

School Education & Literacy Department
Government of Sindh
Islamic Republic of Pakistan

**PREPATORY SURVEY REPORT
ON
THE PROGRAMME FOR
THE RECONSTRUCTION OF
EDUCATIONAL FACILITIES
IN FLOOD-AFFECTED AREAS IN
SINDH
IN ISLAMIC REPUBLIC OF
PAKISTAN**

DECEMBER 2023

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MATSUDA CONSULTANTS INTERNATIONAL CO., LTD.

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Preface

Japan International Cooperation Agency (JICA) has decided to conduct a preparatory survey for cooperation in planning the reconstruction of educational facilities in flood-affected areas in Sindh Province, Islamic Republic of Pakistan, and has entrusted the survey to Matsuda Consultants International Co., Ltd.

JICA sent to the Islamic Republic of Pakistan a study team from May to June 2023.

The survey team held a series of discussions with the officials concerned of the Government of the Islamic Republic of Pakistan, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the programme and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Islamic Republic of Pakistan for their close cooperation contributed to the survey team.

December, 2023

Haruko KAMEI
Director General
Human Development Department
Japan International Cooperation Agency

Summary

1. Outline of the Country

The Islamic Republic of Pakistan (hereinafter referred to as "Pakistan") is located west of India at the nexus of Asia and the Middle East. A large country with an area of 796,100 km², it is about 2.1 times the size of Japan and has a population of 227 million, the fifth largest in the world.¹ The Indus River runs from north to south through the central and eastern parts of the country, and its basin forms the Indus River plain, home to roughly 80% of the population. Northern Pakistan comprises a mountain range featuring peaks higher than 8,000 meters above sea level. China lies on the other side of the mountains. Western Pakistan is a mountainous, arid region bordering Afghanistan and Iran and known as the Balochistan Plateau.

The province of Sindh—the target area of the Project—occupies the vast plains of the lower Indus River basin in southeastern Pakistan and is the second-most populous province in the country with roughly 47 million people mainly in Karachi, the nation's commercial capital. To the west over the Kirthar Mountains is the province of Balochistan. To the north up the Indus River is the province of Punjab. To the east across the Thar Desert is India. To the south, the province opens to the Arabian Sea, and Karachi is located at the western edge. Large-scale irrigated agriculture has developed in inland areas because the majority are arid with annual rainfall of less than 200 mm.

With a nominal GDP of USD 376.5 billion² and a GNI per capita of USD 1,580³, Pakistan is a lower middle-income country according to the DAC classification. Although its market size and geopolitical standing suggest great potential for future economic development, economic growth remains inadequate for many reasons, including volatile domestic security and political circumstances, frequent major natural disasters, and perpetual fiscal and trade deficits.

As for the industrial structure of Pakistan, agriculture and mining/manufacturing account for 22.30% and 19.8% of GDP, respectively, with services comprising the remaining 51.5%;⁴ the economy continues to shift toward services. However, agriculture—mainly cotton and rice—remains a core industry, employing 37.4%⁵ of the working population. Specifically, the production of cotton—the raw material for textile products—comprises 60% of Pakistan's exports and has a commensurately large impact on the national economy.

2. Background and Outline of the Requested Assistance

Pakistan has the potential to enjoy a demographic bonus and achieve significant economic growth in the future, especially thanks to its abundant young population. However, out of the total 51.53 million children aged 5 to 16 in Pakistan, the number of out-of-school children (OOSC) in the same

¹ World Bank, 2022

² World Bank, 2022

³ World Bank, 2022

⁴ World Bank, 2022

⁵ Pakistan Bureau of Statistics, 2020

age group is estimated to be about 22.8 million, the second highest in the world. With roughly 47 million people, the province of Sindh, the project site, has the second-largest population of the four provinces of Pakistan, and is home to Karachi, the largest commercial and industrial city in Pakistan. However, Sindh had the lowest net enrollment rate of Pakistan's four provinces, and the highest percentage and overall number of OOSC. In particular, the completion rate for primary education in grades 1-5 was lower than the national average at 49%, and the gender gap was extremely large (57% for boys, 39% for girls)⁶. The school attendance rate of girls from poor families in rural areas was low, and other disparities based on socioeconomic status were also significant. The net enrollment rate for the first semester of lower secondary education (grades 6-8) following primary education is also low at 32% (35% for boys, 29% for girls)⁷, so the need to address the issue of access to basic education is extremely significant.

To address these issues, JICA has so far provided grant assistance for a total of 54 schools in six southern and six northern districts of Sindh Province through the Project for Upgrading Primary Girls Schools into Elementary Schools in Southern Rural Sindh (approved by the Cabinet in FY2013) and the Project for Upgrading Primary Girls Schools into Elementary Schools in Northern Rural Sindh (approved by the Cabinet in FY2015) (the "Previous Projects"), which upgraded girls' elementary schools (schools for grades 1-8 of primary and middle education) by reconstructing dilapidated primary school buildings and upgrading middle school classrooms in an integrated manner. In addition, through the Project for Upgrading Primary Girls' Schools into Elementary Schools in Rural Areas of Sindh (approved by the Cabinet in FY2022) ("Ongoing Project"), 20 schools in the four northern districts of Sindh and the districts within Karachi Province are being renovated and upgraded from dilapidated primary school buildings and equipped with middle school classrooms for girls, to become girls' elementary schools.

However, the heavy flooding caused by the record-breaking heavy rains since June 2022 has resulted in extensive human and material damage throughout Pakistan. In August of the same year, the Government of Pakistan began calling for assistance from the international community for flood damage, and in mid-September, together with international organizations, the Pakistan Floods 2022: Post-Disaster Needs Assessment ("PDNA") was launched, followed by the release of a report on the findings of the study on October 28, and Pakistan sought additional assistance from the international community as a country affected by climate change through COP27 in January 2023. Based on the concept of "Build Back Better," the PDNA's basic policy is to build disaster-resistant communities through appropriate restoration and reconstruction of infrastructure and public services, including restoration of means of livelihood. According to the report's estimates, infrastructure damage from the floods amounted to USD 14.9 billion, economic losses to USD 15.2 billion, and reconstruction needs over the next five years to USD 16.3 billion, of which total damage to the education sector was estimated at approximately USD 780 million⁸, with 17,205 school facilities either totally or

⁶ PSLM 2019-20

⁷ PSLM 2019-20

⁸ Pakistan Floods 2022: PDNA, 2022

partially destroyed. Sindh was the worst-affected province, accounting for 66% of the total amount of damage and 74% of the total number of affected institutions, affecting the learning opportunities of 1,692,000 children and students ⁹(64% of the 2,624,000 affected nationwide).

According to the "4RF: Resilient, Recovery, Rehabilitation, and Reconstruction Framework" declaration released at the Pakistan Meeting of Flood Recovery Country Assistance, the short-term response is to provide and reopen educational opportunities through temporary schools and other means. While these efforts are underway, medium- and long-term measures must be taken to quickly rebuild damaged educational facilities and ensure that children have safe opportunities to learn. In addition, when rebuilding educational facilities, it is important to consider how to improve these to make them more resilient to disasters.

Furthermore, in response to the flood damage, Japan has conducted a detailed survey of the damage to facilities and equipment at the 78 sites that have cooperated or will cooperate so far in the "Data Collection Survey on Flood Response Through Reconstruction of Education Facilities in Sindh" (hereinafter, the "Data Collection Survey").

Given these circumstances, the Government of Sindh Province, requested grant assistance to rebuild the existing primary schools that were damaged by the floods and heavy rains in 2022, covering 12 sites, 11 selected in the "Data Collection Survey" with the addition of one site strongly requested by the partner country after the "Data Collection Survey" (about 39 classrooms in total) and provision of furniture for education.

3. Overview of Survey Results and Programme¹⁰ Description

In response to the above request, the Japan International Cooperation Agency (JICA) conducted on-site surveys in May 2023 for a total of 12 sites requested.

Given these circumstances, the survey team conducted a domestic analysis based on the results of the field survey and found that the 12 requested sites finally identified in the consultation were suitable for cooperation. Furthermore, the 11 sites selected in the "Information Collection and Confirmation Survey" were identified as requiring reconstruction of existing primary school buildings; the one additional site requested was found to have ceiling leaks, and although the existing primary school was not identified as requiring reconstruction, due to the number of classrooms being insufficient and a strong request from the client, the site was selected for investigation. The feasibility of the Project was confirmed for 12 sites in seven districts, and design within the same scope was developed in accordance with the following requirements, which were finally agreed upon and summarized in this brief study report.

The following is a summary of the Project, compiled based on discussions with the partner country.

⁹ Ibid

¹⁰ The programme is composed of one subproject for the Reconstruction of Educational Facilities in Flood affected Areas in Sindh (hence refer to "the Project").

1) Scope, components, and scale of cooperation

The selection of sites for cooperation is made in accordance with the priority criteria discussed in the "Information Collection and Confirmation Survey" and the order of priority based on the criteria, with priority given to sites where the number of students currently enrolled in G1-G5 (primary education level) and the number of primary school teachers are sufficient to ensure that the middle schools constructed or to be constructed through grant aid will be fully utilized. Specific priority criteria were presented to the Sindh Education and Literacy Department ("SELD") for consideration in the "Information Collection and Confirmation Survey" and through discussions it was agreed that the following criteria would be adopted. The number of elementary school students enrolled is evaluated using grade level averages because of the variation in the number of students per grade level among schools, and is classified into four priority levels from the perspective of whether the standard classroom capacity of 30 students is reached and whether the number of teachers required to operate six grades, including pre-school classes, on a grade-by-grade or double grade basis (6 or 3 teachers) is sufficient. The specifics are as follows.

Table 1: Priority of Target Sites

| Criteria (draft) | |
|--------------------|--|
| Priority level A: | Average enrollment of 30 or more students in grades G1-G5 and 6 or more primary school teachers (PSTs) |
| Priority level A-: | Average enrollment of 30 or more students in grades G1-G5 and 3-5 primary school teachers |
| Priority level B: | Average enrollment of 12-29 students in grades G1-G5 and 3 or more primary school teachers |
| Priority level B-: | Average enrollment of 12-29 students in grades G1-G5 and 2 or fewer primary school teachers |

Schools assigned Priority Level A and A- have high enrollment demand in the future, and are included in the scope of the Project. Schools assigned Priority Level B are included in the scope of the Project on the premise that they will operate combined classes for every two school grades. Additionally, to prepare for contingencies, the policy is to include B- schools in the design scope as alternative sites for A, A- and B schools.

The facilities component was based on the reconstruction of existing primary schools among the girls' elementary schools damaged by floods and torrential rains, and the minimum facilities per site required to operate the schools were 4 or 6 general classrooms (for primary classes), a principal's office, a teachers' room/storeroom (only 3 cooperating secondary schools that were not equipped with these facilities were included in the cooperation), and a lavatory. In addition, plans were made with the minimum classroom furniture necessary as the targets of assistance. It was agreed that the installation of a photovoltaic power generation system, which was initially requested, would be carried out at the expense of the partner country.

2) Design of facilities and equipment

The design specifications of the Previous Project will be the basis for the Project, and several prototypes will be designed independently, with a Design implemented such that the prototypes are applied to each site. The floor plan is based on a simple rectangular/open-corridor style with standard beam spans of 3.12 m, and includes a variety of facility types (e.g. two-story, four-classroom buildings and six-classroom buildings) adaptable to confined properties with different space limitations. The structural style is reinforced concrete-framed structures with high seismic resistance in accordance with local standards, and the dimensions of the members were determined through structural analysis based on the Building Code of Pakistan. First-floor levels were set higher than past inundation levels seen during the 2022 floods. As for electronic equipment, the decision was made to install ceiling fans to counter the punishing heat and to install fixtures and wiring above the maximum inundation level in addition to the absolutely necessary lighting and electrical outlets typically installed and maintained with no problems at existing schools. Regarding furniture, the plan calls for facilities improved under the Project to be furnished with the school furniture absolutely necessary for the facilities to function properly.

The table below lists descriptions and sizes of facilities and descriptions of school furniture and equipment within the scope of the Project.

Table 2: Overview of Facility Plans

| Priority level | No. | Site name (School name) | Facility description | | | | Total floor area (m ²) |
|----------------------|--------|------------------------------|-------------------------|------------|--|------------------|------------------------------------|
| | | | Classroom block | | | Lavatory block | |
| | | | Number of floors/blocks | Classrooms | Principals' offices/ Teachers' rooms/ Staircases | Number of stalls | |
| Top priority (A) | Mi04 | GGES - Kachelo Farm | 2 floors, 1 block | 6 | 1 | 6 | 399.69 |
| | Gh01 | GGES - Officer Colony Ghotki | 2 floors, 1 block | 6 | | 2 | 337.80 |
| Second priority (A-) | Mi08 | GGES - Muhammad Hassan Mari | 2 floors, 1 block | 6 | | 6 | 353.64 |
| | Kh05 | GGES - Bajeed Fakir | 2 floors, 1 block | 6 | | 6 | 353.64 |
| Third priority (B) | Mi03 | GGES - Deh - 294 | 2 floors, 1 block | 4 | 1 | 4 | 267.05 |
| | Kh09 | GGES - Jani Boro | 2 floors, 1 block | 4 | | 2 | 212.00 |
| | Su04 | GGES - Moto Mirbahar | 2 floors, 1 block | 4 | | | 204.80 |
| | Na01 | GGES - Quest | 2 floors, 1 block | 4 | | 4 | 221.00 |
| | Na03 | GGES - Jalalani | 2 floors, 1 block | 4 | 1 | 4 | 267.05 |
| | Totals | 9 sites* | 9 blocks | 44 | 3 | | 2,616.67 |

* The three B- sites, Ba01, Ba06, and Da05, are included in the design scope as contingency replacement sites for the above nine sites.

Table 3: Description of School Furniture

| Room name | Description of furniture | Quantities | |
|----------------------------|-----------------------------------|------------|---------|
| | | Per room | Total |
| Classrooms (Primary) | Teacher desk/chair | 1 set | 35 sets |
| | 2-person desks for students (S) | 15 | 525 |
| | 2-person desks for students (S) | 15 | 525 |
| | Cabinets | 1 | 35 |
| Classrooms (Pre-school) | 6-person student table + 6 chairs | 5 sets | 45 sets |
| | Teacher desk + chair | 1 set | 9 sets |
| | Cabinets | 1 | 9 |
| | School lockers | 1 | 9 |
| Principal's offices | Desk/chair set for principals | 1 set | 3 sets |
| | Visitors' chairs | 4 | 12 |
| | Cabinets | 2 | 6 |
| Storerooms/teachers' rooms | Meeting table/4-chair set | 1 set | 3 sets |
| | Cabinets | 2 | 6 |

4. Implementation Schedule and Project Cost Estimation

The implementation period for this Project is a 4-month period for preparation of bid books followed by a period of five months for local bidding (including one month for preparation) from the announcement to the distribution of drawings, opening of bids, bid evaluation, approval of results, and contracting. Construction of Project facilities is batched into a lot of 9 sites commensurate with the capacities of local construction companies, with the entire Project to be compiled into one lot. The standard schedule for one lot is 12 months for two-story buildings at each site, a realistic amount of time for construction in accordance with local standards. Taking into account sites requiring preparatory work (e.g. earth filling) and reduced work efficiency during the rainy season and Ramadan, construction at each site will be carried out by rotating temporary materials and workers among the 9 sites. These sites are divided into three groups comprising three sites each (12-month per-group construction period). The starting point for each group will be staggered by three months. The total construction period has been set at 18 months. The duration of bidding for furniture procurement is 3.5 months from bid preparation to announcement to contracting. The duration of procurement from ordering to delivery, initial adjustments, and receiving inspections is expected to be seven months in total.

