ex. CT

10) Rescue and Fire Fighting

The aerodrome category of rescue and fire-fighting is to be determined based on the longest aircraft normally using and their fuselage width as shown in following table. Table 9.3.3.1-2 shows that the length and fuselage for DHC8-300 is 25.7 m and 2.69 m, for ATR72-500 is 27.2 m and approx. 3 m. The aerodrome category 5 has been adopted.

Table 9-1. Aerodrome category for rescue and fire fighting

Aerodrome category (1)	Aeroplane overall length (2)	Maximum fuselage width (3)
1	0 m up to but not including 9 m	2 m
2	9 m up to but not including 12 m	2 m
3	12 m up to but not including 18 m	3 m
4	18 m up to but not including 24 m	4 m
5	24 m up to but not including 28 m	4 m
6	28 m up to but not including 39 m	5 m
7	39 m up to but not including 49 m	5 m
8	49 m up to but not including 61 m	7 m
9	61 m up to but not including 76 m	7 m
10	76 m up to but not including 90 m	8 m

Source: ICAO Annex 14 Chapter 9

9.4.2.1 Facilities Improvement Plan

1) Runway

a) Runway Length

Result of runway length requirement for ATR72-500 and DHC8-300 shows a runway length of 1,600 m is required. The required width of runway is 30 m for ATR72-500 and DHC8-300 , and no runway shoulders are to be provided.

b) Runway Layout Plan

Based on the examinations described in 9.4.2, 3), following two optional runway layout plans have been developed as shown below:

i) Case-1; Existing threshold would be displaced by 330 m toward runway 07

ii) Case-2; Plus existing runway would be shifted by 25 m to southeast direction.

Figure 9.4.2.1-1 Runway Layout Plan Case-1

Figure 9.4.2.1-2 Runway Layout Plan Case-2

It is noted that runway layout plan case-1 requires reclaimed land in order to meet ICAO runway strip requirement, meanwhile, runway layout plan case-2 requires relocation of a part of the existing boundary fence and/or resettlement of the existing residents.

c) Pavement

Existing runway pavement consists of 23 cm cement concrete pavement. Based on hearing from PAF, thickness of base course might be 25 to 30 cm. As for subgrade, there is no information of its strength, and therefore, following assumption has been made. It is noted that further examination should be conducted during design stage.

i) Thickness of base course 300 mm
ii) Subgrade strength 33MN/m3 (equivalent to CBR 4%)

Assumed existing pavement structure is shown below.

Concrete Slab t=230

Base Course t=300

Sub-grade 33 MN/m3

Figure 9.4.2.1-3 Assumed Existing Pavement Structures and Subgrade Bearing Capacity

Preliminary structural calculation has been conducted using FAA RFIELD Pavement Design Program. Following assumptions have also been adopted.

i) Type of Aircraft; ATR72-500 with 23 t of gross taxiway weight
ii) Occurrence of the prevailing wind is 70%;
iii) Annual aircraft movements 31,000;
iv) Annual aircraft departures 11,000;
v) Structural condition index 70;

vi) Subgrade k value; 33 MN/m3 (equivalent to CBR 4%)

Based on the above assumptions, preliminary pavement thickness calculations have been made, and calculation has been terminated for reaching minimum overlay thickness of hot asphalt mixture. Therefore, minimum overlay thickness of 50 mm has been laid on the existing pavement. In practice, the existing pavement surface is not flat and has undulations, and actual overlay thickness would need to be increased.

Also due to difference of distance between the runway centerline and parallel taxiway centerline and/or the difference between centerlines of runway after shifted by 25 m, some of the runway and taxiways areas need to be constructed by new pavement, and therefore, additional examination has been made, and following pavement structure has been obtained for new asphalt concrete pavement.

In addition, asphalt concrete pavement is to apply for apron pavement, taking into consideration of the use of light weight turbo prop aircrafts.

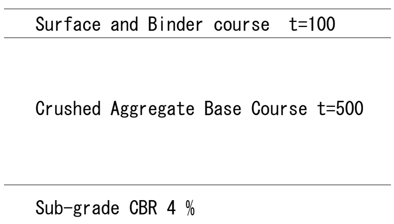


Figure 9.4.2.1-4 Asphalt Pavement Structure

2) Taxiways

a) Parallel Taxiway

Because of distance between the existing runway centerline and existing parallel taxiway centerline is approx. 60 m, and the requirement for non-precision instrument approach, parallel taxiway centerline should be offset to 89 m from the runway centerline.

b) Taxiway Fillet

Examination of taxiway fillet has been conducted. The minimum clearance distance of outer main wheel to taxiway edge is shown below.

Table 9.4.2.1-1 Minimum Clearance Distance of Outer Main Wheel to Taxiway Edge

Code	A	B	C	D	E	F
Min. clearance distance of outer main wheel to taxiway edge	1.5m	2.25m	4.5m[a] 3m[b]	4.5m	4.5m	4.5m
a: Taxiway intended to be used by aircraft with a wheel base equal to or greater than 18 m. b: Taxiway intended to be used by aircraft with a wheel base less than 18 m.						

Source: ICAO Annex 14

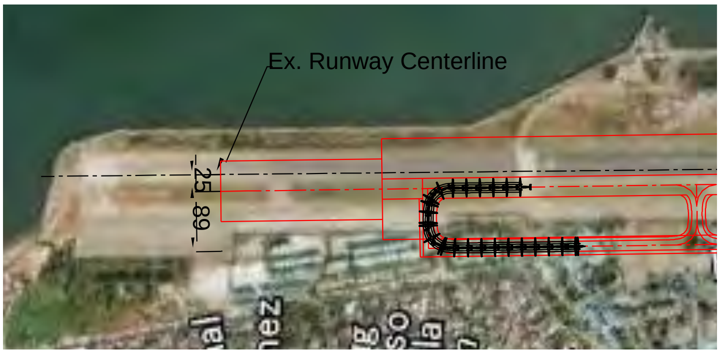


Figure 9.4.2.1-5 Taxiway Fillet

c) Taxiway Shoulder

5-m wide taxiway shoulder on both sides should be provided in order to prevent aircraft engines from ingestion of a surface material. Total width of the paved portion of the taxiway including shoulders is 25 m.

3) Apron Requirement

Four (4) loading apron parkings should be provided for catering peak landing aircrafts demand as mentioned above. Size of the loading apron is 82.5 m in depth and 220 m in width as shown in following figure. Ground service equipment road with 20 m width is also provided between passenger terminal building and loading apron.

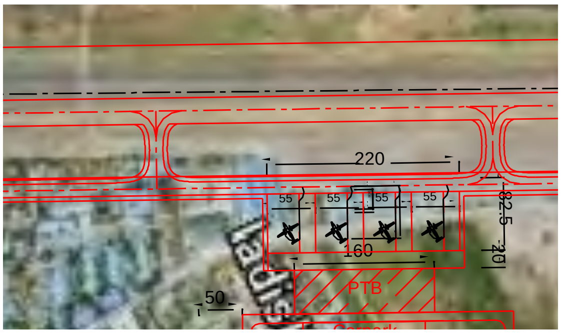


Figure 9.4.2.1-6 Size of Loading Apron

OLS requirement shall be cleared at apron. Assumed cross section is also shown below, assuming that the runway elevation is 2.4 m and elevation of 5.0 m for the apron parking area.

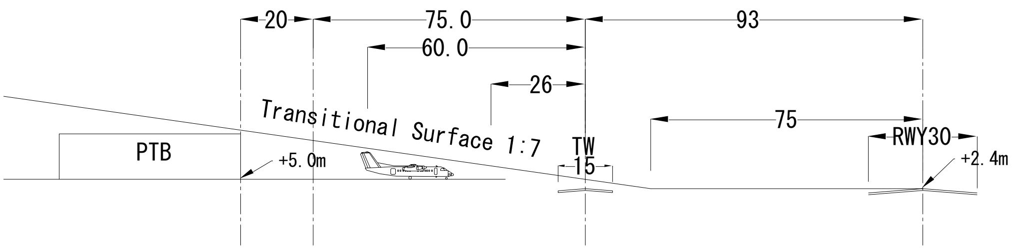


Figure 9.4.2.1-7 Parking Aircraft and OLS

4) Other Civil Works

a) Stromwater Drainage Facilities

Stormwater drainage facilities along the runway, new parallel taxiway and apron as well as road and carpark area should be provided.

b) Circulation Road and Carpark

Circulation road and carpark should be provided in front of the passenger terminal building. Required parking spaces have been estimated based on the Airport Facility Planning Manual by JCAB.

Following assumptions were adopted.

i) Peak passenger movements; 510 Pax
ii) Modal split; ship 20%, bus 50%, private car 30%
iii) Peak passenger movements for private car; 160 pax
iv) Required parking lot per peak passenger movements; 0.8 space / pax
v) Parking space per one parking lot; 35 m2/space

As a result, the required number of parking space is 130, equivalent to 4,600 m2 parking area requirement.

c) Fuel Farm

Fuel farm may need to be provided somewhere near loading apron. In general, fuel farm facilities are provided by private petroleum company of at own cost. Following is expected capacity of the fuel farm based on Airport Facility Planning Manual by JCAB for reference purpose.

Following assumptions were employed:

i) Route distance from SANGLEY to General Santos; 565 km
ii) Computation formula for fuel consumption for Turbo-Prop class aircraft
$Y = 0.0010 X + 0.60$
Where Y is fuel consumption (kl) and X is route distance (km)

iii) Required tank capacity; one week
iv) Daily departures; 70, Weekly Departures; 500

Based on the above assumption i) to iv), required fuel tank capacity for one weeks has been estimated 600 kl.

5) Passenger Terminal Building

Floor space requirement for passenger terminal building has been examined based on following assumptions.

i) Peak hour passenger movement (two ways); 510 pax
ii) Required floor space per passenger; 15 m2
iii) Passenger terminal building is one story.

As a result, an area of 8,000 m2 would be required for passenger terminal building.

6) Administration and Other Buildings

a) Administration Building and Control Tower

Required administration building floor space has been examined based on following assumptions.

i) Rate of employee's number per annual pax; 6.7×10^{-5}
ii) Assumed annual pax; 2.2 million pax
iii) Assumed employee's number; 150 persons
iv) Required floor space per employee; 7 m2
v) Administration building is two stories

Based on above assumptions, required floor space for administration building has been made at approx. 1,100m2.

Regarding control tower floor space, 350 m2 floor spaces has been adopted taking into consideration of required floor space from experience in local airport in the Philippines.

b) Fire Fighting Building

Aerodrome category 5 has been adopted, and the minimum number of rescue and fire fighting vehicles provided for aerodrome category 5 is one (1).

i) Rate of floor space per one vehicle; 429m2
ii) Fire-fighting building is one story of building

As a result, approx. 450 m2 of fire-fighting building is estimated.

c) Power Station

Required power station floor space has been examined based on following assumptions.

i) Rate of floor space per PTB; 0.013m2
ii) Passenger terminal building floor space; 8,000m2

As a result, required floor space of power station is estimated approx. 150 m2.

d) Water Tank and Pump House

Required water tank and pump house building floor space have been examined based on experience from local airport in the Philippines. 800 m2 floor space for water tank and pump house have been obtained.

7) Utilities

Utilities to be provided are listed below.

i) Power supply system; and
ii) Water supply and Sewage system

a) Power Supply System

The power demand has been estimated based on experience from local airport in the Philippines. 1,600 kVA power supply estimate has been assumed, including building such as passenger terminal building, power house, control tower and administration buildings, air navigation system, aeronautical ground lights, etc.

b) Water Supply and Sewage System

The demands of water supply and sewage system have been estimated based on experience from local airport in the Philippines and expected number of passenger per day. 600 m3/ day of expected water supply and sewage system have been obtained.

8) Communication, Navigation, Radar, ATM, AGL and Meteorological Observation Facilities

Communication system, navigation system, radar system, Air Traffic Management, Aeronautical Ground Lights and Meteorological observation facilities to be provided are listed below.

[Communication System]

i) Tower VHF Air to Ground
ii) AIS/AMHS

[Navigation System]

i) LLZ
ii) T-DME

[Air Traffic Management]

i) Tower ATC Console
ii) Voice Switching Control System and Voice Recorder

[AGL Facilities]

i) Simple Approach Lighting System
ii) Precision Approach Path Indicators
iii) Runway Edge Lights
iv) Runway Threshold Lights
v) Runway End Lights
vi) Wind Direction Indicator Lihgts
vii) Taxiway Edge Lights
viii) Apron Floodlight
ix) Central Control Room
x) AGL Control and Monitoring Panel

[Met. Facilities]