In light of the above, the overall Project duration is expected to be 27 months: nine months for bidding, and 18 months for facility construction.

5. Project Evaluation

The Project will rebuild up to 9 existing primary schools (44 classrooms) out of a total of 78 schools (54 schools in Previous Projects and 24 schools in the Ongoing Project) that Japan has upgraded or is planning to upgrade through grant aid, out of a total of 12 sites, 11 sites selected

through the Information Collection and Confirmation Survey plus one additional site, that were damaged by the floods in 2022. The Project aims to rebuild existing primary schools among girls' elementary schools in rural areas of Sindh Province (including some urban areas) in order to create safe learning environments to broadly benefit general citizens residing in the target areas. In addition, Pakistan is conducting a PDNA together with international organizations, etc., the results of which show that there is a need to promptly rebuild damaged educational facilities as a medium- to long-term response and ensure that children have a safe opportunity to learn. In addition, when rebuilding educational facilities, it is important to consider how to improve these to make them more resilient to disasters. The Project is consistent with these efforts and will directly contribute to achieving the goals of higher-level plans.

The following are the outputs expected to deliver quantitative effects as a result of the implementation of the work within the scope of the cooperation.

| Indicator | Baseline (2023) | Target (2029) [Three years after completion of the Project] |
|---|-----------------|--|
| The number of students who can safely learn in the target schools | 491 students | 1,644 students |

The following qualitative effects are also expected to result from the implementation of the Project.

- Educational services at supported facilities will be restored quickly.
- Damage to facilities to be supported by assistance will be reduced in the event of a disaster.

The Project is expected to have these effects, to assist in the improvement of disaster-resistant facilities—a priority of the Government of Sindh based on higher-level plans of the Government of Pakistan—and to contribute to the stability of socioeconomic circumstances in Pakistan by eliminating regional and gender disparities. Therefore, the Project is considered highly appropriate and effective to implement as a Japanese grant aid project.

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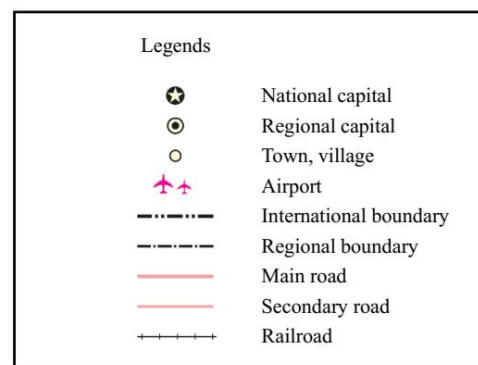
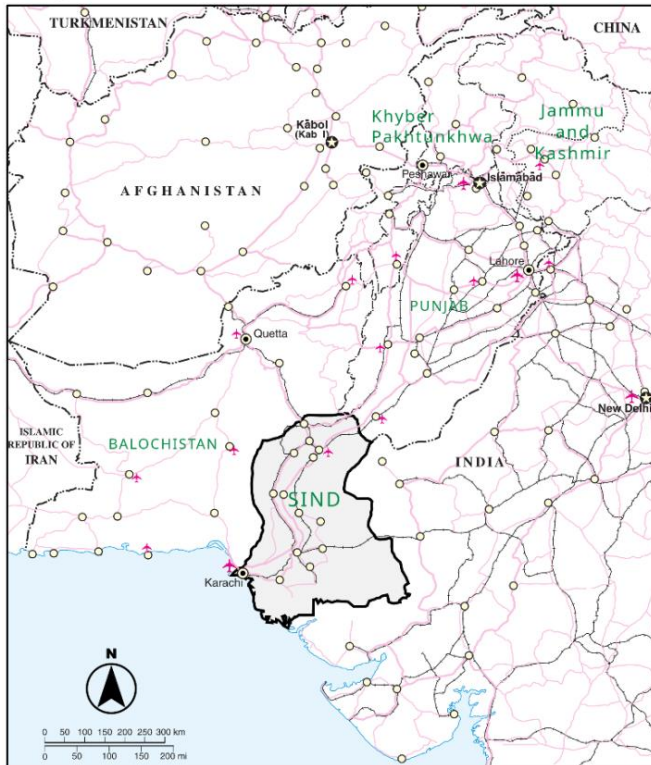
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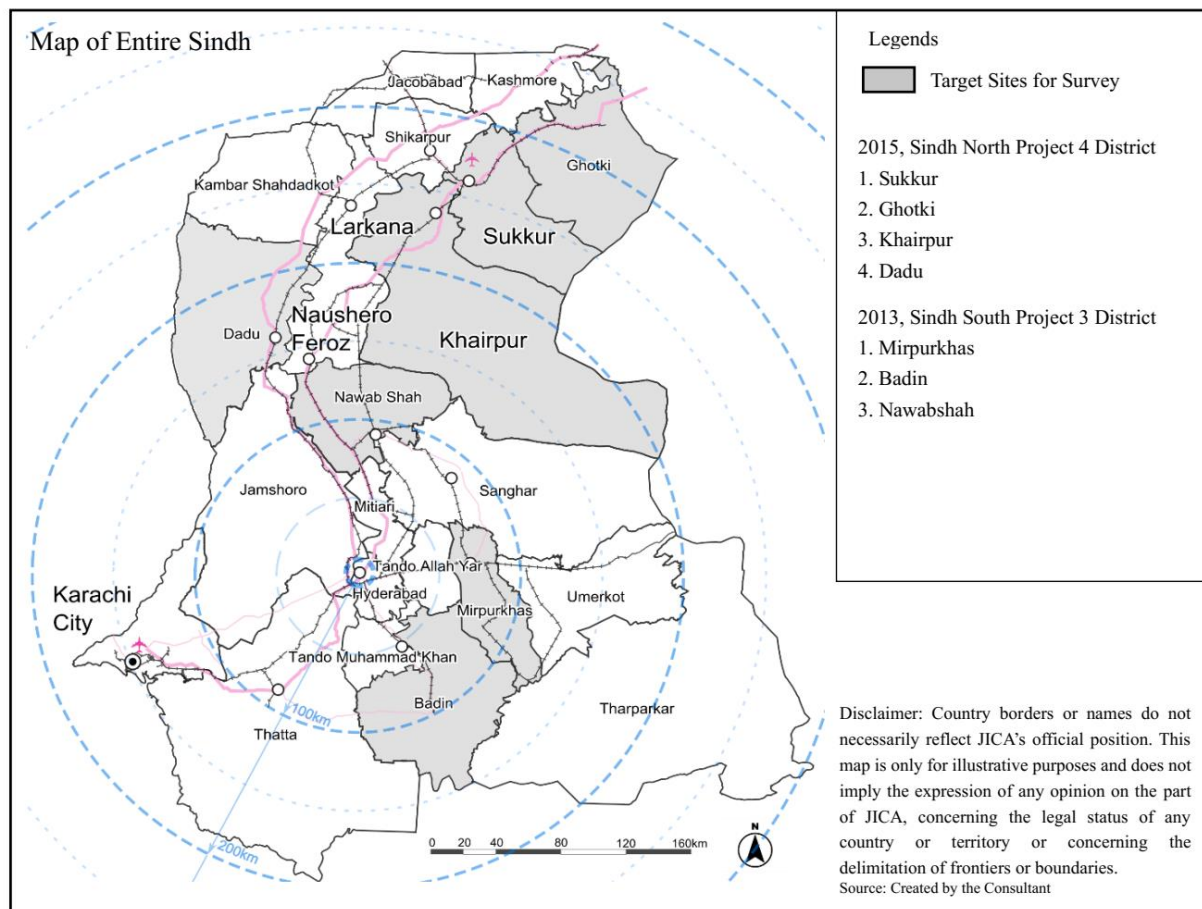
- 1 Members of the Survey Team
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Location Map

Map of Entire Pakistan



Map of Entire Sindh



Perspective



2-story, 4-classroom type (Mi03)



2-story, 6-classroom type (Mi04)

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Abbreviations

| | |
|--------------------|---|
| DEO | District Education Officer |
| EAD | Economic Affairs Division |
| EIA | Environmental Impact Assessment |
| EMO | Education Management Organization |
| E/N | Exchange of Notes |
| FBR | Federal Board of Revenue |
| FRP | Floods Response Plan |
| FTN | Free Tax Number |
| G/A | Grant Agreement |
| HST | High School Teacher |
| IEE | Initial Environmental Examination |
| JICA | Japan International Cooperation Agency |
| NER | Net Enrollment Rate |
| JEST | Junior Elementary School Teacher |
| NGO | Non-Governmental Organization |
| OOSC | Out of School Children |
| PDR | Planning, Development and Research |
| PEC | Pakistan Engineering Council |
| PMR | Project Monitoring Report |
| PSLM | Pakistan Social and Living Standards Measurement |
| PST | Primary School Teacher |
| RC | Reinforced Concrete |
| RSU | Reform Support Unit |
| SBEP | Sindh Basic Education Program |
| SEF | Sindh Education Foundation |
| SELD | School Education and Literacy Department, Government of Sindh |
| SEMIS | Sindh Education Management Information System |
| SERP | Sindh Education Reform Program |
| SESP&R (2019-2024) | School Education Sector Plan & Roadmap (2019-2024) |
| SMC | School Management Committee |
| SPPRA | Sindh Public Procurement Regulatory Authority |
| SST | Secondary School Teacher |
| TED | Teacher Education Development |
| TEO | Taluka Education Officer |
| TLC | Temporary Learning Centers |
| TSS | Transition School Structure |
| USAID | United States Agency for International Development |

Chapter 1 Background of the Project

Chapter 1. Background of the Project

1.1. Background and Outline of the Request

Pakistan is a large South Asian country with a population of about 227 million. Pakistan has the potential to enjoy a demographic bonus and achieve significant economic growth in the future, especially thanks to its abundant young population. However, out of the total 51.53 million children aged 5 to 16 in Pakistan, the number of out-of-school children (OOSC) in the same age group is estimated to be about 22.8 million, the second highest in the world. With roughly 47 million people, the province of Sindh, the Project site, has the second-largest population of the four provinces of Pakistan; with Karachi, the largest commercial and industrial city in Pakistan, the province is seen as an important driver of the country's economic growth. Consequently, many people migrate to Sindh from outside the province, and the population has increased dramatically over the past decade, with a particular increase in the population aged 15 or younger¹¹. However, nearly half of the population lives in rural areas, where three out of four people suffer from multiple forms of poverty¹². In Sindh, economic disparities between Karachi and other urban areas on the one hand and rural areas on the other are more pronounced. Additionally, gender discrimination is more entrenched in Sindh—particularly its rural areas—than in the province of Punjab or the capital of Islamabad, and gender norms and purdah restrict the mobility of girls and women, limiting their access to education and health care services as well as their participation in economic activities.

These economic disparities between urban and rural areas and gender discrimination have a substantial impact on access to education. As noted above, Sindh has a high percentage of OOSC and low school enrollment even compared with other areas of Pakistan, especially among rural girls. Although girls comprise a significantly larger proportion of OOSC among the school-age population (ages 5–16) of Sindh than boys (58% to 47%), the figures for both sexes are well above the national averages (49% and 40%)¹³. Also, as noted above, while there is little difference between genders in urban areas of Sindh when it comes to NER (ages 5-9) in primary education (50% girls, 53% boys), in rural areas there is a 14-point disparity of 32% for girls and 46% for boys¹⁴. Similarly, for NER (ages 10-12) in middle school, the gender gap is reversed in urban areas (25% girls and 24% boys), while in rural areas both genders are very low and girls are in single digits (7% girls and 15% boys)¹⁵.

To address these issues, JICA has so far provided grant assistance for a total of 54 schools in six southern and six northern districts of Sindh Province through the Project for Upgrading Primary Girls Schools into Elementary Schools in Southern Rural Sindh (approved by the Cabinet in

¹¹Sindh Education Sector Plan & Roadmap (SESP&R 2019-2024)

¹² Ibid.

¹³ Pakistan Education Statistics 2016-17.

¹⁴ Government of Pakistan/Pakistan Bureau of Statistics. 2021. *PSLM 2019-20*. Islamabad: GoP/PBS.

¹⁵ Ibid.

FY2013) and the Project for Upgrading Primary Girls Schools into Elementary Schools in Northern Rural Sindh (approved by the Cabinet in FY2015), which reconstructed dilapidated primary school buildings and upgraded middle school classrooms. In addition, through the Project for Upgrading Primary Girls' Schools into Elementary Schools in Rural Areas of Sindh (approved by the Cabinet in FY2022), 20 schools in the four northern districts of Sindh and the district within Karachi Province are being renovated and upgraded from dilapidated primary school buildings and equipped with middle school classrooms for girls, to become girls' elementary schools.

However, from mid-June 2022, monsoon rains caused flooding in various parts of Pakistan, submerging one-third of the country. As a result, the death toll is estimated to have reached more than 1,700, with more than 33 million persons affected (National Disaster Management Bureau, as of November 2022). In mid-September, the Government of Pakistan, together with international organizations, began the PDNA. As mentioned above, according to the PDNA's estimates, the reconstruction needs over the next five years due to heavy rainfall and flood damage amount to USD 16.3 billion, of which USD 918 million accounts for needs in the education sector. In particular, damage in Sindh, which accounts for 66% of the total damage to the education sector, is the most severely affected, far in excess of the other provinces - Balochistan (24.5%), KP (6%), and Punjab (2.5%).

According to the "4RF" declaration released at the Pakistan Meeting of Flood Recovery Country Assistance held in January 2023, the short-term response is to provide and reopen educational opportunities through TLCs and other means. While these efforts are underway, medium- and long-term measures must be taken to quickly rebuild damaged educational facilities and ensure that children have safe opportunities to learn. In addition, when rebuilding educational facilities, it is important to consider how to improve these to make them more resilient to disasters.

Based on the above, the Government of Pakistan requested assistance for the "Project for Reconstruction of Education Facilities in Flood Affected Areas in Sindh". This Project aims to improve learning environments (maintenance of safe learning environments) and disaster resilience through the restoration of educational facilities, equipment, and materials in nine girls' elementary schools in rural areas of Sindh Province that JICA has surveyed and cooperated with, particularly focusing on nine schools in five districts that were damaged by the floods of 2022, and the Project is positioned as a high-priority project in the country's education sector.

The schools supported by JICA in the past through the aforementioned grant aid have been reported to have suffered less damage and destruction from flooding in the 2022 floods, and have been highly evaluated by SELD.

1.2. Natural Conditions

(1) Topography/Geology of the Target Sites

Most of the sites are located on the Indus River plain, which is essentially flat. However, there

is one site (Mi08) that is lower than its surroundings where the ground has been raised with fill dirt to prevent private residences, public facilities, roads, and the like from becoming submerged during floods; when it rains, such sites are at risk of inundation from surrounding properties and long-term flooding.