i) AWOS/Sensor System

Figure 9.4.2.1-8 Improvement Layout Plan Case-1

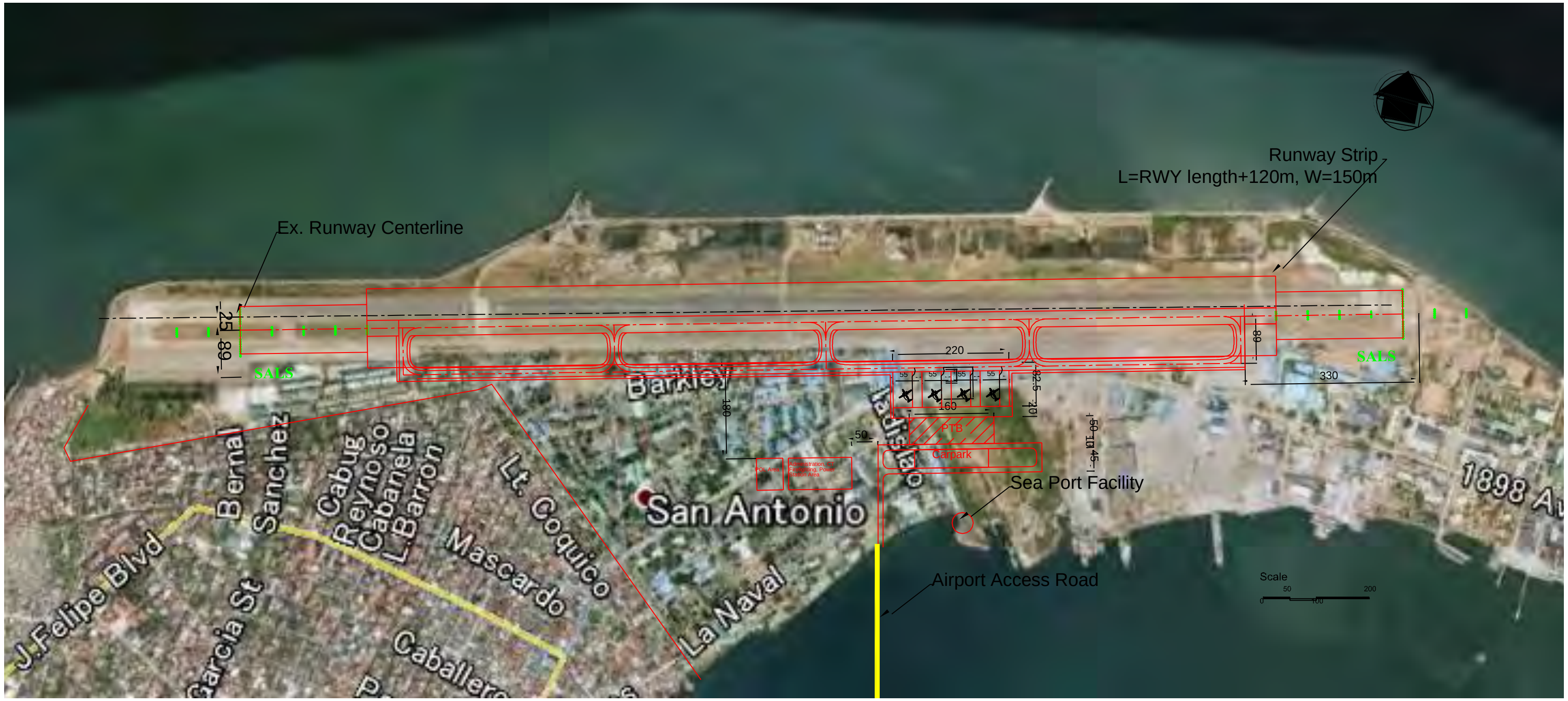


Figure 9.4.2.1-9 Improvement Layout Plan Case-2

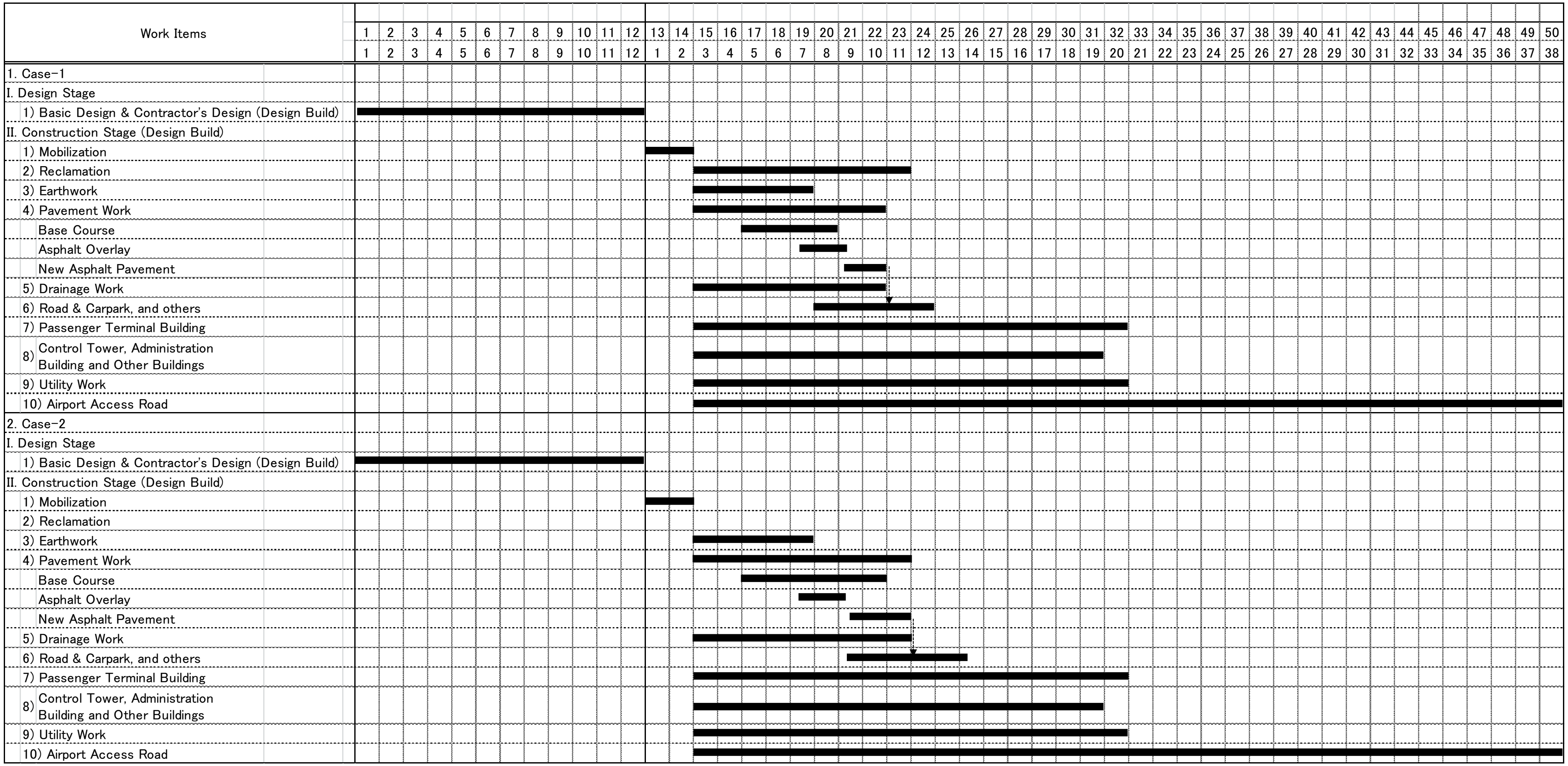
9.4.2.2 Preliminary Construction Schedule

1) Preliminary Construction Schedule

Preliminary construction schedule has been examined based on the following assumption and construction schedule is shown below.

i) Basic design and Contractor's design (Design Build); 12 months
ii) Mobilization; 2 months
iii) Reclamation; 9 months
iv) Earthwork; 5 months
v) 50 % of workable rate for pavement works, and construction capacities for pavement is based on JCAB
vi) Passenger Terminal Building and Utilities; 18 month
vii) Control Tower, Administration building and other buildings; 17 months
viii) Airport Access Road; 36 months

Table 9.4.2.2-1 Preliminary Construction Schedule



2) Preliminary Construction Cost Estimate

Preliminary construction cost estimate has been examined based on experience from local airport in the Philippines. The summary of the preliminary construction cost estimate is shown as follows.

Table 9.4.2.2-2 Summary of Preliminary Construction Cost

	Case-1 (Mill. Php)	Case-2 (Mill. Php)
1. Civil Works	741	468
2. Building Works	832	832
3. Utility Works	390	390
4. CNS/ATM/AGL/MET	944	944
Total	2,907	2,634

SECTION 10

PRELIMINARY ECONOMIC AND FINANCIAL ANALYSIS

SECTION 10: PRELIMINARY ECONOMIC AND FINANCIAL ANALYSIS

10.1 Basic Approach

Based on the objective of the Survey (see Section 1), a preliminary economic analysis and financial analysis for NMIA development project (hereafter referred to as the "Project") has been carried out to grasp any problem and viewpoint related to the approximate amount of project costs, project finance, operating expenditures/revenues, economic effects and others that should be considered in the future study such as Feasibility Study (F/S) for the Project (hereafter referred to as "next step") based on the following conditions:

a) The analysis has been carried out for the site of Sangley Point Option 1 that was rated as feasible in the Survey and the results of this analysis are not to be used to compare with other sites,

b) The preliminary construction cost estimated in Section 8 has been adopted as the basis in this analysis,

c) The operating costs and expenditures at NMIA have been estimated based on the present financial data of NAIA, and no modification (including establishment of new fees/charges) has been considered for improvement of the profitability,

d) The economic benefits have been estimated based on the forecast calculated in Section 3 including traffic distribution between NMIA and CRK,

e) Various parameters for the analysis such as the time value, access time and foreign visitors' average expenditure, etc. have been estimated based on the existing statistical data and information.

10.2 Estimate of Total Project Cost for Initial Phase Development of NMIA

Generally the total project cost consists of the following:

i) Construction cost;
ii) Land acquisition and compensation cost;
iii) Consulting services cost;
iv) Physical contingencies;
v) Price escalation;
vi) Taxes and duties;
vii) Financial cost; and
viii) Operation and maintenance cost.

The preliminary construction cost as well as land acquisition and compensation cost were estimated as described in Section 8. The total project cost has been estimated based on the construction and compensation costs and following preliminary assumptions:

i) The cost for development of NMIA would be financed by a foreign soft loan and own fund of the Government of the Philippines;
ii) The annual maintenance, replacement and operation cost would 1.0% of the total construction cost in the first five years, to be increased to 2.0% from sixth to 10th years and further to 3.0% thereafter.
iii) The consulting service cost would be 8% of the total construction cost;
iv) Physical contingencies of the construction and consulting service costs would be 10% and 5% respectively;
v) The price escalation rates of foreign and local portions would be 2.0% and 3.5% respectively;
vi) The interest rates of the foreign soft loan would be 0.1% for the construction works and 0.01% for the consulting services;
vii) Rate of VAT and import tax would be 12% and 5% respectively;
viii) Cost for the Project Management Unit (PMU) would be 2% of the total construction, consulting services and land acquisition and compensation costs;
ix) A front end fee of 0.2% of the foreign soft loan amount would be payable by the borrower;
x) The foreign soft loan would cover 100% of the eligible portion which would not include the land acquisition and compensation cost, the cost of PMU, taxes and duties; and
xi) Exchange rate used for computation is US$=PHP 45.157.

The estimated total project cost is shown in Table 10.2-1.

Table 10.2-1 Estimated Total Project Cost for Initial Phase Development of NMIA

Item		Project Cost		
		FC	LC	Total
A. ELIGIBLE PORTION				
Ⅰ)	Procurement / Construction	6,126	421,511	15,460
	Division 1: General Requirements	95	9,980	316
	Division 2: Platform Development	2,285	154,888	5,715
	Division 3: Airport Access	206	17,250	588
	Division 4: Airport Civil Facilities	107	27,139	708
	Package 5: Building Works	1,479	54,685	2,690
	Package 6: Utilities	355	13,096	645
	Package 7: CNS/ATM and AGL	95	2,845	158
	Base Cost	4,622	279,883	10,820
	Price Escalation	947	103,309	3,235
	Physical Contingency	557	38,319	1,405
Ⅱ)	Consulting services	741	16,106	1,098
	Base Cost	606	11,741	866
	Price Escalation	100	3,598	180
	Physical Contingency	35	767	52
Total (Ⅰ + Ⅱ)		6,867	437,617	16,558
B. NON ELIGIBLE PORTION		0	0	0
a	Procurement / Construction	0	0	0
	Base Cost	0	0	0
	Price Escalation	0	0	0
	Physical Contingency	0	0	0
b	Land Acquisition	0	2,296	51
	Base Cost	0	1,806	40
	Price Escalation	0	281	6
	Physical Contingency	0	209	5
c	Administration Cost	0	15,000	332
d	VAT	0	52,790	1,169
e	Import Tax	0	15,505	343
Total (a+b+c+d+e)		0	85,591	1,895
TOTAL (A+B)		6,867	523,208	18,454
C. Interest During Construction (IDC)		74	0	74
	Interest during Construction (Const.)	73	0	73
	Interest during Construction (Consul.)	1	0	1
D. Front-End Fee		33	0	33
GRAND TOTAL (A+B+C+D)		6,974	523,208	18,561
E. Foreign Soft Loan Finance Portion incl. IDC (A+C+D)		6,974	437,617	16,665

Source: JICA Survey Team

10.3 General Project Implementation Schedule

General project implementation schedule has been prepared considering the following:

i) Current JICA Data Collection Survey is to be completed by early 2016, followed by implementation of the Full Feasibility Study (FS) for one and a half years.

ii) EIA is to be carried out simultaneously with the FS. EIA is to be finalized based on the result of FS and submitted to DENR/EMB in 2018 for approval and issuance of ECC.

iii) The period from 2018 to 2019 is for various financial arrangements including securing a foreign soft loan.

iv) In the first half of 2019, necessary approval of PRA on the reclamation project will be secured and the engineering consultants will be selected for the design, tender documentation as well as the detail environmental and social examination.

v) Selection of the contractors will be commenced in 2020 and to be completed by 2024 step by step starting from the platform development as well as the airport access road and bridge, followed by the airport airside and landside civil works, the building and utility works, the CNS/ATM and aeronautical ground lights.

vi) The contractors' mobilization and preparatory works will be started in 2021.

vii) The platform development works will be commenced in 2022 and to be completed in five years.

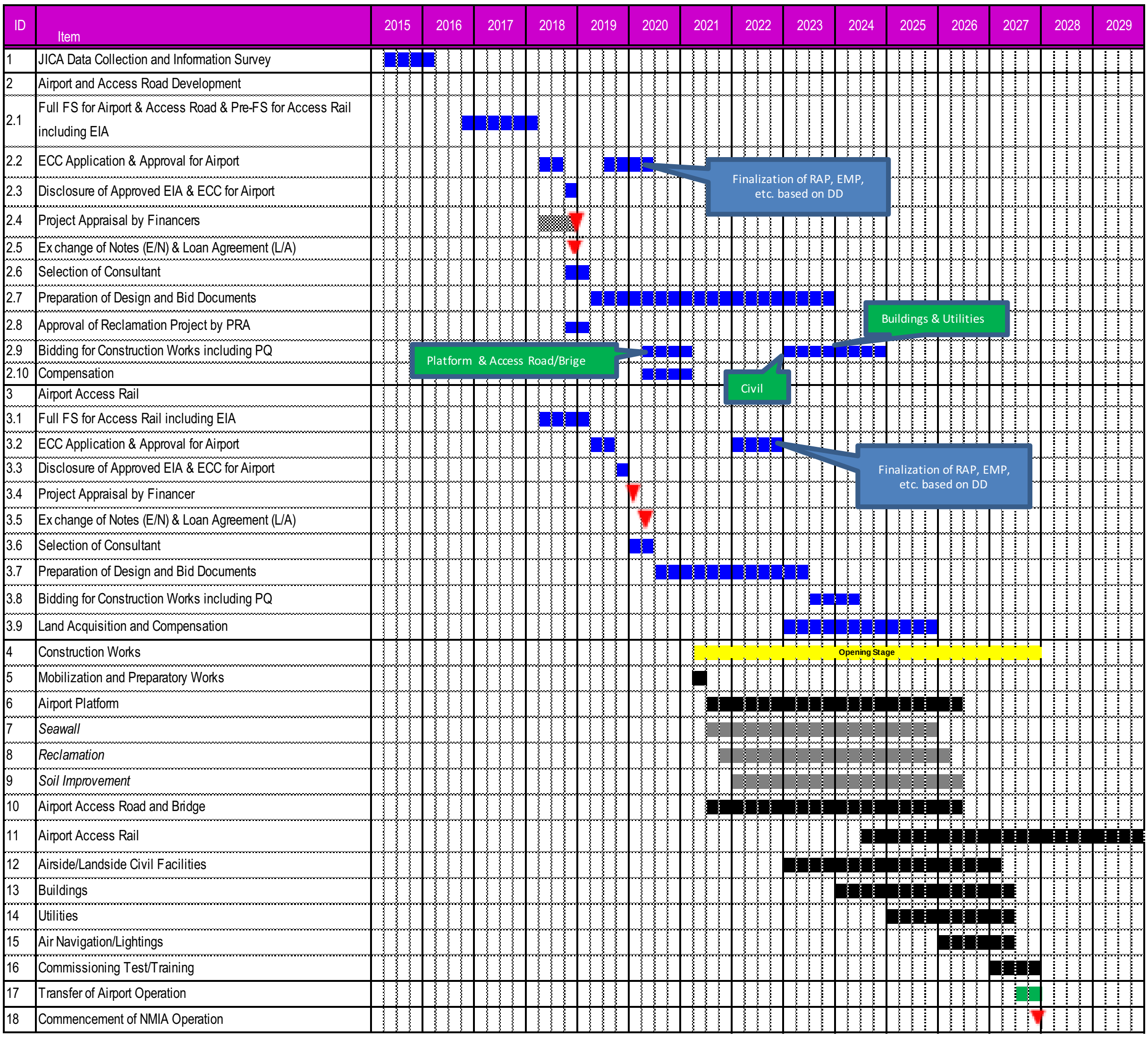
viii) Construction of 3-lane each airport access road will be developed simultaneously with the platform development.

ix) Approximately two years after commencement of the platform development, the works for airport facilities development will be commenced and to be completed in four years, followed by a half year familiarization as well as preparation for transfer of the airport operation.

x) New Manila International Airport will be opened in 2028.

xi) An airport access rail development will continue until sometime after inauguration of NMIA.

The general project implementation schedule is shown in Figure 10.3-1.



Source: JICA Survey Team

Figure 10.3-1 General Project Implementation Schedule for Initial Development of NMIA

10.4 Economic Analysis

10.4.1 Objective of Analyses

The objective of Economic Analysis is to evaluate whether the implementation of the Project would be viable from the viewpoint of the national economy. For the economic appraisal of NMIA Development Project (the Project), the following three conventional indicators of the project's economic worth are examined:

i) Economic Internal Rate of Return (EIRR); the rate at which the discounted economic benefits and costs of the project will be equal. This is the principal measure of a project's worth to society.

ii) Economic Net Present Value (ENPV); the value is defined as the sum of the stream of future net economic benefits (benefits less costs) discounted back to the present value at a social discount rate.

iii) Benefit Cost Ratio (BCR or B/C); the ratio between a project's discounted streams of the benefits and costs.