To select the optimal design for each site based on a firm and detailed understanding of its topography, property size, obstructions, and other conditions, surveys were conducted at 12 sites in total: 11 target sites during the field surveys, as well as one site for which there was an additional request from the Pakistan side. The surveys were subcontracted to local operators, who conducted plane and elevation surveys focusing on existing school properties and including what was known about the surroundings. The surveys were conducted on 10-m grids with 0.5-m contour lines, and the results were compiled into topographic survey charts (CAD data) including coordinates, orientation, property and planned expansion site boundaries, existing building locations, trees and obstructions, and infrastructure.

(2) Soil/Geotechnical Conditions of the Target Sites

When implementing an Outline Design, it is necessary to determine the geology at planned sites and allowable bearing capacity of the ground for designing and building foundations. Accordingly, the following tests were conducted at 12 sites surveyed in the field surveys.

- Standard penetration tests (SPT): Two or three tests were conducted at each site to determine the subsurface structure and ground strength to a depth of 20.0 m below the present ground level.
- Soil sampling and laboratory testing: Undisturbed soil samples were extracted at three points (1 m, 2 m, and 4 m below the present ground level) at two or three locations at each site (a total of six or nine points per site) and tested in a laboratory (triaxial compression tests, consistency limits, grain size distribution, specific gravity, porosity, and moisture content) to determine their physical, chemical, and mechanical properties.

These tests revealed relatively soft ground at many target sites.

According to the survey results, although there were some differences between sites, the soil at the envisioned bearing surface—a depth of 0.8 to 1.2 m below the ground surface—is mostly relatively soft silty clay or silty sand, and the expected bearing capacity is in the range of 50–180 kN/m². Additionally, at sites with high groundwater levels, the water level may fluctuate from season to season, warranting extra attention when constructing foundations.

(3) Climatic Conditions of the Target Area

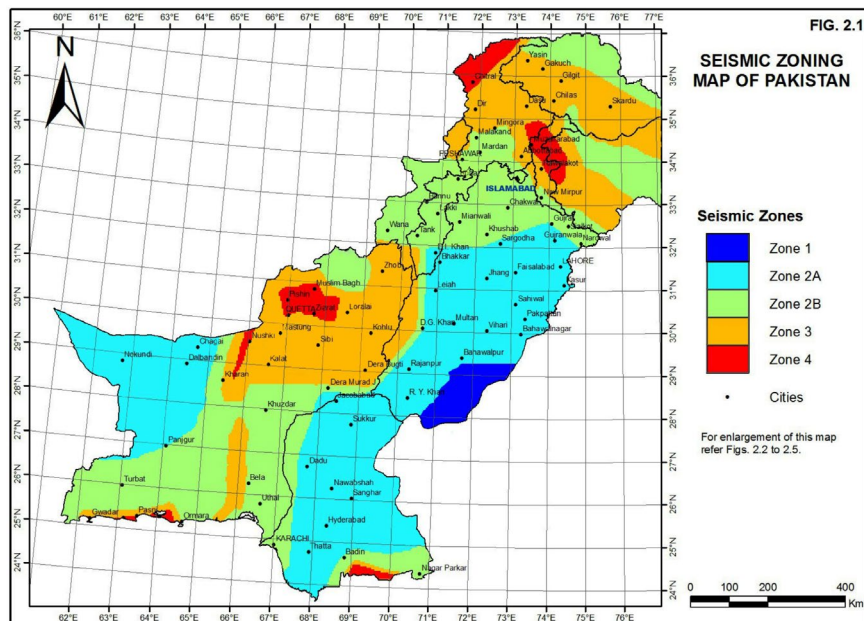
Most of Sindh is in a subtropical monsoon zone, and the year is divided into four seasons: cold (December–February), extremely hot (March–June), rainy (June–September), and transition to cold (October–November). In terms of climate, the province is divided into three areas: the

northern interior (Upper Sindh), the southern interior (Lower Sindh), and the southern coastal region. While the coastal region has a relatively mild maritime climate, most of the interior is hot and dry with less than 200 mm of annual rainfall, with average maximum temperatures higher than 40°C from April to June and temperatures near freezing during the cold season; daily and annual temperature ranges are quite broad. In Upper Sindh, temperatures exceeding 50°C have been recorded at seven locations including Sukkur. Prevailing winds are southwesterly thanks to the monsoon that appears at the end of the cold season in mid-February and stays until the end of September, with cool northerly winds taking over from October to January.

(4) Natural Disasters

Earthquakes

Pakistan frequently experiences earthquakes that entail human loss, headlined by a major magnitude-7.6 earthquake in 2005 that killed more than 70,000 people and caused extensive damage to buildings and other structures in the north of the country. The damage generally occurs in the mountainous regions in northern and western Pakistan. Although there have been some perceptible earthquakes in the target area of the Project, there are no records of earthquakes that damaged buildings. According to the Building Code of Pakistan formulated in response to the 2005 earthquake, Sindh (with the exception of some coastal areas) is classified as Zone 2A (second of the five categories, with the first being the zone with the least expected ground motion). The five districts in which the target sites are located are classified as Zone 2A.

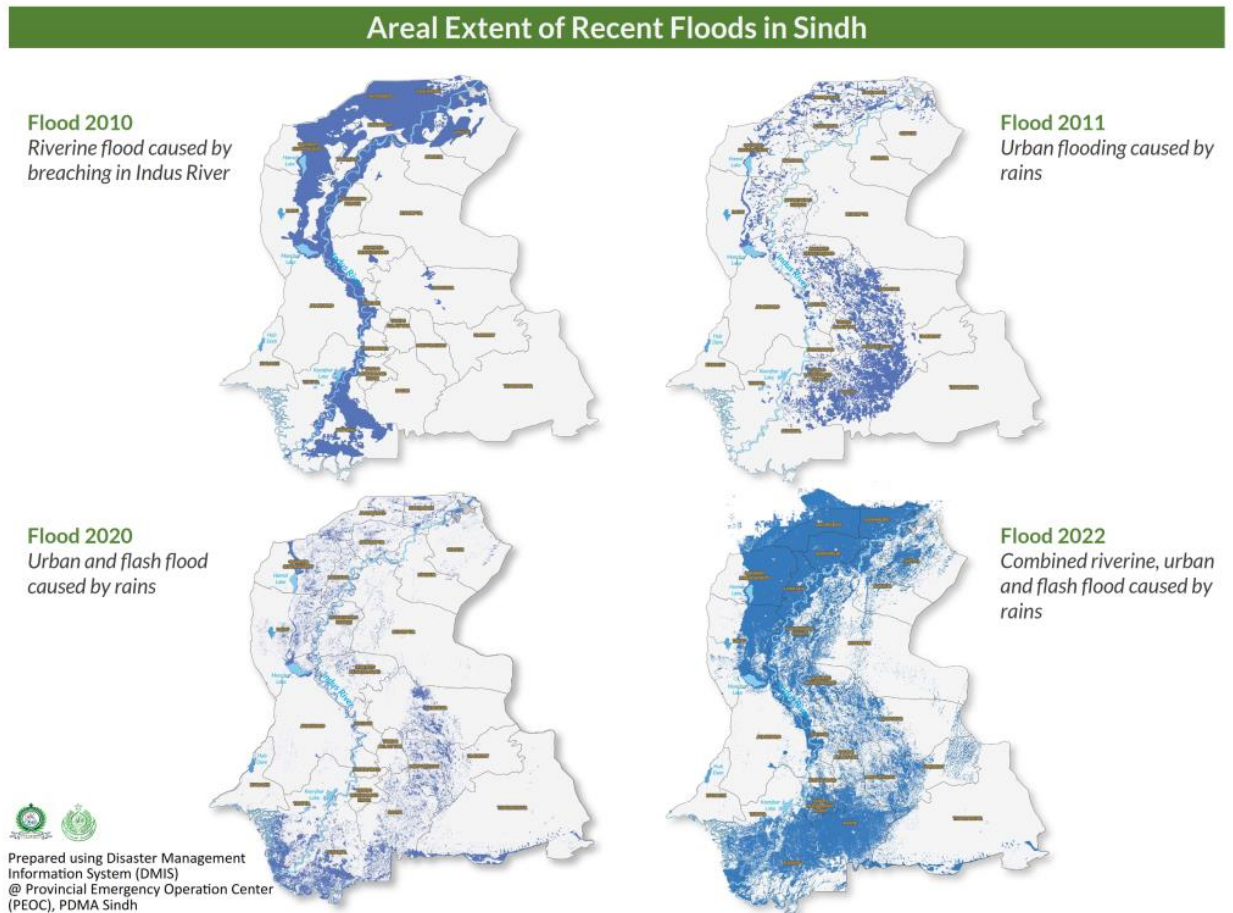


Source: Building Code of Pakistan

Figure 1-1: Seismic Intensity Distribution Map

Floods and Storms

The Indus River plain and Sindh Province are affected by monsoon rains and subsequent flooding every year. Major floods caused by monsoon rains in 2022 resulted in extensive damage with human casualties throughout Sindh Province. The Project must be designed based on the past flooding history of each site so that school buildings may be used or easily restored even in the event of flooding. Following is a flood damage map for Sindh Province for the period 2010-2022. It is clear that the flood damage in 2022 was significant.



Source: <https://pdma.gos.pk/gis-maps/>

Figure 1-2: Flood Damage Map

1.3. Environmental and social considerations

(1) Effects of Project implementation on the natural and social environment

The Project aims to reconstruct existing primary schools damaged by heavy rains, constructing facilities with two-story classroom blocks and lavatory blocks on the sites of girls' elementary schools that were upgraded from primary schools through past cooperation. As each site has already been developed, there are no sites that qualify as ecologically special or environmentally protected. The areas where the facilities are to be constructed are generally around 700 m² and the

topography is mostly flat; however, where the land is lower than the surrounding land and roads, the ground level must be adjusted according to exterior plans to allow stormwater to drain from the properties. Additionally, although effects on the natural and social environment on and off the properties are anticipated due to tree cutting, construction work, and the installation of wastewater treatment systems, environmental standards set out by the Government of Pakistan will be observed. Under the Project, the following considerations will be made to reduce undesirable effects on the environment to the extent possible.

- Land development will be limited to the extent necessary to construct the facilities, and ground levels will be set in overall exterior plans to ensure that building floor levels are above historical flood levels and to avoid negative effects such as stormwater draining out to surrounding land.
- The plan is to minimize changes to the existing natural environment by limiting the removal of existing vegetation to the extent necessary to construct facilities, preserving tall trees to the extent possible.
- Sewage and wastewater will be treated onsite in simple septic tanks and discharged via infiltration inlets in accordance with standards in Pakistan; treated water will be discharged directly into offsite drainage channels only at sites with low infiltration rates. The floor levels of lavatory blocks will be set so that the discharge level from septic tanks is no lower than the maximum flood level for each property to prevent untreated sewage from overflowing even if the property is inundated during the rainy season.
- Most sites must be approached from access roads that run through villages rather than directly from arterial roads. Where there are private residences between roads and sites, access for construction vehicles will be provided along routes that minimize the impact on living environments while obtaining residents' consent.
- Since many of the sites are located in or adjacent to villages, measures against noise during construction, dust and waste material processing, and safety measures will follow the guidelines of the Sindh Environmental Protection Agency, and construction plans will be formulated to minimize negative effects on the living environments of residents in the vicinity.

(2) Systems and procedures pertaining to the Environmental Impact Assessment

The Environmental Protection Agency was established under the Pakistan Environmental Protection Act, 1997, and is responsible for the administration of environmental protection. The agency is also responsible for environmental impact assessments (EIA), and Pakistan Environmental Agency Regulations, 2000, set out specific procedures thereof. The regulations provide a list of projects that require EIA and initial environmental examinations (IEE). Notably, as the Project exists to add facilities to the properties of existing schools or planned expansion sites (on cultivated land) around them, none of which qualify as Environmentally Sensitive Areas

as defined by the Environmental Protection Agency, it has been agreed that no procedures are required. It has also been agreed that SELD will be responsible for handling any such response that becomes necessary.

Chapter 2 Contents of the Project

Chapter 2. Contents of the Project

2.1. Basic Concept of the Project

(1) Overall goal and project purpose

The overall goal of the Project is to restore educational facilities, equipment, and materials in Sindh that were damaged by the 2022 floods, thereby creating a safe learning environment and improving disaster resilience, in turn contributing to ensuring human security and improving social infrastructure in Pakistan. The Project aims to rebuild the damaged educational facilities in order to achieve the overall goal, and to make effective use of these together with the middle schools that have been subject to grant aid thus far.

(2) Basic concept of the project

The Project exists to reconstruct up to 9 schools (roughly 39 classrooms) from 12 sites (11 sites selected in the "Data Collection Survey on Flood Response Through Reconstruction of Education Facilities in Sindh (Data Collection Survey) " plus one additional site) that were damaged by the 2022 floods, out of a total of 78 schools (54 schools in the Previous Project and 24 schools in the Ongoing Project) that Japan has upgraded or is planning to upgrade through grant aid. The Project also exists to provide the minimum required furniture and equipment for operating these facilities.

2.2. Design of the Japanese Assistance

2.2.1. Design Policy

(1) Basic policy

Based on the assumption that the Project will be implemented under Procurement Guidelines for the Japanese Grants (for Japanese consultant and local contractors), and in reference to the design specifications of the previous projects ("Previous Project" and "Ongoing Project"), the Project is formulated such that the local contractors and suppliers will be able to construct high-quality facilities at reasonable prices, and to provide resilience against future disasters.

- Design and construction plans are formulated based on standard construction methods and materials, taking into account the circumstances of construction in each location.
- As a basic requirement, specifications should be appropriately robust against disasters and require little maintenance.
- It is to be used as shelters in the event of a disaster.

(2) Selection of target sites and components

The 12 sites surveyed in this study were the 11 sites selected in the prior "Information Collection and Confirmation Survey" plus one additional site requested by SELD. The sites were selected on the basis

that the existing primary school classrooms required reconstruction after sustaining major structural damage and major leaks due to flooding and continuous rainfall, and the target sites for the Project were selected and prioritized with consideration of the following perspectives.

1) Criteria for selecting target sites

- Sites must not be located in flood hazard areas (flood level GL (Ground Level) + 1.5 m or higher), nor be sites where residents have been relocated.
- Sites must not be in areas where flood waters have yet to recede.
- There must be no overlap with the school construction plans of other donors.
- Sites must not be inaccessible or present difficulty in access.
- It must be possible to ensure safety at the sites.
- The land must be of a size and shape that allows for the envisioned construction of facilities.
- Priority will be given to sites with adequate primary school enrollment (G1-G5) and teacher numbers.

If the Project were to include the 24 sites in the Ongoing Project, the implementation periods would overlap and management would become complicated, so it was decided that sites requiring renovation or reconstruction would continue to be addressed in the Ongoing Project, and they were therefore excluded from the target sites under this Project.

2) Target sites

The selection of sites for cooperation is made in accordance with the priority criteria discussed in the "Data Collection Survey" and the order of priority based on the criteria, with priority given to sites where the number of students currently enrolled in G1-G5 (primary education level) and the number of primary school teachers are sufficient to ensure that the middle schools constructed or to be constructed through grant aid will be fully utilized. Specific priority criteria were presented to SELD for consideration in the "Data Collection Survey" and the following agreement was reached through consultation. The number of primary school students enrolled is evaluated using grade level averages because of the variation in the number of students per grade level among schools, and is classified into four priority levels from the perspective of whether the standard classroom capacity of 30 students is reached and whether the number of teachers required to operate six grades, including pre-school classes, on a grade-by-grade or double grade basis (6 or 3 teachers) is sufficient.

Table2-1: Proposed Criteria for Prioritization

| Criteria for selecting target sites | |
|-------------------------------------|---|
| Priority level A: | Average enrollment of 30 or more students in grades G1-G5 and 6 or more primary school teachers (PST) |
| Priority level A-: | Average enrollment of 30 or more students in grades G1-G5 and 3-5 primary school teachers |
| Priority level B: | Average enrollment of 12-29 students in grades G1-G5 and 3 or more primary school teachers |
| Priority level B-: | Average enrollment of 12-29 students in grades G1-G5 and 2 or fewer primary school teachers |

3) Prioritization of target sites

The following is a prioritized list of sites to be surveyed based on the above criteria.

Table 2-2: Prioritization of Target Sites

| | Code | Province | Taluka | SEMIS | School name | Evaluation |
|--------------------|------|------------|---------------------|-----------|------------------------------|------------|
| Southern Districts | Mi03 | Mirpurkhas | Kot Ghulam Muhammad | 405020099 | GGES - Deh - 294 | B |
| | Mi04 | Mirpurkhas | Kot Ghulam Muhammad | 405020096 | GGES - Kachelo Farm | A |
| | Mi08 | Mirpurkhas | Hussain Bux Mari | 405060015 | GGES - Muhammad Hassan Mari | A- |
| | Ba01 | Badin | T.Bago | 401040123 | GGES - Gullan Khaskheli | B- |
| | Ba06 | Badin | S.F Raho/Golarchi | 401020124 | GGES - Ibrahim Chandio | B- |
| | Na01 | Nawabshah | Nawab Shah | 417020074 | GGES - Quest | B (A) |
| | Na03 | Nawabshah | Sakrand | 417030290 | GGES - Jalalani | B |
| Northern Districts | Kh05 | Khairpur | Faiz Ganj | 415010517 | GGES - Bajeed Fakir | A- |
| | Kh09 | Khairpur | Kot Diji | 415050286 | GGES - Jani Boro | B |
| | Su04 | Sukkur | Pano Akil | 418010225 | GGES - Moto Mirbahar | B |
| | Gh01 | Ghotki | Ghotki | 419010151 | GGES - Officer Colony Ghotki | A |
| | Da05 | Dadu | Mehar | 402040143 | GGES - Wali Muhammad Gorar | B |

The additional building, Na01, was given an A grade based on the criteria for enrollment and number of teachers, but it was determined that some of the existing primary classrooms could continue to be used and that there was no need for reconstruction. However, after discussions with SELD, it was determined that the school has insufficient classrooms for the number of students enrolled and that there is a high need to ensure a safe learning environment for middle class enrollment, so the priority level was lowered to B and it remained eligible.

4) Reviewing and prioritizing target components

The requested components identified in the "Data Collection Survey" are the primary school classroom block (classrooms, principal's offices, and storerooms/teachers' rooms), lavatory block (for students and teachers), classroom furniture, and solar panel systems. In the field survey, the prioritization of the components listed in the table below were explained to SELD and it was suggested that the priority of solar panel system installation should be ranked as Priority C and agreed that it would be carried out at the expense of the partner country. In response, SELD clarified that the

installation of new solar panel systems in 9 schools under this plan and the renovation of solar panel systems in 54 middle schools under the Previous Project were already included in PC-1 as expenses to be borne on the Pakistan side. Regarding the number of classrooms, as a result of the "Data Collection Survey," it was agreed to plan separate classrooms for the pre-school class and the G1 class due to their respective high enrollment numbers. Furthermore, 9 of the 12 sites in the middle schools covered by the Previous Project already had a principal's office and storeroom/teachers' room, and it was agreed that only the three schools without such would be included in the components under this plan. The warehouse will make effective use of the space under the stairs as much as possible.

Below are the descriptions and prioritization of the requested components.

Table 2-3: Descriptions and Prioritization of Requested Components

| | Component | Remarks | Priority level |
|------------|--|---|----------------|
| Facilities | Primary school classrooms | One classroom for each grade level will be maintained according to the expected number of students. Average enrollment in grades G1-5 is 30 or more: 6 classrooms Average enrollment in grades G1-5 is between 12 and 29: 4 classrooms (pre-school, G1, G2+G3, G4+G5) | A |
| | Principal's offices + Teachers' rooms/storerooms | Of the assisted middle schools, the plan will only cover those sites that do not have a principal's office and a storeroom/teachers' room. | B |
| | Lavatory block for students and teachers | | A |
| | Boundary fence/gate | In girls' schools, this is essential to promote school attendance, and so boundaries are to be installed as necessary. | A |
| Equipment | Classroom furniture | Maintain basic student and teacher furniture, etc. | A |
| | Solar panel system | This has already been included in the PC-1 as an expense to be borne by the Pakistan side, and its installation has been confirmed. | C |

In light of the above, regarding the descriptions of target facilities for the Project, and in consideration of the aforementioned requested components among those discussed with SELD during the field surveys, the following criteria were established.

- Facilities must be meet the minimum necessary requirements as primary education facilities among girls' elementary schools.
- Facilities must be standard facilities for public primary education, and must be used and maintained effectively.

5) Policies pertaining to facility plans

Policies pertaining to creating added value (application of the "Build Back Better" concept; use of shelters)

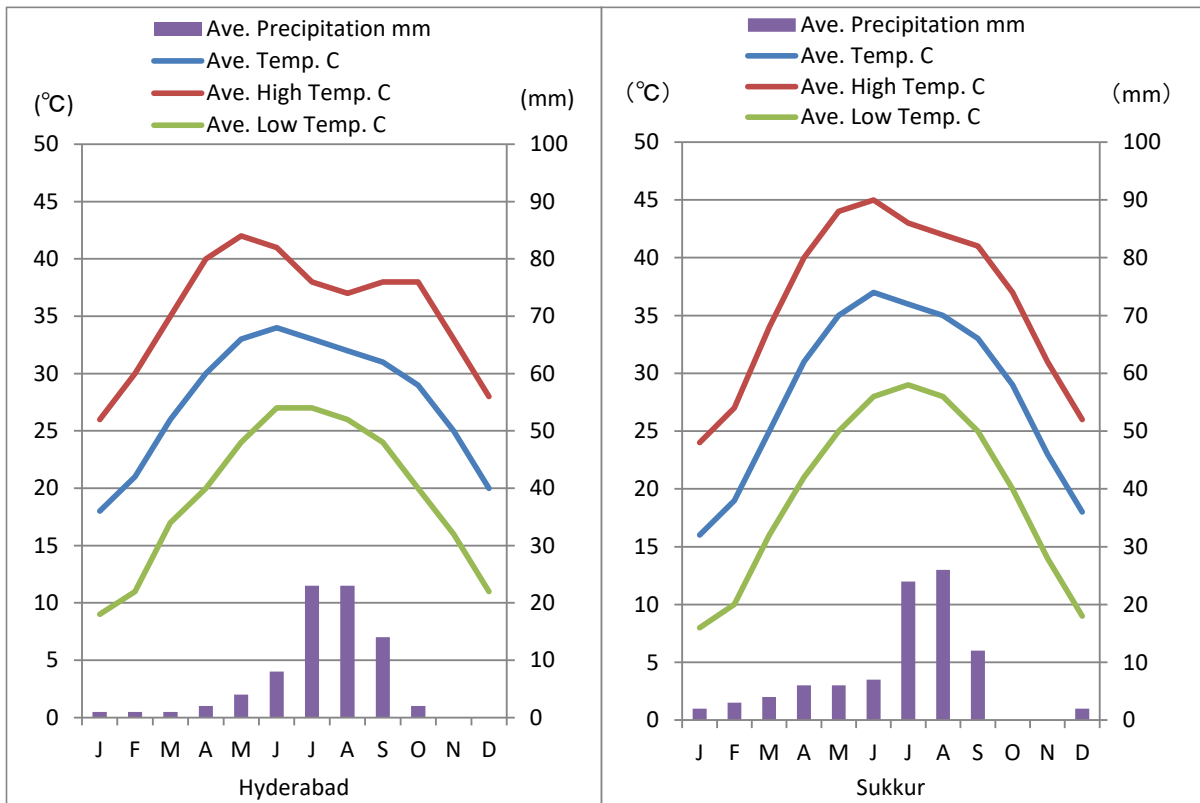
The target middle schools were set at the first floor level based on the inundation level of the 2010 floods, and no inundation above floor level was observed in the 12 middle schools at the 12 sites covered by this Project. In addition, several of the target middle schools were used as shelters in the site field survey, and cases were identified where storerooms were used as private rooms and classrooms were used by multiple families.

In restoring these educational facilities, it is important not trying to return them to their pre-disaster state, but rather to Build Back Better: that is, to identify the likelihood and risks of similar disasters in the future, and then to develop measures to minimize damage from possible future disasters. In light of the above, the policy shall be to include value-added proposals.

(3) Policies for natural environmental conditions

1) Adapting to weather conditions

The province of Sindh is located in the southeastern part of Pakistan and has a subtropical monsoon climate. In terms of climate, the province can be broadly divided into three areas: Upper Sindh (Main city: Jacobabad), Central Sindh (Main city: Hyderabad), and Lower Sindh (Main city: Karachi). Although coastal Lower Sindh has a relatively mild climate, a majority of the inland area extending northward to Sukkur, the target area of the Project, is hot and arid with annual rainfall of less than 200 mm. It is intensely hot from April to June, with average high temperatures exceeding 40°C. Conversely, the weather is relatively cool from November to March, with overnight temperatures dropping below 10°C. The rainy season from July to August occurs as a result of the southwestern monsoon. During this time, torrential rains frequently trigger flooding. Below are weather graphs of average temperatures (maximum and minimum) and rainfall for the past 30 years for Sukkur and Hyderabad.



Source: Prepared by the survey team based on data from <https://www.meteoblue.com/>

Figure 2-1: Weather in the Province of Sindh (Hyderabad, Sukkur)

With regard to these weather conditions, under the Project, facility plans will be implemented according to the following policies.

- Following the standard design in the Project area, buildings will be oriented along the east-west axis whenever possible, and will feature deep eaves to protect the interiors from the sun and rain. At small sites, buildings will be oriented as conditions allow.
- In response to the hot, arid climate, specifications and construction methods that enhance the heat-blocking and insulation performance of roofs and walls will be adopted, with consideration given such that the construction is performed by local contractors.
- With an eye on reducing maintenance costs, plans call for the installation of the minimum number of ceiling fans and other mechanical equipment for high summer temperatures.

Given that most target sites are located on relatively flat land, the policy is to consider the following points with regard to stormwater treatment during the rainy season (July–September).

- In principle, plans call for onsite treatment of rainwater and sewage.
- Concrete plinth protections will be installed around the buildings to prevent contamination of the buildings.

2) Adapting to natural disasters

The main natural disasters in the province of Sindh—the target area—are floods and inundation due to heavy rains and rising rivers. The average annual rainfall in Sindh is roughly 180 mm, but damage occurs every year due to events such as monsoon rains and subsequent flooding. In 2022, heavy monsoon rains (rainfall in the target area: approximately 450-850 mm) caused extensive damage and produced human casualties throughout Sindh Province. Interviews during the reconnaissance surveys of sites revealed that no sites had suffered inundation above floor level in the 2022 floods. In light of the above, under the Project, facility plans will be implemented according to the following policies.

- Standard building floor levels will be set to the design GL + 600.
- The simple septic tanks of lavatory blocks will be installed such that the discharge pipes are higher than the recorded maximum flood level to prevent rainwater from flowing back into the tanks.

Furthermore, as an earthquake-prone country, Pakistan has established seismic design standards for buildings in the Building Code of Pakistan; the target area is classified as 2A (Maximum horizontal acceleration: 0.08–0.16 g). Designs under the Project will take into account the proper seismic forces in line with the Building Code.

3) Adapting to topographical/geological conditions

Most of the target sites (proposed construction areas) are located on flat land, however one site is susceptible to inundation during rainfall as it sits lower than the surrounding area. In response to these topographical and ground conditions, facility plans will be implemented according to the following policies.

- Some sites may be susceptible to inundation because they sit lower than adjacent land or frontage roads; to address this concern, building floor levels will be set to the design ground level + 600, and measures such as using fill dirt or the like to raise the minimum required area to the proper level will be implemented.
- At sites where stormwater is expected to flow in from the surroundings, the plan is to install open channels or other stormwater drainage channels to drain the stormwater offsite.
- On sites with soft ground, the plan is to perform ground improvement or install rubble concrete below the foundations to ensure sufficient soil bearing capacity.

(4) Policies for socioeconomic conditions

1) Policies on cultural aspects

As an Islamic republic, Pakistan observes customs and restrictions in accordance with Islamic law, and also retains a strong structure of traditional tribal society. Additionally, in rural areas, there are wide disparities between men and women and great separation between tribes. Women in particular live under various commandments, including purdah, in which women wear veils and abide by

restrictions on behavior, specifically living separately from men. Project planning will be carried out under the following policies to address these traditional social structures.

- The implementation process will fully account for the impact of Ramadan and other Islamic events.
- In the course of planning the facilities, attention will be paid to environmental improvements that will encourage girls to attend school. Specifically, clean toilets and perimeter fences that block views from outside as much as possible.

2) Policies for price increases

Construction material prices have been rising due to the impact of COVID-19 and recent material price hikes. In particular, the price of rebar has more than tripled since the time of bidding for the Previous Project (November 2016). The costs of other materials have also exceeded the original assumed rate of price increase. In planning the project, it is the policy to fully examine finishing specifications, to minimize cost increases as much as possible, and to set estimated costs that properly account for price increases.

(5) Policies for construction/procurement conditions

1) Architectural standards, permits and approvals, etc.

SELD includes an Education Works department that fulfills a technical role in the construction of school facilities. In donor projects such as the Project, a project unit will be organized to conduct implementation and monitoring pertaining to the Project under SELD. Under the Project, Education Works will verify and approve the technical aspects of compliance with earthquake-resistance standards and other technical standards. Use of local resources will be made efficiently in structural analysis, conducting it in more detail in parallel with the facility study in accordance with local architectural standards.

2) Construction/procurement conditions

Sindh is home to Karachi, the top commercial city in Pakistan, and the province's arterial roads are in good condition; there will be no problems with procuring and transporting common construction materials and equipment locally. Additionally, many construction-related companies—including major contractors and consulting firms involved in large-scale projects inside and outside Pakistan—are based in Karachi. Conversely, in the northern region, even in the main city of Sukkur, the vast majority of construction companies are small and privately owned, making it difficult to secure contractors with the capacity necessary for implementing the Project. Furthermore, as most industrial materials and equipment are procured overland from Karachi, there are risks in terms of cost and construction schedules. Examples include difficulty accessing sites during the rainy season due to unpaved roads and rising transport and material costs due to rapidly increasing fuel prices over the past several years. In the course of planning the construction work, the policy is to properly account for these risks when setting construction schedules and estimating costs.