10.4.2 With Project Case and Without Project Case

In order to figure out the economic benefits, it is normally focused into the difference in economic productivity between the case with implementation of the Project (With Project Case) and the case without implementation of the Project (Without Project Case). The expected return of the Project should be evaluated as incremental benefits attributable to improvement of the facilities. Consequently, benefits and costs should be compared between the two cases as discussed below.

i) With Project Case

The Project will be implemented and the airport capacity of NMIA will be same as air traffic demand in 2030 (76,599,000 of total air passengers). Therefore, the capacity of GCR will be 89,099,000 passengers (including the capacity of CRK as 12,500,000 (*)).

(*): According to CIAC, capacity of existing terminal is 4.5 MPA and capacity of planning new terminal is 8 MPA (the future capacity of terminal is assumed as 12.5 MPA in this study).

ii) Without Project Case

No development will be made for NMIA.

Capacity limit of the existing NAIA is set at 41,500,000 of total air passengers, and the capacity of GCR is 54,000,000 passengers (including the capacity of CRK as 12,500,000). And it is assumed that thereafter in the air passenger traffic would not increase any more.

From the viewpoint of air passenger traffic demand in GCR, the difference between With Project Case and Without Project Case, and air Traffic demand using to calculate the economic benefit is shown in Figure 10.4.2-1.

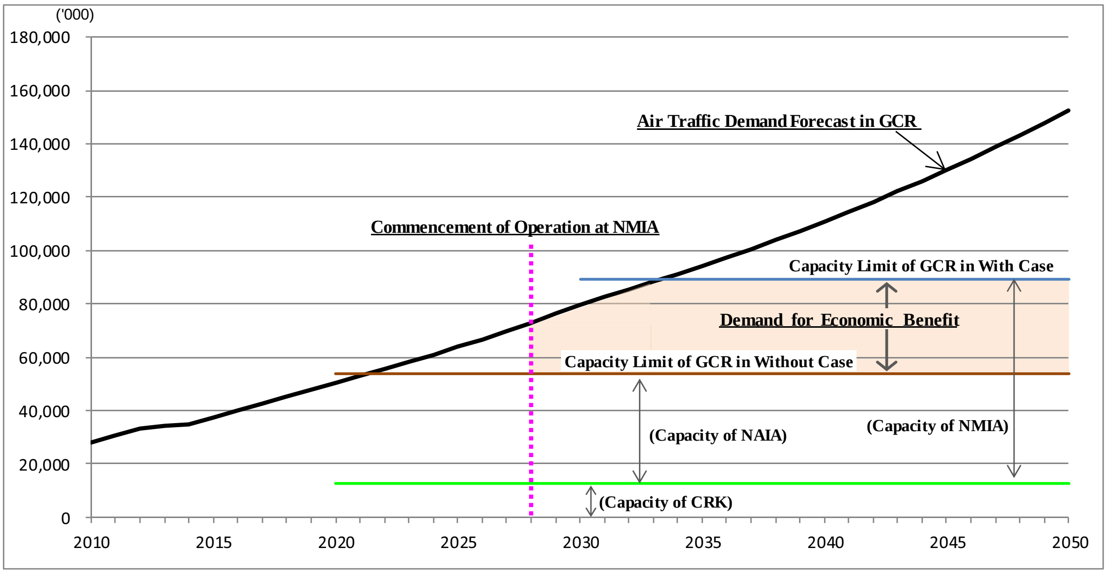


Figure 10.4.2-1 Air Passenger Traffic Demand for Benefits Estimate
(Difference of With Project Case and Without Project Case)

Air passenger traffic demand in GCR in With Project Case and Without Project Case are shown in Figure 10.4.2-2, Figure 10.4.2-3 and Table 10.4.2-1 (based on the result of traffic distribution between NMIA and CRK assumed in Subsection 3.6).

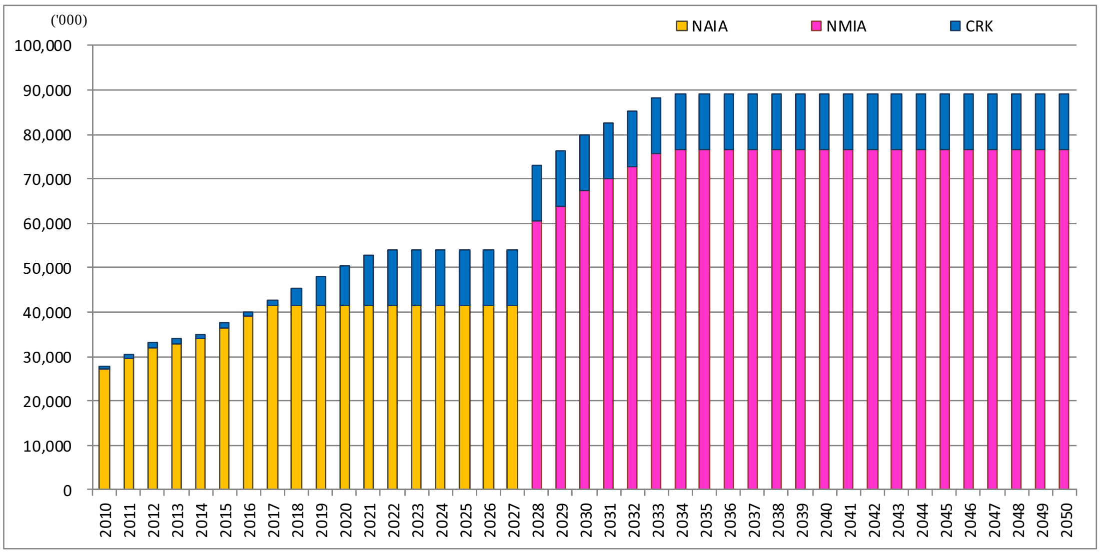


Figure 10.4.2-2 Air Passenger Traffic Demand in GCR by Airport (With Project Case)

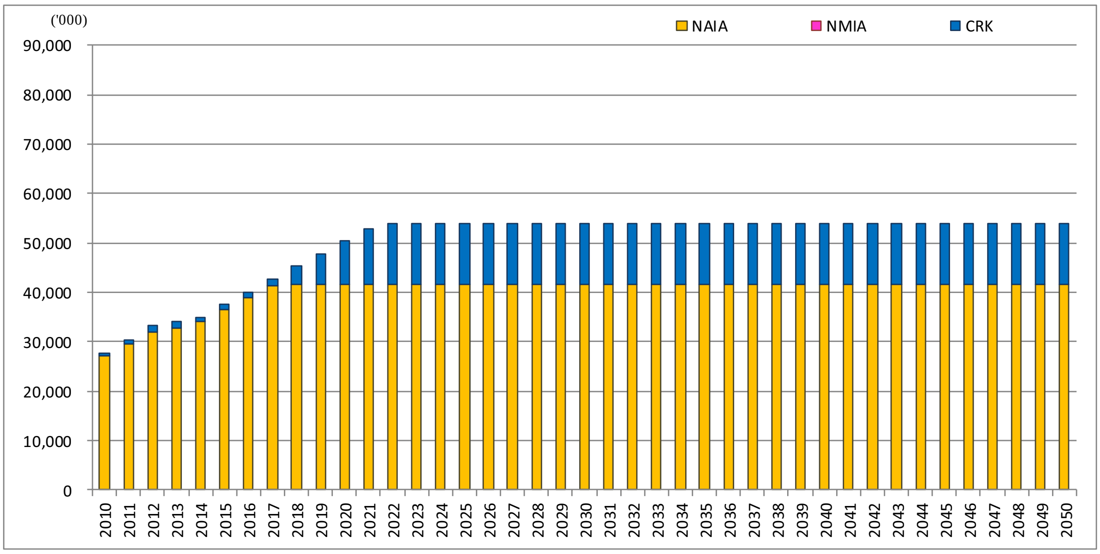


Figure 10.4.2-3 Air Passenger Traffic Demand in GCR by Airport (Without Project Case)

Table 10.4.2-1 Comparison of Air Passengers between With Project Case and Without Project Case

('000 passengers)

Year	With Project Case			Without Project Case			Difference
	NAIA/NMIA	CRK	GCR (1)	NAIA	CRK	GCR (2)	(1) - (2)
2014	34,091	878	34,969	34,091	878	34,969	
2025	41,500	12,500	54,000	41,500	12,500	54,000	
2030	67,289	12,500	79,789	41,500	12,500	54,000	25,789
2035	76,599	12,500	89,099	41,500	12,500	54,000	35,099
2040	76,599	12,500	89,099	41,500	12,500	54,000	35,099
2045	76,599	12,500	89,099	41,500	12,500	54,000	35,099
2050	76,599	12,500	89,099	41,500	12,500	54,000	35,099

Source: JICA Survey Team

10.4.3 Preconditions of Analysis

1) Standard Price

Benefits and costs are estimated at the constant price as of 2015 in Philippines Peso (PhP).

2) Commencement of Service

Commencement of airport operation at NMIA is assumed in 2028.

3) Project Evaluation Period

The project evaluation period is assumed from 2017 as beginning year of the Project to 2057 as 30th year after commencement of operations at NMIA (2028).

4) Social Discount Rate

The Social Discount Rate to evaluate EIRR and to calculate ENPV is adopted as 15.0% by referring to other studies for large scale public investments in the Philippines.

10.4.4 Economic Costs

1) Project Cost

The project implementation cost was adopted based on the result of preliminary estimate of project implementation cost (see Subsection 10.2). The cost consists of the construction cost, consulting service cost and other related costs such as physical contingencies and administration cost but excluding the price escalation, interest during construction and taxes.

As the estimated project cost is still preliminary, the SCF (Standard Conversion Factor) was assumed to be 1.00 in this analysis.

Table 10.4.4-1 Project Implementation Costs for Economic Analysis

(PhP Million)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
Eligible Portion		3,446	3,786	4,006	37,726	74,263	80,486	104,852	144,776	101,414	38,251	527	593,533
Construction Cost					30,082	63,250	67,609	88,044	122,123	85,535	31,955		488,599
Consulting Services		3,270	3,589	3,792	3,832	3,092	4,097	5,084	6,071	4,022	1,764	493	39,106
Contingency		176	198	214	3,811	7,921	8,779	11,725	16,582	11,856	4,532	34	65,828
Non-Eligible Portion	1,502	444	824	831	883	1,779	1,981	2,643	3,725	2,661	1,021	14	18,308
Construction Cost		361	722	722									1,806
Adminnistration Cost		83	101	109	883	1,779	1,981	2,643	3,725	2,661	1,021	14	15,000
Others	1,502												1,502
Total Project Cost	1,502	3,890	4,610	4,838	38,609	76,042	82,467	107,495	148,501	104,075	39,272	542	611,841

Source: JICA Survey Team

2) Operating and maintenance Costs

The operating costs at NMIA were estimated by referring to actual expenditures of MIAA and difference of facility scale between existing NAIA and planning NMIA.

Table 10.4.4-2 Assumed Operating Costs

(PhP Thousand)

	Without Project Case (NAIA)	With Project Case (NMIA)
Personal Cost	848,000	1,462,000
Utility Cost	632,000	1,090,000
Others	583,000	1,005,000

Source: JICA Survey Team

Maintenance and replacement cost in Without Project Case was calculated by referring to actual expenditures of MIAA as PhP 11,800 million annum. And the cost in With Project Case was calculated on the basis of estimated preliminary construction cost as follows:

- ✓ The annual maintenance and replacement cost will be 1.0% of the total construction cost in the first five years, which will increase to 2.0% from sixth to tenth years and 3.0% thereafter.

Table 10.4.4-3 Assumed Maintenance Cost of NMIA

(PhP Million)

	First 5 years (2028 - 2032)	Second 5 years (2033 - 2037)	after 10th year (after 2037)
Ratio to Construction Cost	1.0%	2.0%	3.0%
Civil works	585	1,170	1,756
Building works	1,215	2,429	3,644
Others	363	725	1,088
Total	2,163	4,325	6,488

Source: JICA Survey Team

10.4.5 Economic Benefits

From the view point of national economy, following six items are quantified as the economic benefits attributable to implementation of the Project in this analysis.

1) Saved loss of airport revenues payable by air passengers and air lines

The aeronautical revenues were calculated based on present aeronautical tariff (airport charges and fees) at NAIA, and on difference of air traffic demand in GCR between With Project Case and Without Project Case.

Table 10.4.5-1 Aeronautical Charges and Fees at NAIA

Passenger Facility Charges (PSC)	International	PhP 550/departing passenger	
	Domestic	PhP 200/departing passenger	
Landing Fees	International	PhP 100 per 1 ton (MTOW up to 160 tons) + PhP 80 per 1 ton (in excess 160 tons)	
	Domestic	PhP 70 per 1 ton (MTOW up to 160 tons) + PhP 50 per 1 ton (in excess 160 tons)	
Night Landing Fees		15% of Landing Fees (Night Time : from 06:00 pm to 06:00 am)	10% of Landing Fees for landing before night time or after night time
Aircraft Parking Charges		10% of Landing Fees per 15 minutes	Free for first 1 hour of Jet Aircraft and first 45 minutes of Jet-Prop
Other Revenues		25% of revenues from PSC, landing Fees and parking charges	25%: Assumed ratio based on resent income statement of MIAA

Source: MIAA

The non-aeronautical revenues in Without Project Case were calculated based on present income statement of MIAA. As for With Project Case, the revenues were calculated based on difference of the airport facilities area between existing NAIA and planning NMIA.

Table 10.4.5-2 Assumed Non-Aeronautical Revenues at NAIA and NMIA

Item	Without Project Case	With Project Case
Annual Facility Rent Revenues	PhP 1,245,000 thousand	PhP 2,148,000 thousand
Annual Airport Service Revenues	PhP 911,000 thousand	PhP 1,572,000 thousand
Annual Other Revenues	PhP 30 per passenger	

Source: JICA Survey Team

2) Saved loss of travel opportunities for domestic passengers due to travel cancellation

The benefits were calculated using average expenditure of domestic travelers in the Philippines (PhP 1,622 per traveler; see Table 10.4.5-3).

Ratio of the economic effect to total expenditure of domestic travelers was assumed as 60%.

Table 10.4.5-3 Actual Expenditure of Domestic Travelers

	2010	2012	Average
Average Expenditure (PhP)	1,563	1,680	1,622

Source: DoT

3) Saved loss of consumption by international passengers due to travel cancellation

The benefits were calculated using average expenditure of foreign visitors to the Philippines (PhP 39,102 per traveler; see Table 10.4.5-4).

Ratio of the economic effect to total expenditure of foreign visitors was assumed as 60%.

Table 10.4.5-4 Actual Expenditure of Foreign Visitors

	Year	Average Expenditure (PhP/day)	Average Length of Stay (nights)	Average Expenditure (PhP/visitor)
Foreign Visitors	2012	3,957	9.40	37,198
	2013	4,325	9.44	40,827
	Average	4,150	9.42	39,102

Source : DoT

4) Saved loss of domestic and international cargo trade opportunities due to transport cancellation

The benefits were calculated using average commodity value per tonnage of domestic air cargo in the Philippines (PhP 10,200 per ton) and average trade value per tonnage of international air cargo at NAIA (PhP 4,683,600 per ton) (see Table 10.4.5-4).

Ratio of the economic effect to total commodity value and trade value of air cargoes were assumed as 60%.

Table 10.4.5-5 Assumed Commodity Value of Domestic Air Cargo

	2011	2012	Average
Totla Commodity Value (PhP '000)	3,415,236	2,913,534	3,164,385
Total Domestic Cargoes (tons)	305,795	314,316	310,056
Average Value (PhP '000/ton)	11.2	9.3	10.2

Sources: Philippine Statistics Authority

Table 10.4.5-6 Assumed Trade Value of International Air Cargo

		2011	2012	Average
Exports	Export Value (PhP Million)	711,969	696,778	704,374
	Export Cargoes (tons)	150,604	162,233	156,418
	Average Value (PhP '000/ton)	4,727	4,295	4,503
Imports	Import Value (PhP Million)	711,969	696,778	704,374
	Import Cargoes (tons)	139,901	148,822	144,362
	Average Value (PhP '000/ton)	5,089	4,682	4,879
Total	Totla Trade Value (PhP Million)	1,423,938	1,393,557	1,408,747
	Total International Cargoes (tons)	290,505	311,055	300,780
	Average Value (PhP '000/ton)	4,901.6	4,480.1	4,683.6

Sources: Philippine Statistics Authority

5) Loss of airport access time due to difference of airport locations

Airport access time in GCR is different by airport as shown in Table 10.4.5-7.