(6) Policies pertaining to the utilization of local contractors

1) Local consultant

To maintain consistency with the Outline Design and ensure efficient construction supervision, the Japanese consultant that was in charge of the Outline Design was recommended by JICA to continue implementing the Detailed Design and supervising construction. There are several major consulting firms in Sindh—mainly in Karachi—that work on projects inside and outside Pakistan, and several consultants have experience in construction supervision of multi-site projects by other donors. However, given the difficulty local consultants face carrying out the duties of construction supervision in the short period of time required by Japanese grant aid projects, it has been judged that a great deal of effort must be expended to manage the outsourced work. Additionally, because construction supervision at the sites is typically centered around assessing performance for payments, coordinating with the client and contractors, responding to design changes, and quality control, the policy under the Project is to ask a local consulting firm to provide services including technical advice and consultation on local construction methods; in principle, the plan calls for a system in which local engineers are directly hired to supervise under the Japanese resident supervisor of the Japanese consultant.

2) Local construction companies

In accordance with JICA's Procurement Guidelines for the Japanese Grants (for Japanese consultant and local contractors), in principle, facility construction under the Project will be carried out by contractors selected through a general competitive bidding process open to contractors from the recipient country. In Pakistan, public works contractors are registered with the Pakistan Engineering Council (PEC) in eight ranks (CA to C6) that correspond to parameters such as the contract amounts they can receive. Many CA contractors—the highest rank—are involved in major private-sector construction projects inside and outside Pakistan and have strong financial, quality, and schedule control capabilities, but lack experience constructing smaller-scale educational facilities like those in the Project and are not very willing to try to win the orders anyway. Although most school construction and other public works projects are implemented by CB to C6 contractors, few less than the CB rank have sufficient capacity. The policy under the Project is to select and utilize the most suitable contractors through a bidding process after conducting a qualification screening of CA and CB contractors based in the provincial capital of Karachi with experience constructing educational facilities ordered by provincial and district public works departments and comprehensively verifying their financial status, construction capacity, technical abilities, and the like.

3) Furniture suppliers

There are several major suppliers in the Karachi area with experience supplying school furniture for projects implemented by SELD. Some specialized suppliers import and procure third-country (ready-made) products in addition to producing their own products; most ordinary classroom furniture is produced and supplied by these specialized suppliers. According to the record of deliveries from the

Previous Project, there are no problems with the capacity to procure the furniture required for the Project, and the quality and technical abilities are at levels that are free of problems for the purposes of school furniture. However, because the manufacturing, procurement, and transport of furniture must proceed according to the progress of construction work at each of the many sites scattered throughout the province, there are concerns about the ability to manage the entire operation. The policy under the Project is to select and utilize the best furniture supplier through a bidding process after comprehensively verifying their financial status, their technical abilities through sample inspections, and the like. Additionally, the plan calls for furniture to be delivered to each site at the appropriate time and in a reliable manner.

(7) Policies pertaining to operation and maintenance

To minimize the burden of operating and maintaining the new school facilities to be constructed under the Project, the facilities are designed to be robust and easy to maintain based on the use of local standard construction methods and specifications that do not require special techniques for maintenance. The plan also calls for the inclusion of standard equipment and systems that can be easily managed and operated by local personnel of the schools and taluka education offices without requiring specific guidance for controls, operation, or the like.

(8) Policies pertaining to grading facilities/equipment

Facility grades will conform to the standard grades for basic school facilities in the province of Sindh assigned in the Previous Project; the specifications of the main parts will be compared and reexamined in terms of factors such as functionality, economic efficiency, and ease of maintenance, and grades will be adopted at a level that will ensure the functions and durability required of school facilities. Additionally, the furniture will be the same basic furniture provided as the standard furniture in the Previous Project, and will be of the same specifications and grades as the standard furniture procured by the Government of Sindh.

(9) Policies pertaining to construction schedules

The Project exists to reconstruct primary school facilities at roughly 9 existing girls' elementary schools scattered over a wide area in five districts of Sindh. The Project components are simple: classroom blocks, lavatory blocks, perimeter fences, and furniture. The area per site is small, ranging from roughly 250 m² to a maximum of roughly 400 m². The standard construction period per site in the area is roughly 12 months. If each contract is set to around 9 sites and one lot—which allows for the participation of CB contractors, the best suited for the construction work under the Project—the process will take into account the diversion of temporary construction materials and labor. Additionally, given that work efficiency declines during the rainy season from June to September, it is necessary to assume progress of roughly 60% and factor in delays in material deliveries due to roadblocks during the rainy season, and to devise procurement plans and construction schedules to avoid the rainy season to the extent possible. Additionally, many sites are located on small properties in or adjacent to villages,

and thus have various foreseeable construction issues, including restrictions on temporary sites, material and equipment delivery and installation, and the use of heavy machinery. In light of the aforementioned conditions, the policy is to devise viable work schedules after fully considering the unique conditions of each site.

(10) Policies pertaining to safety measures

In terms of additional expenses for safety measures, Pakistan qualifies as a conflict-affected country defined by JICA. According to the Overseas Travel Safety Information of the Japanese Ministry of Foreign Affairs, the danger level of the Jacobabad district in the northernmost part of Sindh is Level 3 (Avoid all travel), while it is Level 2 (Avoid nonessential travel) in other areas of the province. The policy under the Project is to establish systems for safety measures, make consistent efforts to gather information about security, and include the necessary security measures in construction plans.

2.2.2. Basic Plan (Facility Plans/Equipment Plan)

The basic plans for facilities and equipment are devised based on the details and specifications of the Previous Project, with improvements reflecting the status of facility use and maintenance obtained from the field surveys and modifications in terms of added value improvement to be discussed later in this report.

(1) Selecting and prioritizing target sites

Target sites will be selected and prioritized based on comprehensive judgments made after evaluating and analyzing site conditions and other information obtained from the field surveys.

(2) Confirmation of suitability based on enrollment

In this study, a field survey was conducted for all candidate sites to understand the details of each site's school enrollment and schooling situation, including factors such as natural disasters, girls' schooling, number of students enrolled, number of teachers, number of primary schools in the vicinity, the number of students entering middle school, as well as constraints on transitioning to middle education, to confirm the suitability of the selected sites and their prioritization.

1) Number of students enrolled, number of teachers, nearby schools, etc., and constraints on entry into middle school

The table below shows the number of students enrolled at each target school (primary and middle education), the number of teachers, and the number of primary schools in the vicinity (feeder schools within a radius of about 2 km) where students may enter middle school (grades 6-8). The table also includes the results of a survey on factors that may limit the students' advancement and continuation of schooling, such as when they move from the primary to the middle level of the target school.

Table 2-4 Attendance and Limiting Conditions at Target Sites

| Survey Target school | Number of students enrolled in G1-5 | Number of students enrolled in G6-8 | Number of teachers | Number of schools nearby | Limiting conditions |
|----------------------|-------------------------------------|-------------------------------------|--------------------|--------------------------|---|
| | (2022/23) | | | | |
| Mi03 | 111 | 30 | 8 | None | Mixed Muslim/non-Muslim community. 60% of parents are educated and have a good understanding of girls' education. In some cases, they attend schools in town. |
| Mi04 | 150 | 99 | 10 | 4 schools | Mixed Muslim/non-Muslim community. About half of the parents are educated and have a good understanding of girls' education. After completing middle school, most of them go on to high schools away from home. |
| Mi08 | 195 | 20 | 7 | None | Mixed Muslim/non-Muslim community. Most of the parents are engaged in agriculture, parents' interest in and awareness of girls' education is low, and the number of students enrolled in school tends to drop sharply after the third grade of primary as they perform household chores and take care of younger sisters and brothers for their parents. Even if they continue to attend school, many households do so only through the fifth grade and do not send their children on to higher education after that. |
| Ba01 | 90 (including boys) | 15 *1 | 14 | 2 schools | Middle school has single-digit enrollment in each grade. Even at the primary level, there are dropouts every year. This is because of early marriages and because the parents, who are agricultural laborers, ask them to help with the work. Twenty to thirty percent of the fifth grade graduates do not go on to middle school; a little over fifty percent go on to the middle school of this school, and the rest to the high school in town. Many of the teachers were from outside the village and did not seem enthusiastic about promoting girls' schooling. |
| Ba06 | 97 | 25 | 8 | 3 schools | The practice of early marriage persists in the surrounding communities, with students marrying at the age of 13 or 14, and in some cases dropping out of school in the middle of primary school and not continuing on to middle school. |
| Na01 | 215 | 120 | 27 | None | 100% Muslim community. Many of the parents are agricultural laborers and are not educated, but there is a high level of interest in, and awareness of girls' education, partly due to the presence of a university nearby. |
| Na03 | 70 (including boys) | 21 | 7 | 3 schools | Many parents are agricultural laborers, and there appears to be a significant number of OOSCs who are not educated, have little interest or awareness of girls' education, and do not attend school at all. There are restrictions on women's mobility, a strong tendency for control over decision-making by the father, and mothers not participating at all in SMC activities. |
| Kh05 | 248 (including boys) | 65 | 9 | 4 schools | Parents include not only agricultural workers but also landowners, and about 70% of parents have a high interest in and awareness of girls' education. The community is enthusiastic about promoting girls' education and is a resource-ready community. |

| | | | | | |
|------|-------------------------|----------------------------------|----|-----------|--|
| Kh09 | 100 | 40 | 9 | 3 schools | 100% Muslim community. There is a high level of interest in, and awareness of girls' education among residents, but some parents are resistant to coed schools, and there is demand for students to transfer to the middle school of this school instead of a nearby coed school (SEF). |
| Su04 | 101 | 63 | 3 | None | Although most of the parents are agricultural laborers and have not received education, they are interested in and aware of girls' education, and they send their children to middle school after primary school graduation. Five to ten households do not send their children to school because their children help with agricultural labor. The distance from the city (20 km) and lack of transportation makes it difficult to assign teachers and keep them on the job. |
| Gh01 | 193 (including boys) | 33 | 14 | 3 schools | Close to the city, many of the parents are government employees and have a high interest in and awareness of girls' education. Until this primary school opened in 2022/23, most of the students went to GGHSS Ghotki (~G12), which is 2 km away. |
| Da05 | 66 | 22 (6th and 7th graders only) *2 | 4 | 2 schools | Many parents are agricultural laborers, with only a limited number of educated parents, and interest in and awareness of girls' education is not high. It appears that 20 to 30% of the children do not come to school. From the fourth grade onward, there are also boys who help with agricultural labor and girls who take care of housework and younger siblings, and therefore do not attend school. In addition, there appears to be more control of decision-making by men than in other communities. |

* 1 It should be kept in mind that there is a Sindh Education Foundation (SEF) school run by an NGO within 2 km, and according to interviews, many students attend.

* 2 Although the middle education classes has started as of 2022, it should be noted that there is a discrepancy between the number of enrollments registered and the actual number of attendees.

Note: The number of enrollments basically indicates the number of girls' students

Source: Prepared by the survey team based on information from interviews with principals at each target school.

2) Girls' School Enrollment

Around the school there is a blend of two communities, Muslim and non-Muslim, and while many parents are poor agricultural workers, there are also parents who are engineers, government employees, and self-employed people. Among the candidate schools, especially in Badin, there was a strong tendency among the local population to have an inherent prejudice and lack of awareness of girls' education, and several schools had limited access to middle school (grades 6-8) due to early marriage practices (see table below). However, schools in Mirpurkhas and Khairpur seemed to be changing the mindset of the local population to prioritize girls' education over gender norms (parda). Although a small number of girls in schools with originally limited enrollment of girls, including Badin's school, apparently dropped out after the prolonged school closure due to the spread of COVID-19 and the flood disaster, children and students returned to many of the candidate schools (by around December 2022), although the process took some time.

Table 2-5: Girls' Enrollment at Target Sites

| Surveyed schools | At the time of the girls' elementary school upgrade (When accepting middle school students) | After school closure due to spread of COVID-19 (from September 2020) | After flood disaster (from new semester in August 2022) |
|------------------|---|--|---|
| Mi03 | In the first year (2017), twelve 6th graders were accepted, all of whom completed 8th grade. Most went on to high school (10 km). | After school reopened in September, all children and students returned within about a month. | All the students, including those who had evacuated to other locations, returned around December. |
| Mi04 | In the first year (2018), twenty 6th graders were accepted, all of whom completed 8th grade. Eighteen of them went on to coed secondary schools; two did not (parental opposition). | It was difficult for them to return, and they had to appeal to their parents. Five or six primary school students, especially those commuting from far away, did not return. | It took about a month after the start of the new school year in August for all of the children and students to return. |
| Mi08 | The opening of the school was delayed due to a shortage of teachers. In the first year (2020), only 2 students in 6th grade (impact of COVID-19). The number of faculty members increased to four. | Many of the children and students were eagerly awaiting the reopening of school and returned immediately. | After the school was closed and reopened on September 13th, it took about 10-15 days for children and students from far away to return. |
| Ba01 | In the first year (2017), eleven 6th graders were accepted. All students completed 8th grade; however, there were annual dropouts due to early marriages of primary and middle school students. | Many parents were agricultural laborers and often did not return their children to school because they asked them to help with the work. | This did not have such a great impact, and the children and students soon returned. |
| Ba06 | In the first year (2017), seventeen 6th graders were accepted. Two or three of them dropped out within a year (due to lack of motivation) and the rest went on to secondary school (10 km). | 16 of 102 primary school students and 8 of 28 middle school students did not return; the main reason for dropping out was early marriage. | From September to October, the children and students gradually returned. |
| Na01 | In the first year (2017), nineteen 6th graders were accepted. | Unknown, as the principal interviewed was assigned in the 2022/23 school year. | The area was damaged by flooding for 60 days and used as shelter for about 30 days. |
| Na03 | In the first year (2019), four 6th graders were accepted. | It took about three months for everyone to return. | Four families moved to different locations and thus four primary school children dropped out of school. |
| Kh05 | In the first year (2017/18), the school accepted 28 6th graders, 22 7th graders, and 20 8th graders; after the COVID-19 pandemic began, only 17 of the 24 students who completed 5th grade went on to 6th grade in the 2020/21 school year. | Students gradually returned. | The children and students came back gradually, and it took two months for all of them to return. |
| Kh09 | In the first year (2019/20), fifteen 6th graders were accepted. After the COVID-19 pandemic began in the 2020/21 school year there were eight 7th graders, and in the 2021/22 school year there were 17 8th graders. | The students gradually returned; it took about two weeks for all of them to return. | After a three-month school closure following the start of the new school year in August, the school reopened in November. |
| Su04 | In the first year (2021/22), twenty 6th graders were accepted. All are continuing their schooling through the 8th grade. | The children and students did not return as planned, and it took about two months for all of them to return. | School reopened in October and everyone had returned in December. |

| | | | |
|------|---|--|---|
| Gh01 | In the first year (2022/23 school year), twenty-seven 6th graders were accepted, 13 of them from this primary school and 14 from other primary schools. | Gradually they returned and no one dropped out. | School resumed at the end of August, and it took about a month for everyone to return. |
| Da05 | In the first year (2022/23), eighteen 6th graders and five 7th graders were accepted. | Unknown, as the principal interviewed was assigned in the 2022/23 school year. | School was closed until the end of September, reopened in October, and the children returned immediately as they were eagerly awaiting the reopening. |

(3) Setting the scope of the Project

Based on the results of the above study, and taking into consideration the size of the Japanese budget, the scope of sites for the Project was set as follows in order of priority.

Table 2-6: Prioritization of Target Sites

| Priority level | Site | Remarks |
|----------------|-------------------------------|---|
| A | Mi04, Gh01 | Since high demand is expected based on existing enrollment, the Project plan shall cover one classroom per grade level. |
| A- | Mi08, Kh05 | |
| B | Mi03, Kh09, Su04, Na01, Na03, | Since a certain level of demand is expected based on existing enrollment, the number of classrooms will be set according to existing enrollment and existing available classrooms, and some grades will be targeted for planning as double-grade classes. |
| B- | Ba06, Da05, Ba01 | Although a certain level of demand is expected based on existing enrollment, the number of teachers is below 3, and there are operational concerns; therefore, the site is considered a reserve site with a lower priority level. |

In addition to the number of primary school enrollments, it was agreed with SELD that the order of priority for reserve sites would be Ba06, Da05, and Ba01, given that Ba01 is in competition with SEF-supported schools.

Table2-7: Priority of Target Sites

| S.no | District | School Name | | SEMIS | Kati | | G1 | | G2 | | G3 | | G4 | | G5 | | Total G1-G5 | | Average G1-5 | | G6 | | G7 | | G8 | | Total G6-G8 | | Average G6-8 | | G9 | | G10 | | ECT | | PST | | JEST | | HST/SST | | Other | | Total | | Status of Existing School | Safety Issues | Grade of Target Site (G1-5) | | | | | | |
|------|------------|-------------|------------------------------|-----------|------|----|----|----|----|----|-----|----|----|----|----|-----|-------------|----|--------------|----|----|----|----|----|----|----|-------------|---|--------------|---|----|---|-----|---|-----|---|-----|---|------|---|---------|---|-------|---|-------|-----------------------|---------------------------|-----------------------|-----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------|---|
| | | | | | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | | | | | | | | | | | |
| | | | | | F+ | | M | | F+ | | M | | F+ | | M | | F+ | | M | | F+ | | M | | F+ | | M | | F+ | | M | | F+ | | M | | F+ | | M | | F+ | | M | | F+ | | | | | M | | | | | |
| 3 | Mirpurkhas | Mi03 | GGES - Deh - 294 | 405020099 | 16 | 18 | 24 | 22 | 17 | 14 | 95 | 0 | 19 | 19 | 7 | 8 | 15 | 30 | 0 | 10 | 10 | | | | | | | | | | | | | | | | | | | | | | | 8 | 0 | In need of rebuilding | | B | | | | | | | |
| 4 | Mirpurkhas | Mi04 | GGES -Kachelo Fam | 405020096 | 90 | 36 | 25 | 23 | 47 | 19 | 150 | 0 | 30 | 30 | 47 | 26 | 26 | 99 | 0 | 33 | 33 | | | | | | | | | | | | | | | | | | | | | | | | 10 | 0 | In need of rebuilding | | A | | | | | | |
| 7 | Mirpurkhas | Mi08 | GGES – MuhammadHassan Mari | 405060015 | 50 | 80 | 58 | 38 | 11 | 8 | 195 | 0 | 39 | 39 | 11 | 6 | 3 | 20 | 0 | 7 | 7 | | | | | | | | | | | | | | | | | | | | | | | | 7 | 0 | In need of rebuilding | | A- | | | | | | |
| 22 | Badin | Ba01 | GGES - Gullan Khaskheli | 401040123 | 32 | 18 | 21 | 4 | 11 | 3 | 16 | 4 | 14 | 3 | 14 | 76 | 14 | 15 | 18 | 5 | 7 | 3 | 15 | 0 | 5 | 5 | | | | | | | | | | | | | | | | | | | | 14 | 0 | In need of rebuilding | | B— | | | | | |
| 26 | Badin | Ba06 | GGES - Ibrahim Chandio | 401020124 | 60 | 18 | 11 | 15 | 28 | 25 | 97 | 0 | 19 | 19 | 11 | 8 | 6 | 25 | 0 | 8 | 8 | | | | | | | | | | | | | | | | | | | | | | | | | 8 | 0 | In need of rebuilding | | B— | | | | | |
| 19 | Nawabshah | Na01 | GGES - Quest | 417020074 | 190 | 50 | 55 | 40 | 35 | 35 | 215 | 43 | 38 | 42 | 40 | 120 | 40 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | 30 | 0 | In need of renovation | | B | | | | |
| 21 | Nawabshah | Na03 | GGES - Jalalani | 417030290 | 65 | 25 | 10 | 5 | 10 | 5 | 11 | 1 | 10 | 3 | 11 | 4 | 52 | 18 | 10 | 14 | 9 | 6 | 6 | 21 | 0 | 7 | 7 | | | | | | | | | | | | | | | | | | | | | 9 | 1 | In need of rebuilding | | B | | | |
| 33 | Khairpur | Kh05 | GGES - Bajeed Fakir | 415010517 | 118 | 47 | 25 | 15 | 32 | 3 | 16 | 9 | 27 | 13 | 23 | 20 | 123 | 60 | 24 | 36 | 26 | 21 | 18 | 65 | 0 | 22 | 22 | | | | | | | | | | | | | | | | | | | | 4 | 9 | 0 | In need of rebuilding | | A- | | | |
| 37 | Khairpur | Kh09 | GGES - Jari Buriro | 415050286 | 75 | 24 | 21 | 18 | 13 | 24 | 100 | 0 | 20 | 20 | 17 | 15 | 8 | 40 | 0 | 13 | 13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | 9 | 0 | In need of rebuilding | | B | | |
| 40 | Sukkur | Su04 | GGES - Moto Mirbahar | 418010225 | 50 | 10 | 30 | 21 | 20 | 20 | 101 | 0 | 20 | 20 | 24 | 19 | 20 | 63 | 0 | 21 | 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | 0 | In need of rebuilding | | B | | | |
| 46 | Ghotki | Gh01 | GGES – Officer Colony Ghotki | 419010151 | 55 | 25 | 27 | 15 | 50 | 10 | 19 | 8 | 32 | 6 | 13 | 13 | 141 | 52 | 28 | 38 | 27 | 5 | 1 | 33 | 0 | 11 | 11 | | | | | | | | | | | | | | | | | | | | | | | | 14 | 0 | In need of rebuilding | Exercise caution | A |
| 53 | Dadu | Da05 | GGES – Wali Muhammad Gorar | 402040143 | 40 | 20 | 14 | 12 | 14 | 6 | 66 | 0 | 13 | 13 | 18 | 5 | | 23 | 0 | 8 | 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 | 0 | In need of rebuilding | | B— | |

23

12<P<30
30 ≥ P

ECT: Early Childhood Teacher JEST: Junior Elementary School Teacher
PST: Primary School Teacher HST/SST: High School Teacher / Secondary School Teacher

(4) Reviewing and prioritizing target components

Based on the facility and equipment components requested by SELD, the scope of cooperation will be established by reviewing the relevance of cooperation and the proper details and scale for these components. The following are the results of considerations and design policies for each component.

1) Facility components

Classrooms (for primary education)

An appropriate number of classrooms for primary classes is essential to ensure the effective use of the classrooms for middle education constructed under the Project; accordingly, the plan is to replace existing facilities at sites where existing classrooms are deemed unfit to remain in service because of obvious deterioration or damage caused by natural disasters. The decision was made to set the planned number of primary school classrooms at 6 classrooms if the average enrollment in grades G1-5 is 30 or more, and 4 classrooms if the average enrollment in grades G1-5 is between 12 and 29. In addition, for sites where some of the existing primary classrooms were able to be utilised, plans were made to cover insufficiencies in terms of number of classrooms. In setting 4 classrooms, the plan is for the pre-school class and G1 class to be in separate classrooms due to their respective large enrollment numbers, and for G2 + G3 and G4 + G5 to share classrooms.

Principal's offices

As an essential facility for school operations, one principal's office will be constructed at each site that lacks existing facilities capable of remaining in service. Principal's offices will be half the size of classrooms to provide space for carrying out official duties—enough for a desk, chair, and storage shelves—and for receiving visitors.

Teachers' rooms/storerooms

Given the pressing need to properly store teaching materials and administrative documents, one storeroom/teachers' room will be constructed at each site that lacks a storeroom among existing facilities capable of remaining in service. The plan calls for warehouses/teachers' rooms to be half the size of classrooms, and to double as break rooms for teachers in addition to storage.

Lavatories

As essential facilities for schools to function, the plan calls for lavatories to be constructed in separate blocks to prevent odors and contamination from reaching classroom blocks. Given the need to secure proper distance from sources of clean water and other buildings on small properties, the minimum scale is six stalls for six classrooms (five stalls and one stall for people with disabilities and teachers) and four stalls for four classrooms (three stalls and one stall for people with disabilities and teachers), and the number of stalls will be adjusted according to site constraints. For

sites where a lavatory block cannot be installed due to the lack of space, the plan is to use existing lavatory blocks.

Compound walls

Boundary fences that prevent outsiders from entering and block views from outside are essential for girls' schools in Islamic countries to encourage enrollment of girls. Because many target sites are located on small properties, it is necessary to combine buildings and fences in the designs for some sites; the decision was made to include compound walls in the main construction work and to include the erection of compound walls where no fences exist or where existing facilities are unfit to remain in service in the scope of the Project.

2) Equipment components

Furniture

The scope of the Project includes basic, absolutely necessary furniture, specifically classroom furniture (desks/chairs for students/teachers, storage shelves) and administrative furniture (desks/chairs for principals, chairs for visitors, tables/chairs for meetings, storage shelves). The furniture will be delivered to target sites because it is essential for school facilities to function properly.

Solar power generation system

As mentioned above, it was agreed that the installation of a photovoltaic power generation system would be carried out at the expense of the partner country. This plan includes wall sleeves for piping. Information on the location of inverters and batteries and the load of solar panels will be shared with SELD and reflected in the plan.

(5) **Setting the scope of the Project**

Table 2-8: List of Target Sites/Components

| Priority level | No. | Site name (School name) | Facility description | | | | Compound walls |
|-------------------|------|------------------------------|----------------------|--|------------------|-----------|----------------|
| | | | Classroom block | | Lavatory block | Furniture | |
| | | | Class-rooms | Principal's offices/ Teachers' rooms/ Storerooms | Number of stalls | | |
| 1st priority (A) | Mi04 | GGES - Kachelo Farm | 6 | 1 | 6 | ○ | ○ |
| | Gh01 | GGES - Officer Colony Ghotki | 6 | | 2 | ○ | ○ |
| 2nd priority (A-) | Mi08 | GGES - Muhammad Hassan Mari | 6 | | 6 | ○ | ○ |
| | Kh05 | GGES - Bajeed Fakir | 6 | | 6 | ○ | |
| 3rd priority (B) | Mi03 | GGES - Deh - 294 | 4 | 1 | 4 | ○ | |
| | Kh09 | GGES - Jani Boro | 4 | | 2 | ○ | ○ |
| | Su04 | GGES - Moto Mirbahar | 4 | | | ○ | |
| | Na01 | GGES - Quest | 4 | | 4 | ○ | ○ |
| | Na03 | GGES - Jalalani | 4 | 1 | 4 | ○ | |
| Totals | | 9 sites | 44 | 3 | | | |

The relevance of cooperation and proper details and scale for the facility and equipment components identified in the field surveys in line with the basic policies set out in the previous section (Design Policies) and agreements with the partner country will be considered, and the ultimate priority for the case in which coordination is necessary set in response to the results of the bidding in the implementation stage.

First priority group: Facility and furniture components of sites assigned Priority Level A in enrollment demand evaluations

Second priority group: Facility and furniture components of sites assigned Priority Level A- in enrollment demand evaluations

Third priority group: Facility and furniture components of sites assigned Priority Level B in enrollment demand evaluations

Given that the Project will be implemented in accordance with the framework of Procurement Guidelines for the Japanese Grants (for Japanese consultant and local contractors), the priority groups will be structured to allow for flexible response to the narrowing of components (scope) during rebidding in the event that the local bidding results are unsuccessful.

(6) **Building construction plans**

1) Standard facility type

SELD has established facility standards and minimum scales for primary schools and developed a prototype plan, but in the implementation stage, district-level Education Works departments

implement designs in which they or a consultant contracted by them accounts for individual site conditions. There are no specific standard specifications or design criteria; the system is such that Detailed Designs are compiled on a project-by-project basis.

In light of this fact, the specifications of the design details of the Previous Project will be the basis for the Project, and several prototypes will be designed independently, with an Outline Design implemented such that the prototypes are applied to each site. Notably, because many target sites are located on small properties, and various limitations on construction sites must be accommodated, four types of classroom block (including two-story buildings) and three types of lavatory block were configured. There are many brick or concrete block masonry buildings in the area; however, as in the Previous Project, the decision was made to adopt RC framing, brick walls, and flat (gently sloping single-pitch) RC slab roofs for the Project in pursuit of more robust facilities.

Table 2-9: Facility Types

| | | Name of type | Number of rooms in the building | | | Floor area (m ²) | Remarks |
|------------------|--------------------|--------------|---------------------------------|---------------------|--------------------------------|------------------------------|---------|
| | | | Classrooms | Principal's offices | Teachers' rooms/ Storerooms | | |
| Class-room block | Two-story building | 2F-6CR-HS | 6 | 1 | 1 | 376.65 | |
| | | 2F-6CR | 6 | | | 330.60 | |
| | | 2F-4CR-HS | 4 | 1 | 1 | 250.85 | |
| | | 2F-4CR | 4 | | | 204.80 | |
| Lavatory block | Flush toilets | F2 | 2 stalls | | | 7.20 | |
| | | F4 | 4 stalls | | | 16.20 | |
| | | F6 | 6 stalls | | | 23.04 | |

2) Layout

The layout of facilities on the sites will be optimally planned in accordance with the following principles, holistically accounting for unique conditions of each site (e.g. site size, shape, and topography; state of road access; surrounding environment; existing structures on the site; vegetation).

- The buildings will be oriented along the east-west axis whenever possible, with the open corridor on the south side in principle to protect the interiors from insolation from the south during the day.
- Buildings will be oriented along the slopes of the properties to the extent possible to minimize land development and leveling, while taking full advantage of the present topographical conditions in principle.
- Lavatory blocks will be located such that proper distance from sources of clean water and clean water pipes is secured and the negative impact of odors and contamination are minimized, taking into account prevailing winds and the slopes of the properties. Layouts will also take into

account the qibla¹⁶.

- The following exterior development is planned as the minimum required facilities for Project facilities to function properly.
 - Compound walls: Many target sites are located on small properties, and connections with existing perimeter fences and buildings are expected to be critical factors; therefore, construction work must be based on meticulous plans that account for temporary facilities and schedule restrictions. Because they block views from outside, compound walls are essential facilities for girls' elementary schools, and will be upgraded within the scope of the Project when no existing compound walls are fit to remain in service.
 - Wells: The plan under the Project is to use water from onsite wells (shallow wells) for toilet flushing in all but two sites. Two sites without water supply sources will be served by new wells. In addition, if the water supply pump is malfunctioning, it should be included in the targets for maintenance.
 - Stormwater drainage systems: The target region includes one site where residential land is prone to flooding because roads are raised above the level of residential land to avoid inundation. The plan under the Project is to prevent flooding at the site by accounting for elevation differences with adjacent properties, using fill dirt as needed to prevent stormwater from entering from offsite, and installing open channels as needed to drain stormwater from the sites.
 - Onsite pathways: The minimum required (paved) onsite pathways will be installed to ensure access to school buildings and between facilities when properties are flooded during the rainy season or when the ground is muddy due to rainfall. Onsite pathways will be installed as part of facility construction because they are essential for ensuring that facilities function properly during the rainy season and must be designed in response to building floor levels.
- At many target sites, it is necessary to completely demolish and remove buildings, structures, trees, and other obstacles prior to starting the main construction work. If the partner country is responsible for implementing these tasks, there is a risk of delays to the construction work as in the case of well drilling, as well as the envisioned risk of the contractor in charge of the demolition and removal work failing to perform it properly and substantially impacting the implementation of the main construction work. To reduce these risks and consider the advantages of clarifying the scope of responsibility for the construction work and making it possible to ensure quality and coordinate work schedules under the supervision of the Japanese consultant, the plan is to reduce practical risks by including the necessary demolition and removal work prior to starting the main construction work in the scope of the Project (Exterior work: Site clearance).