Table 10.4.5-7 Airport Access Time by Zone and Airport

Zone	Region / District	City	NAIA		CRK		NMIA	
			Road Distance (km)	Access Time (hr. : min.)	Road Distance (km)	Access Time (hr. : min.)	Road Distance (km)	Access Time (hr. : min.)
North	Region III and others	Tarlac	142	2:40	46	1:00	168	2:41
		Palayan	194	3:23	96	1:45	219	3:25
	Bulacan (south)	San Fernand	85	1:43	21	0:37	111	1:44
Metro Manila	Manila	Manila	11	0:29	96	1:38	36	0:55
	North	Quezon	22	0:53	90	1:22	55	1:06
	Central	Makati	7	0:21	106	1:53	33	0:38
	South	Las Pinas	12	0:27	116	2:16	35	1:12
South	Cavite	Imus	17	0:36	119	2:24	17	0:23
	Rizal	Antipolo	24	0:51	103	1:48	50	1:14
	Laguna	Santa Cruz	85	1:53	188	3:31	100	2:31
	Other Region IV	Batangas	93	1:30	205	3:17	117	2:17

Source: Distance Calculator (GlobeFeed.com)

Average access time of NAIA, CRK and NMIA were calculated by using present passenger distribution at NAIA (see Table 10.4.5-8; Result of Passengers OD Survey carried out in Subsection 7.5) as shown in Table 10.4.5-9.

Table 10.4.5-8 Air Passenger Distribution at NAIA

Region / City		International	Domestic	Total
North	Region I, II, III, CAR	16.9%	8.8%	12.6%
	Bulacan (south)	4.8%	5.7%	5.3%
	Sub-total	21.7%	14.5%	17.9%
Metro Manila	Manila	10.6%	7.2%	8.8%
	North (*1)	14.3%	25.5%	20.3%
	Central (*2)	20.9%	21.6%	21.3%
	South (*3)	6.5%	8.1%	7.3%
	Sub-total	52.3%	62.4%	57.7%
South	Cavite	11.2%	10.4%	10.8%
	Rizal	5.0%	6.2%	5.6%
	Laguna	2.1%	0.9%	1.5%
	Other Region IV	5.8%	3.7%	4.6%
	Sub-total	24.1%	21.2%	22.5%
Others		1.9%	1.9%	1.9%
Total		100.0%	100.0%	100.0%

Remarks: (*1) San Juab, Quezon, Caloocan, Valenzueela, Malabon, Navotas
(*2) Pasay, Makati, Taguig, Mandaluyong, Marikina, Pasig, Pateros
(*3) Paranaque, Muntinlupa, Las Prinas

Source: JICA Survey Team (see Subsection 7.5)

Table 10.4.5-9 Assumed Access Time by Airport

(minutes/one way)

	NAIA	CRK	NMIA
International Demand	68	110	83
Domestic Demand	57	106	72
Weighted Average	62	107	77

Source: JICA Survey Team

Losses of access time are calculated using time values of air passengers and air cargoes.

Time values in this study were assumed as shown in Table 10.4.5-10.

Table 10.4.5-10 Assumed Time Value of Air Demand

	Domestic	International
Passenger (PhP/hour)	115.8	1,534.8
Cargo (PhP/hour/ton)	47.9	635.3

Source: JICA Survey Team

Where

- ✓ Domestic Passenger: The value is result of estimation in MUCEP (The Project for Capacity Development on Transportation Planning and Database Management in the Republic of the Philippines) (DOTC and JICA, 2015). That was calculated based on recent data for actual income of Filipino collected by interview survey and average working time of Filipino.

- ✓ International Passenger: The value was calculated by follow formula;

  Time Value = Time Value of Domestic Passenger (PhP 115.8 /hour)
  x Average of Foreign GDP per Capita (USD 37,933) (*1)
  / GDP per Capita of the Philippines (USD 2,862) (*2)

- ✓ International Cargo: The value was estimated based on actual charges and transport time of air cargo between Manila and Tokyo as follows;
  - Actual Charges of Air Cargo (general cargo)

	Express	Ordinary
Time (hours)	72	144
Weighat (kg)	20	20
Charges (PhP)	5,043	4,128

Source: JICA Survey Team

  - Time Value = (5,043-4,128)/(144-72)/20*1000 = PhP 635.3 /hour/ton

- ✓ Domestic Cargo: The value was calculated by follow formula;

  Time Value = Time Value of International Cargo (PhP 635.3 /hour/ton)
  x GDP per Capita of the Philippines (USD 2,862) (*2)
  / Average of Foreign GDP per Capita (USD 37,933) (*1)

Remarks

(*1) Average of USA, Korea, Japan, Chine, Australia, Hong Kong, Taiwan, Canada, Singapore, UK, Malaysia, Germany, Thailand, India, France and others by IMF.

(*2) by IMF

6) Sale of the existing NAIA property

The 645ha (6,450,000 m2) land of existing NAIA will be freed up for other economic uses.

The economic benefit is calculated as sale of the existing NAIA property (land) by commercial land unit price (PhP 6,000 /m2). The sales price was calculated as approximately PhP 38,700 Million.

Ratio of the economic effect to sales price was assumed as 60%.

10.4.6 Result of Economic Analysis

The result of Economic Analysis for NMIA Development Project is summarized in Table 10.4.6-1 and calculation sheet is shown in Table 10.4.6-2. Sensitivity analysis of the EIRR on negative side is made as shown in Table 10.4.6-3.

As shown Table 10.4.6-1, EIRR was calculated as 13.4 % and that is lower than the Social Discount Rate (SDR) adopted by NEDA in the Philippines (15%).

Table 10.4.6-1 Result of Economic Analysis

Indicators	Calculation
Economic Internal Rate of Return (EIRR)	13.4 %
Economic Net Present Value (ENPV)	PhP - 23,815 million
Benefit Cost Ratio (BCR)	0.85

Source: JICA Survey Team

Table 10.4.6-3 Result of Sensitivity Analysis for EIRR

Case		Benefits		
		- 20%	- 10%	+/- 0%
Costs	+ 20%	9.3%	10.6%	11.7%
	+ 10%	10.0%	11.3%	12.5%
	+/- 0%	10.8%	12.2%	13.4%

Source: JICA Survey Team

Table 10.4.6-2 EIRR Calculation Sheet

EIRR = 13.4%

Year Order	CY	Cost (PhP '000) Investment	O&M	Total (C)	Benefit (PhP '000) Benefit from Aiport Revenue: Aeronautical Revenue (i)	Non-Aeronautical Revenue (ii)	Benefit from Air Traffic Demand: Consumption Activity: Domestic Passengers	International Passengers	Business Opportunity: Domestic Cargoes	International Cargoes	Loss by Access Time	Sub-Total (iii)	Sales of Existing Airport Property (iv)	Total (B) = (i)+(ii)+(iii)+(iv)	Net Cash Balance (PhP '000) (B) - (C)	Accumulation
	2015															
	2016															
	2017	1,502,104		1,502,104											-1,502,104	-1,502,104
	2018	3,889,585		3,889,585											-3,889,585	-5,391,688
	2019	4,609,927		4,609,927											-4,609,927	-10,001,616
	2020	4,837,509		4,837,509											-4,837,509	-14,839,125
	2021	38,608,515		38,608,515											-38,608,515	-53,447,640
	2022	76,042,359		76,042,359											-76,042,359	-129,489,999
	2023	82,467,055		82,467,055											-82,467,055	-211,957,054
	2024	107,494,832		107,494,832											-107,494,832	-319,451,885
	2025	148,500,964		148,500,964											-148,500,964	-467,952,849
	2026	104,074,865		104,074,865											-104,074,865	-572,027,714
	2027	39,272,029		39,272,029											-39,272,029	-611,299,744
1	2028	541,600	1,856,570	2,398,170	4,369,619	2,351,279	5,888,465	80,575,931	169	205,502	-21,820,442	64,849,626	23,220,000	94,790,524	92,392,354	-518,907,390
2	2029		1,856,570	1,856,570	5,137,447	2,446,384	6,863,055	96,292,132	205	261,314	-24,758,652	78,658,054		86,241,885	84,385,315	-434,522,075
3	2030		1,856,570	1,856,570	5,933,106	2,545,292	7,876,628	112,636,998	243	320,387	-27,814,634	93,019,622		101,498,020	99,641,450	-334,880,625
4	2031		1,856,570	1,856,570	6,565,463	2,622,441	8,565,359	127,841,451	284	407,948	-30,198,459	106,616,584		115,804,488	113,947,918	-220,932,707
5	2032		1,856,570	1,856,570	7,215,832	2,701,904	9,274,753	143,502,037	330	508,118	-32,653,936	120,631,302		130,549,038	128,692,468	-92,240,239
6	2033		4,019,140	4,019,140	7,884,371	2,783,751	10,005,428	159,632,445	381	621,605	-35,183,213	135,076,646		145,744,768	141,725,628	49,485,389
7	2034		4,019,140	4,019,140	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	146,972,125	196,457,513
8	2035		4,019,140	4,019,140	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	146,972,125	343,429,638
9	2036		4,019,140	4,019,140	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	146,972,125	490,401,763
10	2037		4,019,140	4,019,140	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	146,972,125	637,373,887
11	2038		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	782,183,442
12	2039		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	926,992,996
13	2040		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	1,071,802,551
14	2041		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	1,216,612,106
15	2042		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	1,361,421,660
16	2043		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	1,506,231,215
17	2044		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	1,651,040,770
18	2045		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	1,795,850,324
19	2046		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	1,940,659,879
20	2047		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	2,085,469,433
21	2048		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	2,230,278,988
22	2049		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	2,375,088,543
23	2050		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	2,519,898,097
24	2051		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	2,664,707,652
25	2052		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	2,809,517,207
26	2053		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	2,954,326,761
27	2054		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	3,099,136,316
28	2055		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	3,243,945,871
29	2056		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	3,388,755,425
30	2057		6,181,710	6,181,710	8,101,658	2,868,054	10,241,277	164,839,048	396	655,317	-35,714,485	140,021,553		150,991,264	144,809,555	3,533,564,980
Total		611,841,344	153,012,746	764,854,089	231,545,627	84,284,336	294,264,336	4,676,618,149	11,112	18,052,486	-1,029,576,976	3,959,369,107	23,220,000	4,298,419,069	3,533,564,980	-

Condition of Discount Rate	**15.0%**
Net Present Value (FNPV) (PhP mill.)	**-23,815**
Benefit - Cost Ratio (BCR)	**0.85**

10.5 Financial Analysis

10.5.1 Objective of Analyses

The objective of Financial Analysis is to evaluate whether or not the implementation of the project is feasible and viable for the project executing body under its financial circumstances. For the financial appraisal of the Project, the following three conventional indicators of the project's financial worth are examined:

i) Financial Internal Rate of Return (FIRR); the rate at which discounted revenues and expenses of the project will be equal.

ii) Financial Net Present Value (FNPV); the value is defined as the sum of the stream of future net revenues discounted back to the present value at a financial discount rate.

iii) Benefit Cost Ratio (BCR or B/C); the ratio between a project's discounted streams of revenues and expenses.

10.5.2 With Project Case and Without Project Case

In order to figure out the financial revenues, it is normally focused into the difference in financial productivity between the case with implementation of the Project (With Project Case) and the case without implementation of the Project (Without Project case) as with Economic Analysis. The expected return of the Project should be evaluated as incremental revenues attributable to improvement of the facilities. Consequently, revenues and expenditures should be compared between the two cases as discussed below.

i) With Project Case

The Project will be implemented and the airport capacity of NMIA will be same as air traffic demand in 2030 (76,599,000 of total air passengers).

ii) Without Project Case

No development will be made for NMIA.

Capacity limit of the existing NAIA has been set at 41,500,000 of total air passengers, and it is assumed that thereafter in the air passenger traffic would not increase any more at NAIA.

From a viewpoint of air passenger traffic demand at NAIA, the difference between With Project Case and Without Project Case, and air Traffic demand using to calculate the financial revenue is shown in Figure 10.5.2-1.

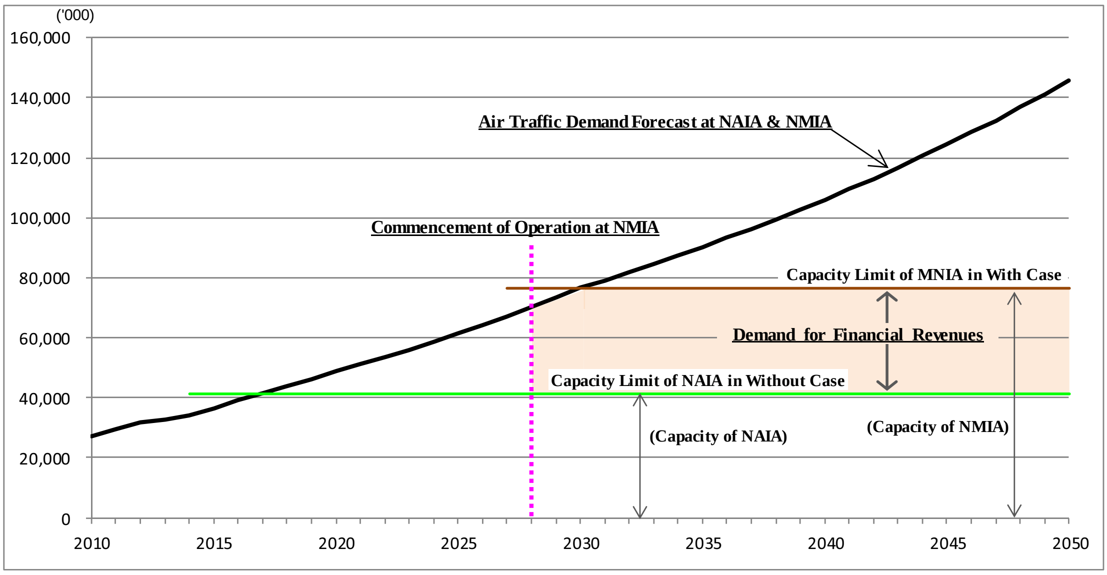


Figure 10.5.2-1 Air Passenger Traffic Demand for Financial Revenues
(Difference of With Project Case and Without Project Case)

Air passenger traffic demand in MNL (NAIA and NMIA) is adopted for 2 cases as follows.

a) Base Case

Air passenger demands in NAIA and NMIA calculated using trend models in Subsection 3.4 are used to analyze.

The demands in With Project Case and Without Project Case are shown in Figure 10.4.2-2 and Table 10.5.2-1.

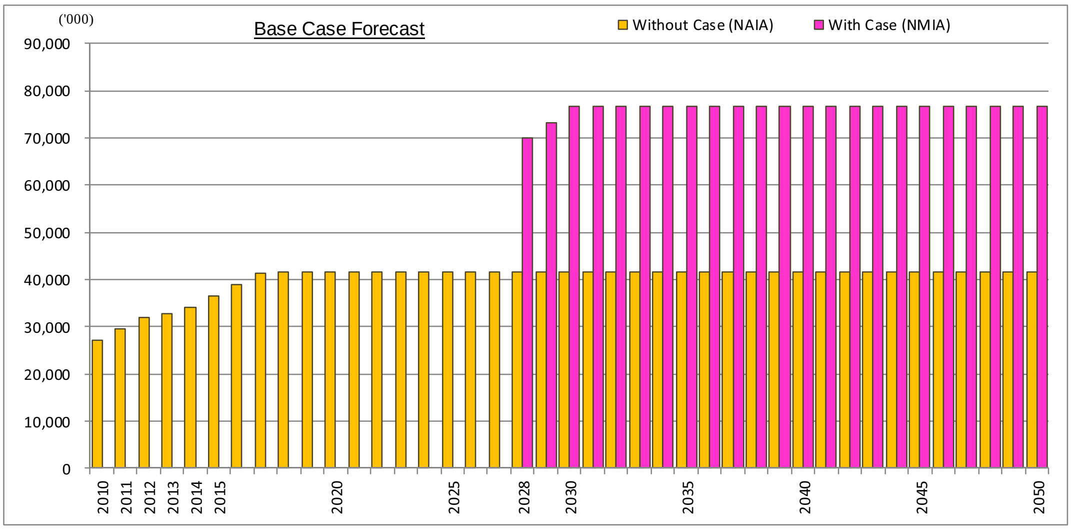


Figure 10.5.2-2 Air Passenger Traffic Demand at NAIA and NMIA (Base Case)

Table 10.5.2-1 Air Passenger Demand (Base Case)

('000 passengers)

Year	(1) With Case	(2) Without Case	Difference (1) - (2)
2014	34,091	34,091	
2025	41,500	41,500	
2030	76,599	41,500	35,099
2035	76,599	41,500	35,099
2040	76,599	41,500	35,099
2045	76,599	41,500	35,099
2050	76,599	41,500	35,099

Source: JICA Survey Team

b) Traffic Distribution Case

Air passenger demands in NAIA and NMIA estimated under the scenario for traffic distribution between NMIA and CRK in Subsection 3.6 are used to analyze.