¹⁶ The direction Muslims face when they pray.

3) Floor plans

The floor plans for each block were devised as follows.

Classroom blocks

The floor plan will be a simple plan with the rooms placed along outside corridors known as “verandas,” which are common in the area. Classrooms will be 5.28 m x 6.24 m (32.95 m² or 1.10 m²/student), which is slightly larger than the SELD minimum dimensions of 16 feet x 20 feet (4.88 m x 6.10 m, 29.77 m² or 0.99 m²/student)—particularly in terms of width—to allow enough space for the furniture, with standard beam spans of 3.12 m for consistency with the floor plans of the Previous Project. Additionally, to accommodate the many restrictions of small sites, the plans for two-story, four-classroom buildings incorporate stairwells at the ends of the outside corridors.

The rooms are structured such that classrooms, multipurpose rooms, principal’s offices, and storerooms are combined within standard spans when necessary. The table below shows the details of the rooms.

Table 2-10: Structure of Rooms

| Room name | Plan details | Floor area |
|--------------------------------|--|--|
| Classrooms | Assuming capacity of 30 people, the spaces are designed to accommodate 15 sets of 2-person desks and 2-seater chairs, as well as one desk and chair for the teacher. As in the Ongoing Project, there is 1.1 m ² /student. The plan is to change only the size of the furniture, keeping the size of the rooms the same as for primary classes. | 32.95 m ² (1.10 m ² /student) |
| Principal's offices | Principal’s offices require space for carrying out official duties (enough for a desk, chair, and storage shelves) as well as a space for receiving visitors and holding meetings. Although slightly below the local standard (17.86 m ²), the planned size is sufficient in terms of functionality. | 16.48 m ² (one-half the size of a classroom) |
| Teachers' rooms/ Storerooms | In addition to storing teaching materials, books, and administrative documents, storerooms/teachers’ rooms will be large enough to accommodate tables and chairs to function as simple break rooms for teachers. | 16.48 m ² (one-half the size of a classroom) |
| Exterior corridors | Exterior corridors at many existing primary schools are used as temporary classrooms and for other educational purposes. The same functions are assumed under the Project; the necessary width (Effective width: Roughly 1.8 m) will be ensured. | - |

Lavatory blocks

Based on the design details of standard facilities in the area, the plans include three types of facilities (with two, four, or six stalls) corresponding to the number of planned classrooms at each site. In principle, the standard will be a total of four stalls comprising three stalls for the four primary classrooms added under the Project and one stall for people with disabilities. If no existing

lavatories are fit to remain in service, one or two stalls will be added so that the lavatories have toilets in a total of five or six stalls. For sites where site constraints make it difficult to build according to the standard, the plan is to build two stalls, and for sites where a lavatory block cannot be installed due to a lack of space, the plan is to use existing lavatory blocks.

Many of the sites lack space, so the policy is to keep the building size as small as possible to prevent interference with the well that serves as the water source.

The following table shows the details of plans for each site and facility type based on the aforementioned plans.

Table 2-11: Details of Plans for Each Site

| SR.# | School | Planned Facilities | | | | | | | | | | Other items | | | | | | |
|-------------------|------------------------------|--------------------|--------|----------|----------|----------------|----------|--------------------|-------------------------|--------------|---------------|---------------|------------|--------------------|------------------|------------------------|------|------|
| | | Classroom block | | | | Lavatory block | | Total | Infrastructure | | | Extended land | Embankment | Soil stabilization | Bearing capacity | Demolition and removal | | |
| | | BLDG type | Storey | FL level | Area [a] | BLDG type | Area [b] | Floor area [a]+[b] | Electricity Client work | Water supply | Drainage | | | | | BLDG | Wall | Tree |
| Mirpurkhas | | | | | | | | | | | | | | | | | | |
| Mi03 | GGES - Deh - 294 | 4CR-HS | 2F | +600 | 250.85 | F4 | 16.20 | 267.05 | Solar power | New well | Soakaway | — | — | — | | Need | — | Need |
| Mi04 | GGES - Kachelo Farm | 6CR-HS | 2F | +600 | 376.65 | F6 | 23.04 | 399.69 | Solar power | City water | Soakaway | Yes | — | — | | Need | Need | Need |
| Mi08 | GGES – MuhammadHassan Mari | 6CR | 2F | +600 | 330.60 | F6 | 23.04 | 353.64 | Solar power | City water | Soakaway | — | — | — | | Need | Need | — |
| Badin | | | | | | | | | | | | | | | | | | |
| Ba01 | GGES - Gullan Khaskheli | 4CR | 2F | +600 | 204.80 | | | 204.80 | Solar power | City water | Soakaway | — | — | — | | Need | Need | Need |
| Ba06 | GGES - Ibrahim Chandio | 4CR | 2F | +600 | 204.80 | F4 | 16.20 | 221.00 | Solar power | Ex. Well | Soakaway | — | — | — | | Need | Need | — |
| Nawabshah | | | | | | | | | | | | | | | | | | |
| Na01 | GGES - Quest | 4CR | 2F | +600 | 204.80 | F4 | 16.20 | 221.00 | Solar power | City water | Public sewage | — | Yes | — | | — | Need | — |
| Na03 | GGES - Jalalani | 4CR-HS | 2F | +600 | 250.85 | F4 | 16.20 | 267.05 | Solar power | Ex. Well | Public sewage | — | — | — | | Need | — | — |
| Khairpur | | | | | | | | | | | | | | | | | | |
| Kh05 | GGES - Bajeed Fakir | 6CR | 2F | +600 | 330.60 | F6 | 23.04 | 353.64 | Solar power | New well | Soakaway | — | — | — | | Need | Need | Need |
| Kh09 | GGES - Jani Buriro | 4CR | 2F | +600 | 204.80 | F2 | 7.20 | 212.00 | Solar power | Ex. Well | Soakaway | — | — | — | | Need | Need | Need |
| Sukkur | | | | | | | | | | | | | | | | | | |
| Su04 | GGES - Moto Mirbahar | 4CR | 2F | +600 | 204.80 | | | 204.80 | Solar power | Ex. Well | Soakaway | — | — | — | | Need | — | — |
| Ghotki | | | | | | | | | | | | | | | | | | |
| Gh01 | GGES – Officer Colony Ghotki | 6CR | 2F | +600 | 330.60 | F2 | 7.20 | 337.80 | Solar power | Ex. Well | Soakaway | — | — | — | | Need | Need | Need |
| Dadu | | | | | | | | | | | | | | | | | | |
| Da05 | GGES – Wali Muhammad Gorar | 4CR | 2F | +600 | 204.80 | | | 204.80 | Solar power | Ex. Well | Soakaway | — | — | — | | Need | Need | Need |

4) Elevation and section plans

Classroom blocks

- **Floor levels:** In light of past inundation levels, the standard floor level is set to the design GL + 600 mm.
- **Floor/ceiling heights:** Given the hot, arid weather conditions in the target area, the policy is to strive to improve indoor environments by ensuring sufficient airspace and providing natural ventilation; accordingly, floor heights are set to 3.4 m and 3.43 m on the first and second floors, respectively, and ceiling heights of at least 3.2 m will be ensured.
- **Roof structure:** Gently sloping (1/20) single-pitch concrete slab roofs, which are common in Sindh, will be used. The Omnia slab roofs common in other parts of Pakistan (bricks placed on small steel beams, covered with PVC sheets, and finally held in place with straw mortar) leak when it rains and require maintenance every few years. Additionally, leaks apparently caused by inadequate waterproofing or insufficient steel reinforcement cover have been observed on the concrete slab roofs of existing facilities; therefore, attention will be paid to specifications such as the quality of waterproofing and treatment of concrete joint surfaces, and quality will be ensured through intensive construction supervision. Furthermore, solar panels will be installed on the slab roofs at the cost of the partner country.
- **Ceilings:** Double ceilings will not be installed in an effort to ensure as much airspace as possible.

- Openings: The plan is to reduce window widths to prevent hot air from entering the rooms while considering ventilation and natural light. As in similar projects, windows will be aluminum; sliding windows will be used on the outside corridor sides of the rooms. The opposite sides of the rooms will have (inward-opening) high windows, with large continuous eaves above to minimize the insolation that reaches room interiors and ensure sufficient ventilation.

Lavatory blocks

- Floor levels: To prevent sewage from spilling out in the event of a flood, the standard floor level is set to the design GL + 600 mm, provided that the outlets for discharging treated water from simple septic tanks are installed no higher than the floor levels of the classroom blocks.
- Roof structure/ceilings: Concrete slab, like the classroom blocks. In addition, a plastic cistern for water supply will be installed on the slab roof.
- Openings: The necessary light and ventilation will be ensured with continuous openings at the tops of walls below and parallel to the beams, with no openings for lighting or ventilation to be made below the line of sight to double as a means of blocking views from outside.

5) Structural planning

As for structural planning, designs will be implemented such that they are compliant with the applicable structural standards in the target area based on the standard design details of the Previous Project and similar facilities in the province of Sindh.

Structure types

Main structures: Structure types common in the area are reinforced concrete post-and-beam frames or brick or concrete block masonry for one-story buildings, and reinforced concrete post-and-beam frames for two-story buildings. Although there is no history of major earthquakes in Sindh, the structural design standards for Pakistan have been established in response to damage from several major earthquakes; under the Project, all buildings will be constructed with reinforced concrete post-and-beam frames for high earthquake resistance. The cross-sections and dimensions of the structural members are determined through structural analysis in accordance with the Building Code of Pakistan.

Non-load-bearing walls: At similar schools constructed by other donors, bricks or concrete blocks are used as curtain walls in structures with reinforced concrete frames. Although concrete blocks take less work to install and make it relatively easy to ensure quality, they are difficult to procure outside greater Karachi; therefore, bricks, which are widely used throughout the province of Sindh, will be used for the Project.

Structural standards and load conditions

Pakistan has its own building code—the Building Code of Pakistan—which sets out guidelines for structural design. The structural design of the Project will be implemented in accordance with the Building Code of Pakistan.

- **Bearing capacity:** The results of geological surveys reveal differences between the sites; at the envisioned bearing surface—a depth of 1.0 to 1.5 m below the ground surface—the soil at the northern sites is mostly relatively soft silty clay and silt layers mixed with fine sand. The expected bearing capacity is roughly 50–180 kN/m².
- **Wind loads:** Regarding base wind speeds, wind pressure is calculated as 33 m/s (120 km/h) for sites in the north and south of Sindh in accordance with the Building Code of Pakistan.
- **Seismic forces:** Sindh experiences fewer earthquakes than other regions in Pakistan. The Building Code of Pakistan defines the target sites as Zone 2A (Maximum horizontal acceleration: 0.08–0.16 g). Given the results of soil sample tests from the ground surveys, the soil type is presumed to be SD or SE. The policy is to implement designs with seismic intensity coefficients of 0.32 to 0.40.

Structural materials

Structural materials will conform to ASTM and/or BS standards that are widely applied in Pakistan. Cement in the foundations and up to the risers will be slag cement produced domestically in accordance with BS146, with cement produced domestically in accordance with BS12 for the ordinary parts.

The structural materials to be used in the Project are listed below.

- **Concrete:** The design strength will be set as follows.
 - Concrete for frames 21 Mpa
- **Steel reinforcement:** Grade-60 products compliant with ASTM A615 for deformed reinforcement, which are distributed in the area, will be used in the Project.
 - Deformed reinforcement 420 Mpa

6) Equipment and systems planning

The following are the details of equipment and systems planning for Project facilities in light of the status of development and use in existing schools and similar schools constructed during the Previous Project and with assistance from other donors, and accounting for the standard details and specifications implemented at middle school facilities in Sindh as well as the weather conditions and electricity and water supply conditions in the target area.

Electrical equipment and systems

All target sites are already connected to electric power supplies or can draw power at low voltage from existing power grids in the vicinity; however, power outages are frequent, with some sites experiencing outages that last more than half a day. In light of these circumstances, the plan under the Project is to introduce solar panel systems as well as the following electrical equipment and systems as in the Previous Project.

Solar panel systems: In consideration of the unstable power supply described previously, solar panel systems will be installed on the roofs of the classroom blocks at each site, with electricity stored in batteries to supply the minimum required amount of electricity. In anticipation of future improvements in the public power supply, solar panel systems will be planned so that they can connect to the public power grid.

Lighting systems: Public primary schools in Sindh generally operate under a single shift; nighttime use of facilities is generally not envisioned. However, after the facilities are completed, it is envisioned that they will be used at night for informal classes and SMC (School Management Committee) meetings. Therefore, the plan under the Project is to install the minimum required LED lights on ceilings: four sets for each classroom and two sets for each principal's office and storeroom.

Electricity outlets: None of the classes conducted in the classrooms of existing primary schools use electricity. However, classrooms are generally equipped with switchboards, some of which are equipped with electrical outlets. Outlet installation is relatively easy because it does not require separate wiring. Notably, outlets are mounted at the same height as light switches, which is effective for preventing the negative effects of flooding. The plan under the Project is to install the minimum required outlets alongside the light switches: two for each classroom and storeroom and four for each principal's office.

Ceiling fans: Nearly all existing schools have ceiling fans installed in light of the severity of the dry, arid weather conditions. Ceiling fans were also installed in all classrooms in the Previous Project. Under the Project, as is the case in similar facilities, two ceiling fans will be installed in each classroom, and one ceiling fan will be installed in each principal's office and storeroom that doubles as a teachers' room. Notably, several made-in-Pakistan ceiling fans are readily available on the market.

Water supply, wastewater, and sanitation systems

The Project requires water for flushing toilets and handwashing. The existing city water supply or installed well water will be used, and only some sites (Mi03, Kh05) will include shallow well drilling in the main construction work. For sites with failing pumps, the plan under this Project is for new pumps to be installed and water supply to be brought to the water tank.

Wastewater systems

Some of the target sites are located in the areas where treated water from simple septic tanks is discharged directly into adjacent gutters, rice fields, and otherwise on the ground surface for lack of public drainage ditches. The basic plan under the Project is to install infiltration inlets to allow treated water to leach onto the properties, except for two sites (Na01 and Na03) where public drainage ditches are in place. However, infiltration may not be possible at some sites; the plan for those sites is to discharge overflow from the infiltration inlets into offsite gutters. Notably, the sizes of the infiltration inlets will be properly set based on the results of infiltration tests outsourced to local entities. Additionally, to prevent clogging of infiltration inlets due to inundation, the top edges of the inlets will be set to the design GL + 600.

Sanitation equipment and systems

The same sanitary fixtures as in the Previous Project will be installed, specifically ceramic Turkish style toilets with high tanks for students and Western-style toilets for people with disabilities and teachers, with faucets designed for use with buckets in each stall to account for how the lavatories will actually be used. Handwashing basins will not be installed. However, faucets will be installed outside the lavatories for the purpose of cleaning before worship.