The demands in With Project Case and Without Project Case are shown in Figure 10.4.2-3 and Table 10.5.2-2.

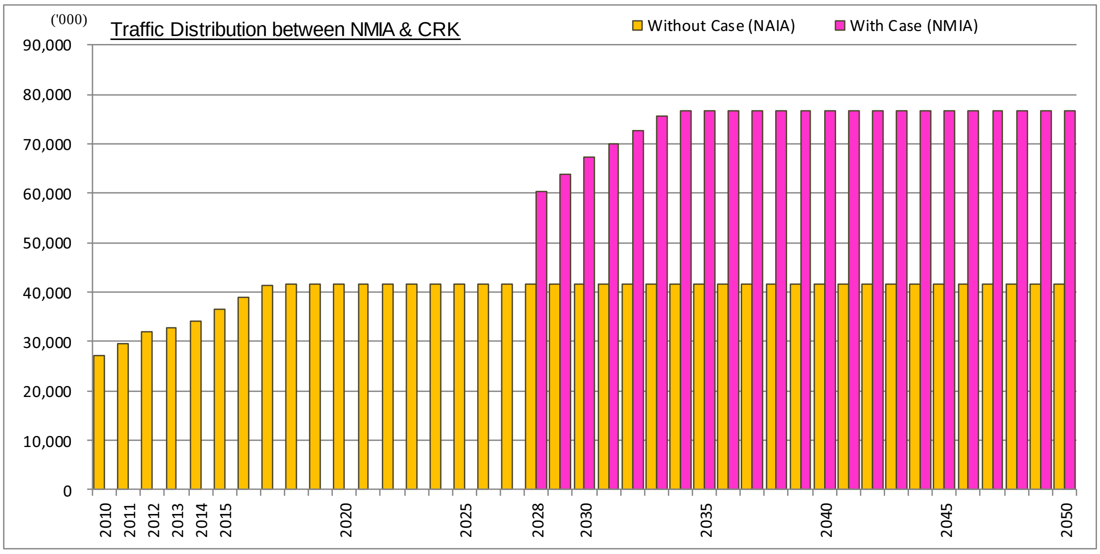


Figure 10.5.2-3 Air Passenger Traffic Demand at NAIA and NMIA (Traffic Distribution Case)

Table 10.5.2-2 Air Passengers Demand (Traffic Distribution Case)

('000 passengers)

Year	(1) With Case	(2) Without Case	Difference (1) - (2)
2014	34,091	34,091	
2025	41,500	41,500	
2030	67,289	41,500	25,789
2035	76,599	41,500	35,099
2040	76,599	41,500	35,099
2045	76,599	41,500	35,099
2050	76,599	41,500	35,099

Source: JICA Survey Team

10.5.3 Preconditions of Analysis

1) Standard Price

Benefits and costs are estimated at the constant price as of 2015 in Philippines Peso (PhP).

2) Commencement of Service

Commencement of airport operation at NMIA is assumed in 2028.

3) Project Evaluation Period

The project evaluation period is assumed from 2017 as beginning year of the Project to 2057 as 30th year after commencement of operations at NMIA (2028).

4) Financial Discount Rate

The Financial Discount Rate to evaluate FIRR and to calculate FNPV has been adopted as 15.0% by referring to other studies for large scale public investments in the Philippines.

10.5.4 Financial Costs

1) Project Cost

The project implementation cost is adopted based on the result of preliminary estimate of project cost (see Subsection 10.2). The cost consists of the construction cost, consulting service cost and other related costs such the physical contingencies, administration cost and taxes but excluding the price escalation and interest during construction.

Table 10.5.4-1 Project Implementation Costs for Financial Analysis

(PhP Million)

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
Eligible Portion		3,446	3,786	4,006	37,726	74,263	80,486	104,852	144,776	101,414	38,251	527	593,533
Construction Cost					30,082	63,250	67,609	88,044	122,123	85,535	31,955		488,599
Consulting Services		3,270	3,589	3,792	3,832	3,092	4,097	5,084	6,071	4,022	1,764	493	39,106
Contingency		176	198	214	3,811	7,921	8,779	11,725	16,582	11,856	4,532	34	65,828
Non-Eligible Portion	1,502	761	1,232	1,269	5,043	10,062	11,307	14,943	20,639	14,416	5,361	67	86,603
Construction Cost		361	722	722									1,806
Administration Cost		83	101	109	883	1,779	1,981	2,643	3,725	2,661	1,021	14	15,000
Tax		317	408	437	4,161	8,283	9,326	12,301	16,913	11,755	4,341	53	68,295
Others	1,502												1,502
Total Project Cost	1,502	4,207	5,018	5,275	42,769	84,325	91,793	119,795	165,414	115,830	43,613	594	680,136

Source: JICA Survey Team

2) Operation and maintenance expenses

The same operation, maintenance and replacement expenses estimated for the economic analysis are used in the financial analysis.

10.5.5 Financial Revenues

The aeronautical revenues are calculated based on the current aeronautical tariff system (see Table 10.4.5-1).

The non-aeronautical revenues are estimated on a basis of actual income of MIAA (see Table 10.4.5-2).

And the land sale of existing NAIA is included as extraordinary income. The sales price was calculated as approximately PhP 38,700 Million (see Subsection 10.4.5).

10.5.6 Result of Financial Analysis

The result of Financial Analysis for NMIA Development Project is summarized in Table 10.5.6-1, and calculation sheets are shown in Table 10.5.6-2 and Table 10.5.6-3.

Table 10.5.6-1 Result of Financial Analysis

Indicators	Base Case	Traffic Distribution Case
Financial Internal Rate of Return (FIRR)	- 5.8 %	- 12.2 %
Financial Net Present Value (FNPV)	PhP - 157,839 million	PhP - 162,800 million
Benefit Cost Ratio (BCR)	0.10	0.07

Source: JICA Survey Team

As shown Table 10.5.6-1, FIRR were estimated as -5.8% in Base Case and -12.2% in Traffic Distribution Case. Major reasons behind incalculable is the enormous amount of construction cost (especially cost of platform development) against small amount of operating revenue.

Table 10.5.6-2 FIRR Calculation Sheet (Base Case)

FIRR = -5.8%

Year Order	CY	Expenditure (PhP '000) Investment	O&M	Total (C)	Revenue (PhP '000) Aeronautical Revenue: Airport Landing Charge	Airport Parking Charge	Terminal Facility Charge	Others	Sub-Total (i)	Non-Aeronautical Revenue: Facility Rent Revenue	Aiport Survice Revenue	Others	Sub-Total (ii)	Sales of Existing Airport Property (iii)	Total (B) = (i) + (ii) + (iii)	Net Cash Balance (PhP '000) (B) - (C)	Accumulation
	2015																
	2016																
	2017	1,502,104		1,502,104												-1,502,104	-1,502,104
	2018	4,207,074		4,207,074												-4,207,074	-5,709,178
	2019	5,017,831		5,017,831												-5,017,831	-10,727,009
	2020	5,274,963		5,274,963												-5,274,963	-16,001,972
	2021	42,769,188		42,769,188												-42,769,188	-58,771,160
	2022	84,325,100		84,325,100												-84,325,100	-143,096,260
	2023	91,793,115		91,793,115												-91,793,115	-234,889,375
	2024	119,795,475		119,795,475												-119,795,475	-354,684,849
	2025	165,414,277		165,414,277												-165,414,277	-520,099,127
	2026	115,829,973		115,829,973												-115,829,973	-635,929,100
	2027	43,612,696		43,612,696												-43,612,696	-679,541,795
1	2028	594,244	1,856,570	2,450,814	1,061,155	489,916	4,445,693	1,491,316	7,488,080	903,000	661,000	787,279	2,351,279	38,700,000	48,539,360	46,088,546	-633,453,249
2	2029		1,856,570	1,856,570	1,185,518	546,966	4,982,738	1,669,987	8,385,208	903,000	661,000	882,384	2,446,384		10,831,592	8,975,022	-624,478,228
3	2030		1,856,570	1,856,570	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	9,997,921	-614,480,307
4	2031		1,856,570	1,856,570	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	9,997,921	-604,482,386
5	2032		1,856,570	1,856,570	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	9,997,921	-594,484,465
6	2033		4,019,140	4,019,140	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	7,835,351	-586,649,114
7	2034		4,019,140	4,019,140	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	7,835,351	-578,813,762
8	2035		4,019,140	4,019,140	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	7,835,351	-570,978,411
9	2036		4,019,140	4,019,140	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	7,835,351	-563,143,060
10	2037		4,019,140	4,019,140	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	7,835,351	-555,307,709
11	2038		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-549,634,928
12	2039		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-543,962,147
13	2040		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-538,289,366
14	2041		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-532,616,585
15	2042		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-526,943,803
16	2043		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-521,271,022
17	2044		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-515,598,241
18	2045		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-509,925,460
19	2046		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-504,252,679
20	2047		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-498,579,898
21	2048		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-492,907,116
22	2049		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-487,234,335
23	2050		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-481,561,554
24	2051		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-475,888,773
25	2052		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-470,215,992
26	2053		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-464,543,211
27	2054		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-458,870,430
28	2055		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-453,197,648
29	2056		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-447,524,867
30	2057		6,181,710	6,181,710	1,309,902	604,024	5,541,265	1,854,008	9,309,199	903,000	661,000	981,292	2,545,292		11,854,491	5,672,781	-441,852,086
Total		680,136,039	153,012,746	833,148,785	38,923,924	17,949,558	164,583,855	55,073,513	276,530,850	27,090,000	19,830,000	29,145,848	76,065,848	38,700,000	391,296,699	-441,852,086	-

Condition of Discount Rate	**15.0%**
Net Present Value (FNPV) (PhP mill.)	**-157,839**
Benefit - Cost Ratio (BCR)	**0.10**

Table 10.5.6-3 FIRR Calculation Sheet (Traffic Distribution Case)

FIRR = -12.2%

Year Order	CY	Expenditure (PhP '000) Investment	O&M	Total (C)	Revenue (PhP '000) Aeronautical Revenue: Airport Landing Charge	Airport Parking Charge	Termnal Facility Charge	Others	Sub-Total (i)	Non-Aeronautical Revenue: Facility Rent Revenue	Aiport Survice Revenue	Others	Sub-Total (ii)	Sales of Existing Airport Property (iii)	Total (B) = (i) + (ii) + (iii)	Net Cash Balance (PhP '000) (B) - (C)	Accumulation
	2015																
	2016																
	2017	1,502,104		1,502,104												-1,502,104	-1,502,104
	2018	4,207,074		4,207,074												-4,207,074	-5,709,178
	2019	5,017,831		5,017,831												-5,017,831	-10,727,009
	2020	5,274,963		5,274,963												-5,274,963	-16,001,972
	2021	42,769,188		42,769,188												-42,769,188	-58,771,160
	2022	84,325,100		84,325,100												-84,325,100	-143,096,260
	2023	91,793,115		91,793,115												-91,793,115	-234,889,375
	2024	119,795,475		119,795,475												-119,795,475	-354,684,849
	2025	165,414,277		165,414,277												-165,414,277	-520,099,127
	2026	115,829,973		115,829,973												-115,829,973	-635,929,100
	2027	43,612,696		43,612,696												-43,612,696	-679,541,795
1	2028	594,244	1,856,570	2,450,814	577,534	238,971	2,012,081	703,432	3,532,017	903,000	661,000	407,919	1,971,919	38,700,000	44,203,936	41,753,123	-637,788,673
2	2029		1,856,570	1,856,570	678,687	284,751	2,444,366	847,476	4,255,280	903,000	661,000	486,118	2,050,118		6,305,398	4,448,828	-633,339,845
3	2030		1,856,570	1,856,570	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	5,275,144	-628,064,701
4	2031		1,856,570	1,856,570	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	5,275,144	-622,789,558
5	2032		1,856,570	1,856,570	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	5,275,144	-617,514,414
6	2033		4,019,140	4,019,140	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	3,112,574	-614,401,841
7	2034		4,019,140	4,019,140	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	3,112,574	-611,289,267
8	2035		4,019,140	4,019,140	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	3,112,574	-608,176,693
9	2036		4,019,140	4,019,140	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	3,112,574	-605,064,120
10	2037		4,019,140	4,019,140	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	3,112,574	-601,951,546
11	2038		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-601,001,543
12	2039		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-600,051,539
13	2040		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-599,101,535
14	2041		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-598,151,532
15	2042		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-597,201,528
16	2043		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-596,251,524
17	2044		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-595,301,521
18	2045		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-594,351,517
19	2046		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-593,401,513
20	2047		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-592,451,510
21	2048		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-591,501,506
22	2049		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-590,551,502
23	2050		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-589,601,499
24	2051		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-588,651,495
25	2052		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-587,701,491
26	2053		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-586,751,488
27	2054		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-585,801,484
28	2055		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-584,851,480
29	2056		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-583,901,477
30	2057		6,181,710	6,181,710	779,880	330,600	2,893,942	995,847	5,000,269	903,000	661,000	567,444	2,131,444		7,131,713	950,004	-582,951,473
Total		680,136,039	153,012,746	833,148,785	23,092,869	9,780,523	85,486,826	29,434,622	147,794,841	27,090,000	19,830,000	16,782,471	63,702,471	38,700,000	250,197,312	-582,951,473	-

Condition of Discount Rate	**15.0%**
Net Present Value (FNPV) (PhP mill.)	**-162,800**
Benefit - Cost Ratio (BCR)	**0.07**

SECTION 11

IMPLEMENTATION ARRANGEMENT (PRELIMINARY)

SECTION 11: IMPLEMENTATION ARRANGEMENT (PRELIMINARY)

11.1 Introduction

The realization of the new NAIA will span about 10 years – wherein the implementing arrangements would need to change in accordance with its development phases or stages.

The 1st phase is the pre-construction period that covers site selection, planning and design of the new airport facilities. The 2nd phase focuses on site development works, followed by construction of the aerodrome facilities. The 3rd phase is the operations and maintenance of the completed facility.

11.2 Organizing for Phase 1

The recommendations of the 2011 JICA "Study on Airport Strategy for GCR" on implementation arrangement was focused on phase 1 activities. The key points of its recommendations are summarized hereunder:

- Establishment of a joint organization, which essentially places the concurrent development of MNL and CRK under one umbrella (which it referred to as GCRA Special Task Force);
- Adoption and execution of a TDR regime that will re-allocate traffic from MNL to CRK;
- Implementation of a "capacity-based" development scheme for NAIA, which would start in 2012 and ends in 2020;
- Extensive privatization of NAIA and DMIA operations;
- Creation of a GCR Airport Authority – either by legislation or executive action - that will merge MIAA and CIAC.

The last two items are more relevant to phase 3 activities - but assumed a situation where the existing NAIA would remain in conjunction with CRK. This was the Base Case scenario mentioned earlier. Hence, it omitted the construction of a new airport facility. Implicitly, it conceded that the responsibilities for all capital improvement projects for MNL and CRK shall remain with the appropriate SOEs, i.e., by MIAA for MNL and by CIAC for CRK.

There is no reason to modify the 2011 Study's recommendations – in so far as the screening and selection of alternative site for NAIA. The site selection can be handled by the aforementioned Task Force (assuming that this Task Force has been created). Considering precedents, however, such a decision would ultimately end up at the NEDA-ICC and the Office of the President. This explains why DOTC has sought the convening of the IATCTP to discuss the findings of this NMIA Study. Based on historical precedent, however, and the institutional dynamics, the technical level (of IATCTP) will simply be recommendatory.

At the technical level, the critical elements are: technical viability, environmental hurdles, and project cost. And since the available alternatives would require reclamation works, the process would be vetted by the PRA (per Executive Order No. 146 s2013) which must endorsed the same to NEDA. In so far as the Laguna Lake option is concerned, the LLDA will also be in the processing loop. PRA, in turn would rely substantially on prior evaluation of the DENR whose review would be influenced by the Manila Bay Critical Habitat Management Council in case the preferred site is in the Manila Bay area (SG-2 or MBC). The GCRA Task Force should therefore play an important role in the buy-in for the preferred site by the specialized agencies.

CAAP and MIAA would be the key clearing organizations in so far as technical viability (aerodrome operations) is concerned. The MIAA could wash its hands off on the Sangley-1, Sangley-2 and San Nicholas options because the sites are outside its legal jurisdiction. The DND (which currently owns Sangley Airport) has not objected to the possible conversion of Sangley into civilian uses, but its requirements for 'resettlement' would impact on eventual project cost and timetable of implementation.

11.3 Organizing for Phase 2

Once a decision is made on the preferred site, a Project Management Office should be organized to handle the construction of a new NAIA on this preferred site. Such a PMO can be formed in three ways:

(i) By MIAA (if site is within NCR) under its charter (EO No. 778 s1982), is responsible for the development and management of the country's premier gateway airport within NCR;

(ii) By CAAP (if site is outside NCR), which is responsible for all other airports outside NCR and Cebu.

(iii) By DOTC, as it is wont to do under the current administration.

The 3rd option is more appropriate under the following circumstances:

- Site development would entail inter-agency collaboration (road works by DPWH, reclamation by PRA);
- Funding would rely on ODA and/or GAA that is beyond the financial capability of NAIA or CAAP, which are two corporate entities that are independent but attached to DOTC;

The projected site development cost of Php80B to P90B is beyond the financial capacity of MIAA (which has a capitalization of Php10.0 Billion) and CAAP (which has a capitalization of Php50.0 Billion). Substantial inter-agency collaboration will be entailed. Thus, a PMO directly under the

DOTC is advantageous. Its main drawback is the lack of project implementation capacity at the DOTC level – which can be remedied by the secondment of technical experts from MIAA and CAAP, as well as by the hiring of external consultants.

The development of new NAIA can be divided into two phases: site development (cost ~Php90B) and airport facility construction (cost ~Php189B). The second maybe considered for PPP, but the first stage should follow traditional mode of implementation - via direct government funding. The reasons for eschewing the PPP modality for the site development works are as follows:

- Site development will entail reclamation works on site classifiable as in the public domain and outside the commerce of man, i.e., cannot be titled by private entities;
- A project with long gestation period without intermediate cash flows will face difficulty in financial closing;
- The construction will involve substantial geotechnical works with its attendant uncertainties;
- To avoid the cascade effect of construction delays that might subject the project to long-drawn legal challenges;
- The social and environmental obstacles present risks than can be handled better by the public sector;
- Financial viability of new NAIA (as presented in Section 10.5) will not pass the private Sector's ROI hurdle rate, especially with the addition of site development cost.

When the site is almost ready, a PPP approach should be considered for the 2nd stage of construction. This is a natural progression to what DOTC is currently implementing for the existing NAIA.
DOTC has proposed, and gotten NEDA-ICC approval in July 2015, for the upgrading and privatization of the existing Ninoy Aquino airport via a Public-Private Partnership (PPP) mode. The modality is Rehabilitate-Add-Operate-Maintain-Transfer for a period of 15-20 years. In effect, responsibilities for the various physical capital improvements that had been pending in the last 5 years would be transferred to a private concessionaire. The indicative price tag is Php74.56 Billion, and will likely cover the following items:

- Improvements of runway and airfield compliance works;
- Provision of new air traffic control equipment;
- Enhancement of baggage-handling and IT systems;
- Overhaul of sewerage treatment plant;
- Other items to improve capacity and service quality

The concessionaire is expected to recover its investment from landside and airside fees and ancillary commercial revenues.

11.4 Organizing for Phase 3

The recommendation of the 2011 "Study on Airport Strategy for GCR" for a single airport authority, however, needs further review. Efficiency considerations do not favor a monopoly provider. An environment of friendly competition between new NAIA and Clark can be more beneficial to the country. Separate but cooperating bodies is all the more advisable, in the event that the privatization of existing NAIA pans out.

It would be a natural progression to put the construction of the airport complex also on the PPP mode of implementation. Or the government may opt to build and fund also the stage 2 construction and turnover operations and maintenance responsibilities to the private sector. Such a choice can wait until sometime year 2025, when site development works would have been nearly completed.

Assuming the existing NAIA is privatized as contemplated by DOTC, the PPP option for Stage 2 of the new NAIA project would become the favored approach. Such a scenario would occur only at the tail-end of the concession period (2031, if the concession is awarded in 2016 for 15 years.

It may be more advantageous to start afresh – so that a new business culture can be created for the new NAIA. If MIAA simply slides into taking over responsibility for the new NAIA, then it would be hampered by its established organizational culture and habits. It is more difficult to re-organize a legacy organization than build from a blank slate. The new authority can be given the option to hire or select employees from the old MIAA. The separate authority model (CIAC and MIAA are independent of each other), akin to the London airports, maybe more appropriate for the Philippines[1].

1) It permits a climate of friendly competition, such that the performance of one can be measured or compared with the other. Conversely, the poor service of one gateway airport will not affect the country as a whole.

2) Airlines – especially international carriers – will be given a choice.

3) Two contrasting models or airport management becomes possible. One airport can be under a private concessionaire, while the other can be retained under government management.

4) Instructive in this regard is the case of airports for Greater Tokyo. In 2003, a Narita International Airport Corporation was passed by Parliament to provide for the privatization of the airport. As

[1] One model is to have two separate authorities for each. In Japan, Haneda and Narita are under separate management. The airports of Greater London started under one Authority, but later separated. Gatwick is owned and managed by Global Infrastructure Partners (which is private), while Heathrow is under Heathrow Airport Holdings Ltd (which was an offshoot of the privatization of the British Airport Authority in 1986).

Examples of the single authority model can be found in Paris (Aeroports de Paris), and in Washington DC (Metropolitan Washington Airports Authority). The two US capital airports are about 42 km apart; compared to about 90-km for MNL-CRK.

part of this change, on 01-April 1 2004, New Tokyo International Airport was officially renamed Narita International Airport. The airport was also moved from government control to the authority of a new Narita International Airport Corporation – which has remained an SOE, despite attempts at privatization. On the other hand, Haneda Airport remained under the MLIT.

SECTION 12

UTILIZATION OF JAPANESE TECHNOLOGY

SECTION 12: UTILIZATION OF JAPANESE TECHNOLOGY

12.1 Japan's Technology for the Airport Sector

1) General

There are many items in which Japanese organizations/companies have participated and Japan's superior infrastructure, environmental technology has been applied in cooperation related to the airport development.

In this section, 26 typical items/technologies at 9 thematic fields are summarized in each sheet and introduced from the above point of view.

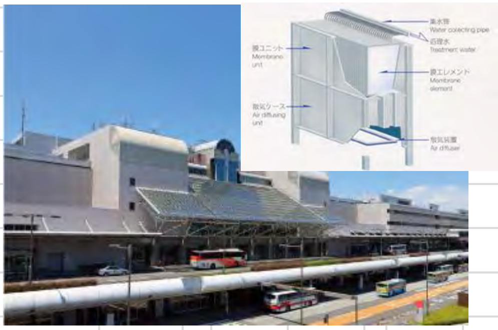
Japan's Technology for Airport Sector

1. Waste Disposal/Recycling

Feature of Technologies	The main targets of special technologies for waste treatment are wastes that need to be incinerated on the air side—such as airline meal residues needing quarantine—and those that need to be sorted and compacted for transport and disposal outside, such as personal waste and office waste.

Summary of Products

1. Sewage Treatment/Waste Water Reuse



Source: DRICO, Ltd.

Feature of Japan Technology

In addition to normal sewage treatment, technologies exist to allow reuse of waste water for general purposes, including biotreatment, membrane technologies, and ozone disinfection. Technologies for purification of rain water for potable use have been developed for disasters.

Example of Installation at Airports

Recycled water re-use and rain water harvesting systems in passenger terminals.
Reduce the environmental load on the airport waste disposal system.

2. Solid Waste Treatment

Source: New Kansai International Airport Company, Ltd.

Feature of Japan Technology

Technologies have been developed for incinerating waste with high contents of water and plastics to reduce smoke, dioxins, and CO2. There is also special smoke suppression technology.

Example of Installation at Airports

Treatment of airline meal residue requiring quarantine as well as plastic containers separated from the airport waste stream.
On-site processing of airport waste.
Reduce the burden on the transport and disposal of waste outside the airport.

3. Sorted Collection/Recycle

Source: WATANABE ENGINEERING CORPORATION

Feature of Japan Technology

Methods for faster sorting and collection of airport waste for recycling.
Reduction of transportation requirements by compaction and baling of office waste paper.

Example of Installation at Airports

Promotion of the 3Rs (Reduce, Reuse, Recycle) movement at airports.
Improving awareness of recycling in resource-limited countries.

Japan's Technology for Airport Sector

2. Renewable Energy

Feature of Technologies

In developing countries with limited resources, the balance of trade can be improved by increasing energy self-sufficiency. Airports facilitate the rapid transmission of information and can therefore be used to raise public awareness.

Summary of Products

1. Solar Panels/ Power Storage Batteries

Source: Japan Airport Terminal Co., Ltd.

Feature of Japan Technology

Japanese products excel in the fields of system operation in combination with storage batteries, coping with adverse weather conditions, and inverter technology in power generation stabilization. Some products are developed for broad availability and installation is independent of roof design.

Example of Installation at Airports

Solar power can be used in passenger terminals. Solar power obtained from the large surfaces in airports can produce large savings when coupled with sophisticated computerized control systems.

2. Solar Heat Utilization System

Source: Agency for Natural Resources and Energy

Feature of Japan Technology

The use of solar heating for hot-water supply is more energy efficient than using electricity generated from solar panels. It reduces electricity and fuel consumption as well as CO_2 emissions.

Example of Installation at Airports

Airport hot water supply and air conditioning facilities can utilize solar heating.

3. Biomass Fuel Production

Source: euglena Co.,Ltd.

Feature of Japan Technology

Fuel produced from microbes such as euglena and algae absorb CO_2 during photosynthesis, so even when the fuel is burned to produce heat they result in no net CO_2 emission, and thus can be described as circulating fuel source.

Example of Installation at Airports

This technology can help meet the ICAO's CO_2 reduction targets for the aviation sector by the year 2020. Requires initiative to be taken for production and commercialization of biofuel derived from genetically modified euglena.

Japan's Technology for Airport Sector

3. Eco-Friendly

Feature of Technologies

Apart from waste disposal and renewable energy, three other eco-friendly technologies can be introduced to the airport sector for energy efficiency and conservation of resources.

Summary of Products

1. Thermal Barrier Coatings for Glass

Source: Dyflex corp.

Feature of Japan Technology

Thermal barrier coatings on glass surfaces can reduce electricity and fuel consumption and CO2 emissions.

Example of Installation at Airports

Thermal barrier coated glass panels have often been used in passenger terminals in recent years to block infrared and ultraviolet rays.

2. Photocatalysts

Source: NANOWAVE.Co.,Ltd.

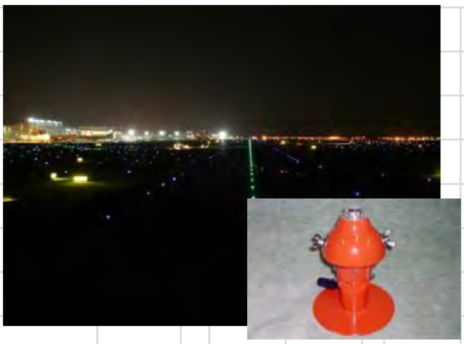
Feature of Japan Technology

The decontamination and antibiotic properties of photocatalysts have application in preventing the spread of epidemics. They are used in contaminated site cleanup work that harnesses the degradation potential of microbes.

Example of Installation at Airports

Can be used for cleaning of external walls, windows, and toilets and to assist with air purification for airport facilities to prevent the spread of infectious diseases brought in from other countries and regions.

3. LED Taxiway Lighting



Source: Shinwa Sogo Co., Ltd.
NIPPON KOKI KOGYO CO., LTD

Feature of Japan Technology

Operating costs can be reduced by using LED lights, which have a long life and low energy consumption. They are extremely economical compared to traditional lights on a life-cycle cost basis.

Example of Installation at Airports

LED lights can be used for taxiway lights and runway centerline lights.

Japan's Technology for Airport Sector

4. Disaster Prevention/Disaster Reduction

Feature of Technologies	Technologies and products that can be used for disaster mitigation and preparedness in airports in the Philippines are herein summarized with reference to technologies developed in Japan, where natural hazards such as earthquakes and typhoon are prevalent.

Summary of Products

1. Buried Cable Protection Housing

Source: SUGIE SEITO CO., LTD

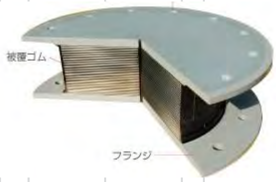
Feature of Japan Technology

Tube casings have been developed that are hard, non-corrosive, and non-combustible with superior durability and pressure resistance compared to normal materials. Some materials are made from recycled construction waste.

Example of Installation at Airports

Can be applied for runway power supply cables to provide protection from fire in aircraft disasters. They are also useful for providing protection from aircraft takeoff and landing pressures.

2. Seismic Isolation Rubber Bearings



Source: Bridgestone Corporation

Feature of Japan Technology

Rubber bearings minimize the impacts of earthquakes on buildings by absorbing seismic energy.

Example of Installation at Airports

Can be installed under the floor of terminal buildings to minimize damage to the building. Not only does this protect people in the terminal during an earthquake, but it allows terminals to be used as temporary evacuation centers.

3. Automatic Tide Gates

Source: NOMURA Four C's., ltd.

Feature of Japan Technology

Many materials, structures, opening and closing systems, and a variety of power-supply products have been developed to prevent seawater from storm surges and typhoons flowing into buildings. Although power failure often requires manual opening and closing, some products have been developed that are powered by compressed nitrogen

Example of Installation at Airports

Airports in coastal locations require technology to prevent storm surges from flooding the airside and access roads and from entering utility facilities and passenger terminal buildings.

Japan's Technology for Airport Sector

5. Airport Security

Feature of Technologies	Japan has pioneered a number of technologies in the field of safety and security.

Summary of Products

1. Inspection Instrument for Liquids in Bottles

Source: Engineering Company of Tokyo Gas Engineering Solutions Corporation.

Feature of Japan Technology

This product can detect flammable liquids in plastic, glass or aluminium bottles within 3 seconds.

Example of Installation at Airports

For detection of flammable liquids during security checks.

2. Face Authentication System

Source: NEC Solution Innovators, Ltd.

Feature of Japan Technology

Japan's world-respected face authentication technology is able to identify suspicious individuals in real time or from archived footage and image files. It is able to scan using multiple cameras 24 hours a day, 365 days a year.

Example of Installation at Airports

The rate of successful facial recognition for people not wearing cap, sunglasses, or mask is commercially viable and is being installed in Japan. Checking against a database of blacklisted persons, it can be deployed in immigration control or for screening entrances and exits for airport staff.

3. CCTV

Source: Japan Airport Terminal Co., Ltd
SONY Business Solutions Corporation

Feature of Japan Technology

Closed circuit television can monitor people in areas in 4K (3840 x 2160) with networks of high-definition cameras. The cameras are dustproof, waterproof, weather resistant, and can be operated in exposed locations for long periods.

Example of Installation at Airports

Useful for watching aircraft and airport service vehicles. Can be applied as security cameras passenger terminals to prevent crime. They can also be deployed along boundary fences to prevent unauthorized persons breaching the airport perimeter.

Japan's Technology for Airport Sector

6. Dredging/Reclamation/Foundation Improvement

Feature of Technologies	Japanese dredging and landfill technologies developed during the country's period of high-growth offer superior advantages and have become widespread in Asia. Excellent techniques have been developed for foundation improvement and strengthening soft dredged material for use as fill.

Summary of Products

1. Accelerated Consolidation of Fill Material

Source: AOMI CONSTRUCTION CO.,LTD.

Feature of Japan Technology

Vertical drains shorten the drainage distance and accelerate consolidation in combination with embankment loading and strengthening. To drain the water, a sand mat is installed under the preloading sand.

Example of Installation at Airports

These methods can prevent subsidence during the construction period and accelerate the consolidation of reclaimed or filled land for airports.

2. Liquefaction Countermeasure in Fill

Source: JDC Corporation

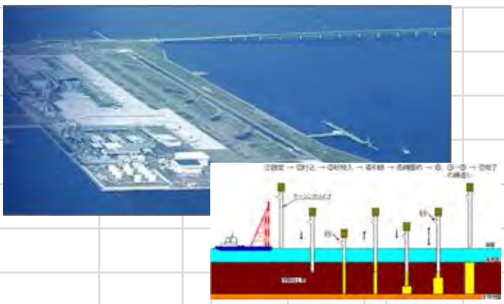
Feature of Japan Technology

This method compacts fill material by means of a heavy weight repeatedly falling from 10 to 30 m high. The improved surface layer reaches N-value of 10 to 20. This method is easy and economic but, must be applied carefully.

Example of Installation at Airports

Prevents liquefaction in filled land of airports in the event of earthquake.

3. Soft Ground Stabilization for Seawall Foundations



Source: YORIGAMI MARITIME CONSTRUCTION CO., LTD.

Feature of Japan Technology

The SCP method is a type of vibration compaction for sand. It accelerates consolidation by pressing a sand pile into cohesive soil. The deep mixing method which mixes cement and lime in the ground achieves excellent results.

Example of Installation at Airports

This type of ground improvement prevents the subsidence of seawalls after construction and sliding rupture during construction. It is extremely reliable and suits a wide variety of substrates.

Japan's Technology for Airport Sector

7. Shore Protection/Pier Construction Method

Feature of Technologies

Japanese construction technologies have features to enhance quality control, reduce the construction period, and protect the surrounding environment when constructing high quality facilities in the sea.

Summary of Products

1. Steel Tube Truss Jacket Structure Pier

Source: Nikkei Business Publications, Inc.

Feature of Japan Technology

Accuracy and quality is enhanced if most of the major construction can be done on land. Steel structures can be coasted with high quality anti-rust compound to extend the life of the structure and reduce the requirements for maintenance.

Example of Installation at Airports

This is a suitable approach for constructing aviation fuel receiving piers into water in front of seawalls utilizing the land behind. This method improves construction accuracy and reduces the construction period.

2. Environment-responsive Gentle Slope Revetment

Source: Fudo Tetra Corporation

Feature of Japan Technology

This method mitigates the impact of reflected waves and allows passage of small boats in front of seawalls. Leads to lower risk of rotation slip, lowers the requirement for foundation improvement and improves the construction speed and economic efficiency. Related technologies include blocks for seawalls that provide spaces for plants to grow

Example of Installation at Airports

With this method, it is often easy to access airport from the sea side, so consideration must be given to security with perimeter fencing.

3. Block for Wave Dissipation Revetment

Source: NIKKEN KOGAKU co.,ltd.

Feature of Japan Technology

The greater their Kd value, the greater the stability of wave-dissipating concrete blocks. Some Japanese light block weight products have a Kd value of 20 that enables construction of durable yet economical seawalls.

Example of Installation at Airports

To prevent waves overtopping and entering an airport may involve raising the height of the crest seawall. An effective alternative approach is to install wave-dissipating concrete blocks which with a superior ability to reduce the size of waves before they hit the seawall.

Japan's Technology for Airport Sector

8. Other Technologies of Civil Engineering and Construction

Feature of Technologies	Other environmental technologies and products.

Summary of Products

1. Permeable Pavement

Source: Taisei Rotec Co., Ltd.

Feature of Japan Technology

Permeable concrete and asphalt concrete can allow water to be drained in a horizon direction under the subgrade along an impermeable layer.

Example of Installation at Airports

Suitable for installation in runways and aprons as well as perimeter roads and access roads to maintain trafficability during rainfall and minimize the deterioration of visibility from rain droplets.

2. Greening

Source: Ohshima Landscape Construction Co., Ltd.
NIKKEN SEKKEI LTD

Feature of Japan Technology

Methods of lowering the surface temperature of concrete and asphalt improve the environment. Products with high water retention and water absorption properties combined with automatic watering system can be used in low-rainfall areas.

Example of Installation at Airports

The roof and walls of terminal buildings and empty land at airports are important parts of the design that can incorporate vegetation. The Kuala Lumpur international airport has a rainforest-like courtyard that is praised by design experts and passengers alike.

3. Noise Suppression

Source: INC Engineering Co., Ltd.

Feature of Japan Technology

Noise ground tests by aircraft have a serious nuisance impact. Measures are needed to reduce noise, vibration and pressure waves.

Example of Installation at Airports

Test drives on the ground are conducted during non-operating hours. Sometimes noise suppression covers over aircraft are required to meet environmental standards.

Japan's Technology for Airport Sector

9. Airport IT Technologies

Feature of Technologies	ICAO surveys show that annual average world growth in air travel demand to 2025 will be approximately 3.6% (North America) to 5.8% (Asia). The highest growth area will be Asia/Pacific countries, where air traffic volume is expected to increase by three times compared to 2005 levels. Countries in the region are actively undertaking airport construction. Such increasing air travel demand requires effective IT solutions for congestion mitigation, such as ATFM.

Summary of Products

1. Air Traffic Flow Management System

Source: MLIT Civil Aviation Bureau

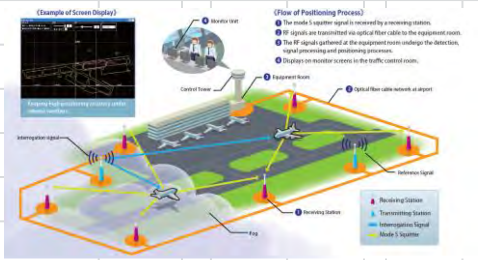
Feature of Japan Technology

The operator for a given air space forecasts the air traffic demand and delivers control information to airlines. The system operates with high-integrity not only for regular airline flights, but also training flights, patrol planes, and space exploration in collaboration with the Air Space Management System (ASM)

Example of Installation at Airports

Airlines can predict congestion at the destinations of air routes in advance using the distributed information. This system enables holding times at destinations to be minimized reducing delays to departure times.

2. Multilateration



Source: MLIT Civil Aviation Bureau

Feature of Japan Technology

Allows observation of obscured parts of the airport with the Airport Surface Detection Equipment (ASDE) and enhances control capability in bad weather when visibility is poor. Does not require any installation or renovation of aircraft.

Example of Installation at Airports

Wide Area Multilateration (WAM) covers also the airspace above the airport to provide timely and uninterrupted operation. Safety management requires identification of the location of all aircraft at an airport, particularly where there are crossing taxiways and runways. Moreover, with WAM installed, the number of takeoffs and landings can be increased.

SECTION 13

GENERAL TERMS OF REFERENCE FOR NEXT STEP

SECTION 13: GENERAL TERMS OF REFERENCE FOR NEXT STEP

Presented hereunder is Draft Terms of Reference for Master Plan and Feasibility Study for New Manila International Airport Development Project.

13.1. Background and Rationale

Since the late 1990s, the Government of the Philippines (GOP) has recognized the need to replace the existing Ninoy Aquino International Airport (NAIA) due to the increasing growth of air traffic and the facility's limited capacity. The planned development of a replacement gateway airport, however, was not pursued by GOP. Hence the air traffic congestion at NAIA worsened through years.

Sometime in 2011, a 1st study ("Airport Strategy for Greater Capital Region in the Republic of the Philippines") was made about the possible choices of actions. It conducted preliminary evaluation of alternative sites and ended with a recommendation to enhance the capacity of Clark International Airport (CRK), predicated on a rapid rail express connection between Metro Manila and Clark. This was subsequently reviewed in the 2013 JICA-funded study ("Roadmap for Transport Infrastructure Development of Metro Manila and Its Surrounding Areas"). The latter concluded that a twin Gateway Airport strategy is justified for the Greater Capital Region (GCR). The twin gateway concept envisions CRK as the airport of choice to serve the northern areas of GCR, and a new Manila International Airport (NMIA) for the southern part of the region.

Due to numerous issues raised and the great impact of such a project, a JICA-funded follow-up 2nd study ("Information Collection Survey for New Manila International Airport in the Republic of the Philippines") was conducted in 2015. After assembling detailed technical and other data about nine (9) potential sites, a final report was submitted by the second Quarter of 2016. It shortlisted the top two ranking sites, viz.: (i) Sangley Point Option 1 (SP1) and ii) Western Portion of Laguna de Bay (WLB).

The forthcoming Master Plan and Feasibility Study is proposed to be a follow up to the 1st and 2nd studies and bring denouement to a strategic infrastructure facility issue that is critical to the overall competitiveness of the Philippines.

13.2. Objective

Basic objective of the Study is to assist the GOP in deciding the most preferred site for development of New Manila International Airport (NMIA) and in preparing the necessary information towards its realization.

It is needless to say that development of a fast, reliable and convenient airport access is an essential part of the Project and the airport access road network development is to be included in the Master Plan and Feasibility Study. However, with regard to the rail system, it is not practicable to identify any connection of NMIA with adequate existing or planned rail systems, and conduct of a full feasibility study for the airport access rail system at this moment is considered not efficient. In this coming Master Plan and Feasibility Study for New Manila International Airport Development Project, a conceptual study to examine possible connection with the existing and planned rail systems, route plan, etc. should be carried out, to be followed by another separate full feasibility study for the airport rail access system.

In addition to the airport access road network, currently DOTC has ongoing transport project namely "Southwest Integrated Transport System Project", aiming at maximizing road usage by reducing vehicle volume and improving traffic flow along Metro Manila's major thoroughfares under PPP framework. It is noted that the project would be one of the possible access element in order to make efficient and diversified airport access to a passenger, so it might be necessary to take the project into account in the Feasibility Study.

In particular, the following shall be performed in the Mater Plan and Feasibility Study for New Manila International Airport Development Project:

a) Confirm and recommend the best gateway airport system for the Greater Capital Region (GCR) with adequate long-term airport capacity.
b) Evaluate in greater detail the two sites for development of New Manila International Airport (NMIA) based on the aforementioned 2nd Study and secure a firm decision on the preferred site.
c) Carry out a full feasibility study for the development of NMIA at the selected site and its surrounding area, to include demand forecast to year 2050, site development works and comprehensive airport facilities development in stages, environmental and social evaluation, economic and financial analyses, implementing and financial arrangement.
d) Also carry out a full feasibility study for the development of airport access bridge and road system including, but not necessarily limited to, selection of an optimum alignment, preliminary engineering design for road and bridge, environmental and social evaluation as well as economic and financial analyses.
e) For the airport rail access, carry out a conceptual study to examine possible connection with the existing and planned rail systems, route plan, preliminary project framework, preliminary economic and financial viability and initial environmental examination.
f) Assist the GOP in fast tracking the development of CRK that will relieve NAIA until NMIA comes on-stream.
g) Review and identify other infrastructure components including the industrial/urban development in the surrounding area harmonized with NMIA development.
h) Enhance capability of personnel of DOTC, CAAP, MIAA, CIAC in their respective roles in the implementation of the aforementioned projects and their sub-components. As a course of this task, it is considered recommendable to invite key personnel of

DOTC/CAAP/MIAA/CIAC to Japan to foster their understanding and perception of Japanese technology related to the offshore airport development projects.

13.3. Scope of Works

The Study for NMIA is to be divided into Stage 1 through Stage 4 as briefed below:

- Stage I: Formulation of the Best Airport System for GCR;
- Stage II: Feasibility Study for Development of NMIA;
- Stage III: Feasibility Study for NMIA Access Road and Bridge; and
- Stage IV: Conceptual Study for Access Railway.

[Stage I: Formulation of the Best Airport System for GCR]

I.0 Preparation and Discussion of Inception Report

I.1 Examination of Existing Conditions and Development Plans

I.1.1 Socio-economic Conditions

I.1.2 Air Traffic Demand

I.1.3 Relevant Public and Private Sectors

I.1.4 Relevant Policies

I.1.5 Ninoy Aquino International Airport (NAIA)

I.1.6 Clark International Airport (CRK)

I.1.7 Airspace Utilization in and around GCR

I.1.8 Urbanization and Spatial Development

I.1.9 Road and Rail Network

I.1.10 Environmental Laws and Regulations

I.2 Passenger Perception Survey

I.3 Base Case Air Traffic Demand Forecast

I.3.1 General

I.3.2 Basic Approaches and Methodology

I.3.3 Projection of Future Socio-economic Framework

I.3.4 Air Traffic Demand Forecast

I.3.5 Aircraft Movement Forecast

1.4 Analysis on Airport System in GCR

I.4.1 Major Multi-airport Systems in Asia

I.4.2 Alternative Airport Systems for GCR

I.4.3 Government Policies

I.4.4 Airline Perceptions

I.4.5 Long-term Air Traffic Demand and Airport Capacity Analysis

I.4.6 Examination on Role Demarcation of Gateway Airports in GCR

I.4.7 Operation/Maintenance/Development Organizations

I.4.8 Roadmap for Development of GCR Airport System

I.4.9 Trial/Sample Traffic Distributions

I.5 Relief Plans until Opening of NMIA

I.5.1 Access Transport Services and Traffic Management

I.5.2 Utilization of Clark International Airport

I.6 Airport Access for GCR Airport System

I.6.1 Examination of Present GCR and World-class Airport Access Systems

I.6.2 Airport Access Systems and Services for NMIA

I.6.3 Airport Access Demand Forecast for GCR

I.6.4 Evaluation of Existing and Future Road and Rail Network for GCR Airport System

I.6.5 Recommendations for GCR Airport Access System

I.7 Confirmation on Basic Requirements for NMIA Development

I.7.1 Examination of Alternative Airport Zoning Plans

I.7.2 Examination of Required Airport Property (Platform Size)

I.7.3 Airport Access Services and Road/Rail Links

I.8 Related Urban Developments

I.8.1 Identification of Development Needs

I.8.2 Harmonized Urban Development and Spatial Framework with NMIA Development

I.8.3 Required Coordination by Stakeholders

I.9 Examination on Sites for Development of NMIA

1.9.1 Review of 2015 JICA Survey

I.9.2 Additional Site Condition Surveys

I.9.2.1 Geotechnical Investigation at Western Portion of Laguna de Bay

I.9.2.2 Others

I.9.3 Technical/Environmental/Social/Urban Planning Examination

I.9.4 Public Consultations with Stakeholders and Policy Makers

I.9.5 Strategic Environmental Assessment for Sites for Development of NMIA

I.9.6 Selection of NMIA Development Site

I.10 Conclusion on Best GCR Airport System

I.11 Preparation and Discussion of Interim Report

[Stage II: Feasibility Study for Development of NMIA]

II.1 Formulation of NMIA Development Plan

II.1.1 Preparation of Phased Facility Development Plan

II.1.2 Airspace and Aircraft Flight Operation Procedures

II.1.2.1 Instrument Flight Procedures

II.1.2.2 Reorganization of Surrounding Airspaces

II.1.2.3 Obstacle Restrictions and Control in Surrounding Area

II.1.3 Airport Access Road and Rail Development Plan

II.1.4 Opportunities for Development/Redevelopment of NMIA Surrounding Area

II.1.5 Opportunities for Redevelopment of Existing NAIA

II.1.6 Opportunities for Development of Logistic Hub

II.2 Preliminary Design of First Phase NMIA Development Plan

II.2.1 Natural Condition Survey (Bathymetric, Boring, Wave and Tide)

II.2.2 Examination of Design Conditions for Seawall Construction and Reclamation

II.2.3 Preliminary Design of Major Facility Development Plans for Opening Day

II.2.4 Project Implementation Schedule and Cost Estimate

II.3 Economic and Financial Evaluation

II.3.1 Evaluation Framework

II.3.2 Economic Evaluation

II.3.3 Financial Evaluation

II.3.4 Opportunities for PPP

II.3.5 Recommendation on Project Implementation Scheme

II.4 Examination on Environmental, Social, Gender and Development Considerations

II.4.1 Approach

II.4.2 Natural Environment

II.4.3 Ecological Preservation

II.4.4 Resettlement, Social, Gender and Development Consideration

II.4.5 Preparation of EIA Report for the Selected Airport Site

II.4.6 Provision of Assistance to DOTC to secure Environmental Compliance Certificate (ECC)

II.5 Policy Issues and Action Plans for Development of NMIA

II.5.1 Policy Issues for Development of GCR Airport System

II.5.2 Organizational Issues

II.5.3 Government Action Plans

II.6 Conclusions and Recommendations

II.7 Preparation and Discussion of Draft Final Report

II.8 Preparation of Final Report

[Stage III: Feasibility Study for NMIA Access Road and Bridge]

III.0 Preparation and Discussion of Inception Report

III.1 Overview of Road Development Plan and Previous Studies

III.2 Examination of Optimum Alignment Alternatives

III.2.1 Examination of Alignment Alternatives for Airport Access

III.2.2 Examination of Alignment Alternatives for Local Transport

III.3 Update of Traffic Demand Forecast

III.3.1 Methodology

III.3.2 Estimate of Airport Access Traffic Demand

III.4 Examination of Impacts of Airport Access Traffic

III.4.1 Impact of Airport Traffic on Overall Urban Transport

III.4.2 Impact of Airport Traffic in Nearby Affected Areas and Communities

III.5 Preparation and Discussion of Progress Report

III.6 Preliminary Engineering Design

III.6.1 Natural Condition Survey[*1]

(1) Topographic Survey

(2) Geotechnical Investigation

(3) River Survey and Bathymetric Survey (River and Marine Portions)

Note[*1]: DPWH/DOTC will employ a qualified and accredited geodetic survey company who carries out the parcellary survey based on the result of the preliminary engineering design but separately from this Feasibility Study.

III.6.2 Road Design

(1) Access Road Main Alignment Design

(2) Airport Terminal Ramp Design

(3) Interchanges/Intersections Design

(4) Pavement Design

III.6.3 Bridge Design

(1) Selection of Optimum Bridge Type

(2) Selection of Superstructure Type

(3) Selection of Substructure Type

(4) Selection of Foundation Type

III.6.4 Hydrological/Hydraulic Design

(1) Meteorological, Hydrological and Marine Information Survey (Climate, River Discharge, Waves, Tides, Currents, Navigation Channel Limitation, etc.)

(2) Design of River/Canal Crossing Structures

III.6.5 Geotechnical Design (Soft Ground Treatment for Embankment)

(1) Consolidation Settlement

(2) Liquefaction

III.7 Preparation of Construction Plan and Cost Estimates

III.8 Preparation of Maintenance, Operation and Implementation Plan

III.9 Economic and Financial Evaluation

II.9.1 Evaluation Framework

II.9.2 Economic Evaluation

II.9.3 Financial Evaluation

II.9.4 Opportunities for PPP

II.9.5 Recommendation on Project Implementation Scheme

III.10 Preparation of Publicity Campaign Materials

III.11 Natural and Social Environmental Studies

III.11.1 Preparation of Environmental Impact Assessment (EIA) Report for Development of Airport Access Road and Bridge

III.11.2 Preparation of Resettlement Action Plan Report

III.11.3 Provision of Assistance to DPWH to secure Environmental Compliance Certificate (ECC)

III.12 Technology Transfer

III.13 Preparation and Discussion of Draft Final Report

III.14 Preparation of Final Report

[Stage IV: Conceptual Study for NMIA Access Railway]

IV.1 Overview of Railway Development Plan and Studies

IV.2 Preliminary Traffic Demand Forecast

IV.3 Preliminary Examination of Route Plan

IV.4 Preparation and Discussion of Progress Report

IV.5 Preliminary Examination of Project Framework

IV.6 Preliminary Examination of Project Implementation Plan

IV.7 Preliminary Examination of Project Implementation Structure

IV.8 Preliminary Economic and Financial Analyses

IV.9 Initial Environmental Examination

IV.10 Preparation and Discussion of Draft Final Report

IV.11 Preparation of Final Report

13.4. Work Schedule

The Study will be completed in 18 months as presented in Figure 13.4-1.

Table 13.4-1 Study Schedule

Items / Month	Months after Commencement of the Study																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Stage I: Formulation of the Best Airport System for GCR																		
I.0 Preparation and Discussion on Inception Report																		
I.1 Examination of Existing Conditions and Development Plans																		
I.2 Passenger Perceptiion Survey																		
I.3 Base Case Air Traffic Demand Forecast																		
I.4 Analysis on Airport System in GCR																		
I.5 Relief Plans until Opening of NMIA																		
I.6 Airport Access for GCR Airport System																		
I.7 Confirmation on Basic Requirements for NMIA Development																		
I.8 Related Urban Developments																		
I.9 Examination on Sites for Development of NMIA including Boring																		
I.10 Conclusion on Best GCR Airport System																		
I.11 Preparation and Discussion of Interim Report																		
Stage II: Feasibility Study for Development of NMIA																		
II.1 Formulation of NMIA Development Plan including PTB Concept																		
II.2 Preliminary Design of First Phase NMIA Development Plan																		
II.3 Economic and Financial Evaluation																		
II.4 Examination on Environmental and Social Consideration																		
II.5 Policy Issues and Action Plans for Development of NMIA																		
II.6 Conclusions and Recommendations																		
II.7 Preparation and Discussion of Draft Final Report																		
II.8 Preparation of Final Report																		
Stage III: Feasibility Study for Access Road Development																		
III.1 Overview of Road Development Plan and Previous Studies																		
III.2 Examination Alignment Alternatives																		
III.3 Update of Traffic Demand Forecast																		
III.4 Examination of Impacts of Airport Access Traffic																		
III.5 Preparation and Discussion of Progress Report																		
III.6 Preliminary Engineering Design																		
III.7 Preparation of Construction Plan and Cost Estimate																		
III.8 Preparation of Maintenance, Operation and Implementation Plan																		
III.9 Economic and Financial Evaluation																		
III.10 Preparation of Publicity Campaign Materials																		
III.11 Natural and Social Environmental Studies																		
III.12 Technology Transfer																		
III.13 Preparation of Draft Final Report																		
III.14 Preparation of Final Report																		
Stage IV: Conceptual Study for Access Rail Development																		
IV.1 Overview of Railway Development Plan and Studies																		
IV.2 Preliminary Traffic Demand Forecast																		
IV.3 Preliminary Examination of Route Plan																		
IV.4 Preparation and Discussion of Progress Report																		
IV.5 Preliminary Examination of Project Framework																		
IV.6 Preliminary Examination of Project Implementation Plan																		
IV.7 Preliminary Examination of Project Implementation Structure																		
IV.8 Preliminary Economic and Financial Analyses																		
IV.9 Initial Environmental Examination																		
IV.10 Preparation of Draft Final Report																		
IV.11 Preparation of Final Report																		

13.5. Required Expertise

Following expertise will be required for efficient conduct of the Study:

[Stages I: Formulation of the Best Airport System for GCR and Stage II: Feasibility Study for Development of NMIA]

1) Team Leader/Airport Planner
2) Airport/Aviation Policy Expert
3) Airport Planner
4) Urban Transport Planner
5) Air Traffic Demand Forecast Specialist
6) Airport Access Traffic Demand Forecast Specialist
7) Airspace Utilization/Aircraft Operation Procedures
8) Industrial/Urban Development Planner
9) Environment Planner
10) Cargo Logistics Planner
11) Airline Industry
12) Economic and Financial Analyst
13) Airport Business Planner
14) Legal/Policy/Institutional Specialist
15) Environmental/Social Expert (EIA Specialist)
16) Environmental/Social Considerations (SEA Specialist)
17) Gender and Development Expert
18) Public Consultation Specialist
19) Personnel Capacity Building Specialist
20) Natural Disaster Management Specialist
21) Natural Condition Survey Specialist 1 (Bathymetry and Boring)
22) Natural Condition Survey Specialist 2 (Wave and Tide)
23) Oceanographic Conditions Specialist
24) Oceanographic Simulation Specialist
25) Marine/Port Engineer
26) Geotechnical Engineer
27) Airport Civil Engineer
28) Airport Facility Architect
29) CNS/ATM Specialist
30) Mechanical Engineer
31) Electrical Engineer
32) Hydrologist
33) Transport Planner

34) Structural Engineer
35) Railway Planner (Civil, Depot)
36) Railway Planner (Facility, Equipment)
37) Cost Estimator
38) Construction Planner
39) Construction Materials Procurement Specialist

[Stage III: Feasibility Study for NMIA Access Road]

1) Deputy Team Leader/Highway Planner
2) Highway Engineer
3) Structural Engineer (Superstructure)
4) Structural Engineer (Substructure)
5) Structural Engineer (Revetment)
6) Geotechnical Engineer
7) Hydrological Engineer
8) Electrical Engineer
9) Construction Planner
10) Operation & Maintenance Planner
11) Cost Estimator
12) Geodetic Engineer
13) Traffic Demand Forecast Specialist
14) Environmental Specialist
15) RAP Specialist

[Stage IV: Conceptual Study for NMIA Access Railway]

1) Urban Railway Planner
2) Team Leader for Civil Engineering
3) Team Leader for E&M Planning
4) Train Operation Planner
5) Rolling Stock Expert
6) E&M System Expert
7) Signal and Telecommunication Expert
8) Depot Facility Expert
9) Route & Alignment Planner
10) Track Expert
11) Architect for Station and Depot Building
12) Railway Operation and Maintenance Planner
13) Environmental and Social Considerations Expert

SECTION 14

STAKEHOLDERS MEETING

SECTION 14: STAKEHOLDERS MEETING

14.1. Objective

DOTC conducted consultation of Stakeholders' meeting on 29 January 2016 based on one of the instructions given by Interagency Technical Committee on Transport Planning (IATCTP). The Stakeholder's meeting was aiming at showing the information and/or findings of the Survey to Related Government Organizations, Local Government Units (LGUs), Philippine Chamber of Commerce and Industry, airlines, travel agencies, etc. thus promoting better understanding of the Survey and to cope with queries from the Stakeholders.

14.2. Main Agenda of the Meeting

Main agendas of the Stakeholders' meeting are as follows:

a) Project Overview
b) Presentation of Interim Report
c) Question and Answer

Presentation of Interim Report was undertaken by JICA Survey Team, including the result of discussion with Philippine Port Authority (PPA) on possible conflict of the Central Portion of Manila Bay site with operations Manila Port South Harbor. Following shows the main topics of the presentation:

a) Long-term Air Traffic Demand and Capacity of GCR;
b) Need to Develop Twin-Airport System for GCR;
c) Basic Requirement: Ultimate Airport Platform Size;
d) Nine Alternative New Airport Sites;
e) Initial Screening of Alternative Sites;
f) Prospective New Airport Sites;
g) Key Control Point for Site Examination: RP-P1;
h) Key Control Point for Site Examination: Sub-surface Soils of Laguna de Bay;
i) Summary Result of Site Examination;
j) Existing NAIA; and
k) Proposed Next Step.

During Question-Answer session after above the presentation, no negative comment was expressed by the Stakeholders. In the wake of the Stakeholder meeting, DOTC requested the participants to submit their comments if any within two weeks.

14.3. Comments Submitted from the Stakeholders

1) Comment from Philippine Reclamation Authority (PRA)

The comment from PRA was submitted on March 2016 addressing to Assistant Secretary of Planning and Finance of DOTC. The comment from PRA shows their positive position for Sangley Point Option 1 as the site for NMIA.

[PRA Comment]

"*In response to your letter dated February 15, 2016, herewith are the comments of PRA particularly regarding the potential feasible sites for the New Manila International Airport (NMIA) as an offshoot of Japan International Cooperation Agency's (JICA's) Draft Final Report entitled "JICA's Information Collection Survey for New Manila International Airport.*

For the record and consistent with the results and findings in the Pre-Feasibility Study (PFS) of the said project prepared by this Agency and submitted to the DOTC, PRA considers the Sangley Options as the acceptable site for the proposed NMIA".

Signed by PETER ANTHONY A. ABAYA, General Manager and CEO

2) Comment from ACE LOGISTICS INC.

The comment from ACE LOGISTCS INC submitted on January 29, 2016 stated the importance of efficient cargo handling, and cargo facilities and terminal issues should be seriously considered during the planning and development stages of the Project. This matter should be carefully taken into account.

[Comment from ACE LOGISTICS]

"Further to our forum today at DAP, I wish to thank you for inviting Ace Logistics to the stakeholders meeting.

From the freight and logistics sector, kindly include for the record that we represent a vital if not integral part of airline operations side by side with the passenger sector. As you know, we now operate at 3 or 4 cargo terminals which we find inefficient while creating bottlenecks at passenger terminals. Car/truck traffic to/from the airport or cargo terminals thus ingress and egress should be well planned and strategically located at the airport.

We hope that in the process of planning and study of developing and/or finding alternative airports, the cargo facilities and the cargo terminal are seriously considered. And yes, from the logistics point of view, Sangley Option 1 is a better alternative but our utilization of Clark airport must be maximized.

My thoughts only. Please feel free to let us know as to how we can be of more service to DOTC and our country. More power to DOTC."

Signed by Abe V. Asuncion, President

3) Comment from Civil Aviation Authority of the Philippines (CAAP)

CAAP submitted its letter to DOTC stated as follows:

"This is in response to the letter dated 15 February 2016 and received 18 February 2016 requesting for comments and inputs from the Civil Aviation Authority of the Philippines (CAAP) to the Draft Final Report on the NMIA Study prepared by the Japan International Cooperation Agency (JICA) Study Team on or before 29 February 2016.

Given the detailed report requiring a more exhaustive review of the comments we will not be able to submit the appropriate comments on the JICA study by 29 February 2016.

However, we would like to request for an executive presentation by the JICA Team in a joint session to be attended by representatives of the DOTC and CAAP, together with the General Manager of the Manila International Airport (MIAA) and the President of the Clark International Authority (CIAA) at a mutually agreed date, time and venue. Through such joint session, we intend to give immediate feedback to discussion points and look forward to having points for clarification to be duly addressed including discussion points raised during the Stakeholders' Meeting and the PPA consultation.

We look forward to being an integral partner in coming up with the final report of the JICA's Information Collection Survey."

Signed by LTGEN WILLIAM HOTCHKISS III AFP (RET), Director General

4) Comment from Department of Public Works and Highways (DPWH)

The comment submitted by DPWH to DOTC on 29 February 2016 is presented below. The request for clarity of a road project has been incorporated in the Final Report. The comment in the subsequent paragraphs is to be carefully taken into account in the next step feasibility study.

"This has reference to your letter dated 15 February (copy attached) for the on-going Information Collection Survey for New Manila International Airport (NMIA) Project funded under the Japan International Cooperation Agency (JICA) Technical Grant Assistance.

We have gone through the details of the NMIA preliminary survey report and we would like to clarify the transport listed in Table 4.1-1 Railway and Road Project specifically the "Dike Road", whether the study team is pertaining on the DPWH Project titled Laguna Lakeshore Expressway Dike (LLED). If this refers to LLED, we suggest that the study team uses the project name specified by DPWH to avoid confusion. If not, integration of the project is essential when considering the Western Portion *of Laguna de Bay as the NMIA site. Attached is the latest project briefer for reference.*

We recognize that the proposed NMIA, whichever site would be most feasible, will complement other infrastructure projects that will increase the economic growth of our country. It is also worth noting that a well-planned mass transport is essential to complement the NMIA project and to address the rising transport problem in the Greater Metro Manila Area especially that a new airport will rise within a new corridor. This will also be coordinated with the DPWH PPP Service for the technical considerations with particular emphasis on its implication on the proposed Cavite-Laguna Expressway Project and other PPP projects as tabulated in Table 4.1-1.

We look forward in the completion of this study and eventual realization of the project. May we also request that you furnish us electronic and hard copies once the report has been finalized for our reference? Rest assured that the Department will extend assistance whenever necessary.

Should there be other concerns and data needed, please feel free to contract the undersigned on this number."

Signed by CONSTANTE A. LLAENES, JR., CESO III

Director IV, OIC-Undersecretary for Planning and PPP