7) Building material planning

The architectural specifications for each section are planned as follows, with reference to the details of plans for similar facilities in Pakistan and the implementation status of the Ongoing Project, and with the necessary improvements.

Local specifications and proposed improvements

- Corridor floor finishes: Trowel-finished concrete. Considering the track record of the Ongoing Project and the fact that construction work will be performed at multiple sites, the specifications were set so that skilled workers would not be required.
- Exterior wall baseboards: Unfinished concrete + Spatter dash (salt-resistant cement). Highly durable specifications adopted.
- Roofs: Reinforced concrete slab + waterproof coating + Protective concrete (t = 80 mm). Selected and adopted from local specifications in consideration of insulation, workability, durability, and economic efficiency.

Table 2-12: Comparison of Specifications of Main Parts of Classroom Blocks

| | | Similar facility (2021: USAID SBEP) KG-G10 target | Similar facility in Sindh (Elementary school) Ongoing Project | This Project (proposed) |
|--------------------|---------------------|--|---|---|
| Target province | | Sindh | Sindh | Sindh |
| Classroom capacity | | 40 people | 30 people (Sindh standard) | Same as left |
| Classroom area | | 48.31 m ² 20' x 26' (6.10 m x 7.92 m) | 32.95 m ² (5.28 m x 6.24 m) | 32.95 m ² (5.28 m x 6.24 m) |
| Main structure | Foundation | Reinforced concrete mat foundation (salt-resistant cement) | Reinforced concrete mat foundation (salt-resistant cement) | Reinforced concrete mat foundation (salt-resistant cement) |
| | Floors | Reinforced concrete dirt floor | Reinforced concrete dirt floor (salt-resistant cement) (GFL = DGL + 600 mm) | Reinforced concrete dirt floor (salt-resistant cement) (GFL = DGL + 600 mm) |
| | Walls | Brick masonry | Brick masonry | Same as left |
| | Pillars and beams | Reinforced concrete | Reinforced concrete | Same as left |
| | Roof trusses | - | - | - |
| External finishes | Floors: Corridors | Marble tile | Trowel-finished concrete | Same as left |
| | Exterior baseboards | Marble tile | Unfinished concrete + Spatter dash (salt-resistant cement) | Same as left |
| | Walls | Tile | Mortar + Paint | Same as left |
| | Windows | Aluminum windows + Security bars | Aluminum windows + Security bars | Aluminum windows + Security bars |
| | Doors | Steel frame/wooden door + Paint | Steel frame/wooden door + Paint | Same as left |
| | Ceilings | Thin coat of mortar + Paint | Thin coat of mortar + Paint | Same as left |
| | Roofs | Reinforced concrete slab + Waterproofing sheet + PC tile | Reinforced concrete slab + Waterproof coating + Protective concrete (t = 80 mm) | Reinforced concrete slab + Waterproof coating + Protective concrete (t = 80 mm) |
| Interior finish | Floors | Marble tile | Terrazzo tile + Mortar | Terrazzo tile + Mortar |
| | Walls | Mortar + Paint | Mortar + Paint | Same as left |
| | Ceilings | Thin coat of mortar + Paint | Thin coat of mortar + Paint | Same as left |

Measures for improving added value

In restoring these educational facilities, the company is not trying to return them to their pre-disaster state, but rather to Build Back Better: that is, to identify the likelihood and risks of similar disasters in the future, and then to develop measures to minimize damage from possible future disasters. In light of the above, the policy shall be to include value-added proposals.

Table 2-13: Measures for Improving Added Value

| | Measure for improving added value | Remarks |
|---|--|-------------------------|
| 1 | Set first-floor levels in consideration of past maximum inundation levels. | Disaster risk reduction |
| 2 | Plan a storeroom which can be used as a private room when the disaster shelter is used in the event of a disaster. | Disaster risk reduction |
| 3 | To minimize building damage in the event of flooding, plan a two-story structure. | Disaster risk reduction |

1) Furniture planning

The minimum required furniture for educational and administrative purposes will be provided in line with the intended uses and functions of each room. The same specifications as those in the Previous Project will be adopted, and the details and quantities will be as follows.

Classrooms (primary): Install 15 two-person desk/two-chair sets for the planned capacity of 30 students, one desk/chair set for the teacher, and one cabinet with a lockable door. Notably, the size of furniture for primary classes should take into account the reality that combined classes are common.

Classrooms (pre-school): Install five sets of six-person tables and 30 chairs for the planned capacity of 30 students, one desk/chair set for the teacher, one cabinet with a lockable door, and four school open lockers. Notably, the size of furniture should take into account the reality of preschool classes.

Principal's offices: Install one office desk/chair set, four chairs for visitors, and two cabinets with lockable doors.

Storerooms/teachers' rooms: Based on the assumption that storerooms will double as preparation rooms and break rooms, install one worktable/four-chair set and two cabinets with lockable doors.

Table 2-14: List of Furniture

| Category | Items | Quantity | Remarks |
|--|--------------------------------------|---------------|---------|
| Classroom furniture (primary class) | 2-person desk/bench set for students | 15 sets/room | |
| | Desk/chair set for teachers | 1 set/room | |
| | Cabinet | 1 unit/room | |
| Classroom furniture (pre-school class) | 6-person student table/6-chair set | 5 sets/room | |
| | Desk/chair set for teachers | 1 set/room | |
| | Cabinet | 1 unit/room | |
| | School lockers | 4 units/room | |
| Principal's office furniture | Desk/chair set for principals | 1 set/room | |
| | Visitors' chairs | 4 chairs/room | |
| | Cabinet | 2 units/room | |

| | | | |
|--|---------------------------|--------------|--|
| Teachers' room/ storeroom furniture | Cabinet | 2 units/room | |
| | Meeting table/4-chair set | 1 set/room | |

2) Finishing carpentry work

The plan includes the following major miscellaneous work, which includes built-in furniture to be built onsite.

Table 2-15: Built-in Furniture and Miscellaneous Work

| Room name | Details/Items |
|----------------------------|------------------------------|
| Classrooms | Blackboards, bulletin boards |
| Principal's offices | Bulletin boards, key boxes |
| Teachers' rooms/storerooms | Bulletin boards |

Sign installation—installing room name signs and pictorial signs for lavatory—will also be performed.

2.2.3. Outline Design Drawings

(1) Location map of the project sites

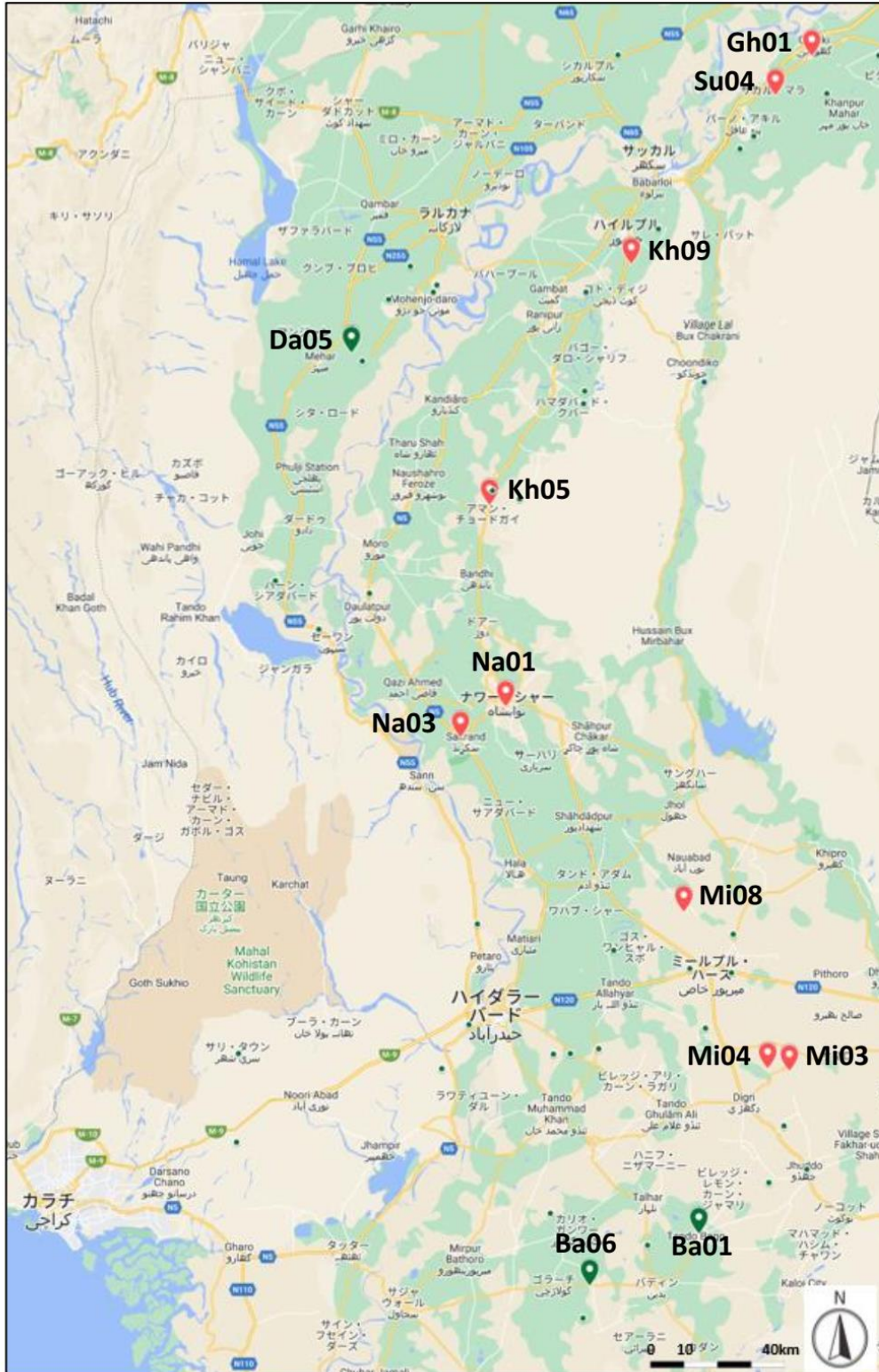
(2) Site plans (9 sites)

Mi03 GGES Deh 294
Mi04 GGES Kachelo Farm
Mi08 GGES Muhammad Hassan Mari
Na01 GGES Quest
Na03 GGES Jalalani
Kh05 GGES Bajeed Fakir
Kh09 GGES Jani Boro
Su04 GGES Moto Mirbahar
Gh01 GGES Officer Colony Ghotki

(3) Floor plan, elevation/cross-sectional plan

2F-6CR-HS
2F-6CR
2F-4CR-HS
2F-4CR
F2, F4, F6

Location map of the project sites



● Candidate Sites (9 sites)

- Khairpur (2 Sites)
- Kh05: GGES Bajeed Fakir
- Kh09: GGES Jani Boro
- Sukkur (1 Site)
- Su04: GGES Moto Mirbahar
- Ghotki (1 Site)
- Gh01: GGES Officer Colony Ghotki
- Mirpurkhas (3 Sites)
- Mi03: GGES Deh 294
- Mi04: GGES Kachelo Farm
- Mi08: GGES Muhammad Hassan Mari
- Nawabshah (2 Sites)
- Na01: GGES Quest
- Na03: GGES Jalalani

● Alternative Sites (3 Sites)

- Badin (2 Sites)
- Ba01: GGES Gullan Khaskheli
- Ba06: GGES Ibrahim Chandio
- Dadu (1 Site)
- Da05: GGES Wali Muhammad Gorar

Source: Created by the Consultant

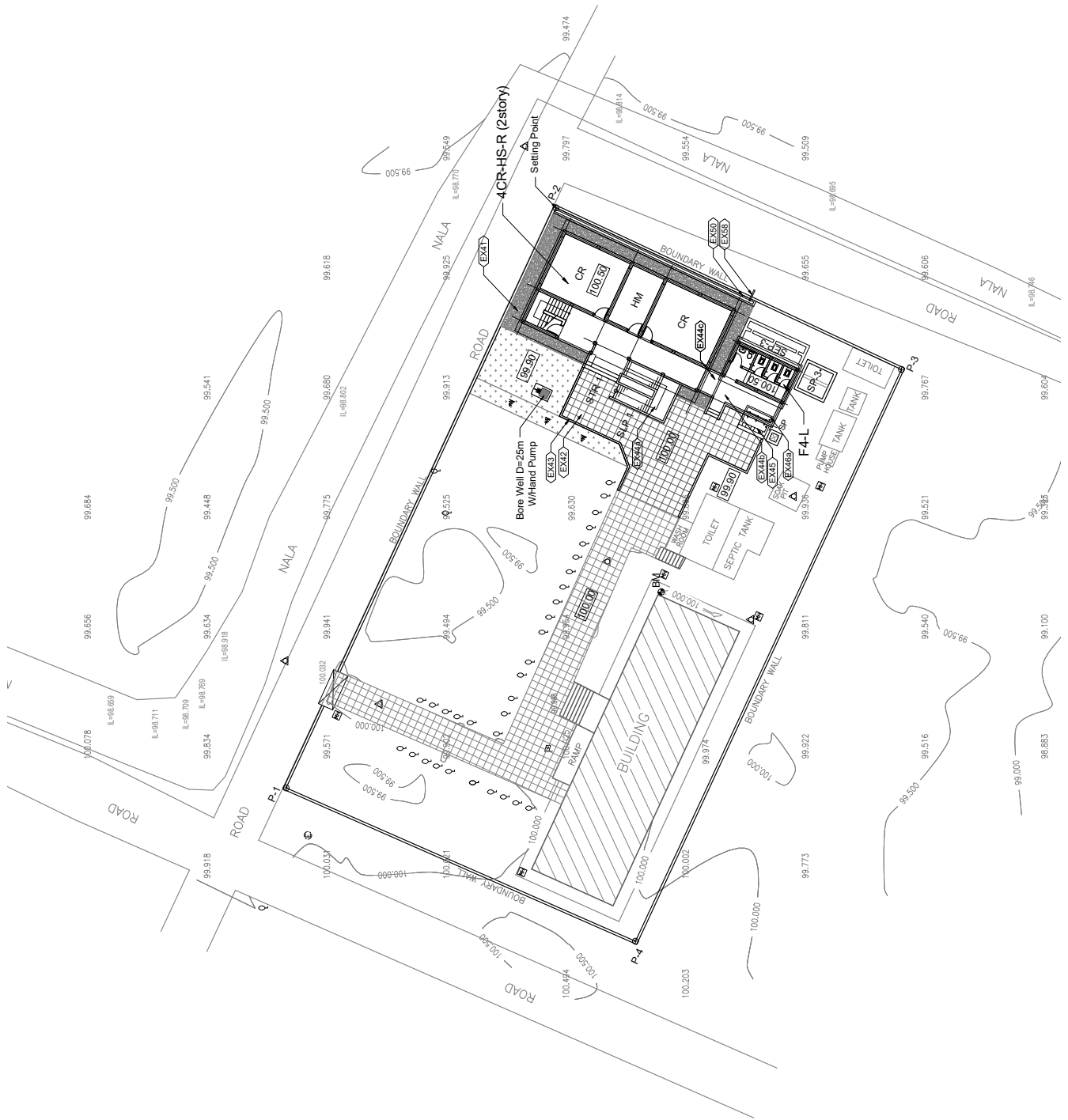
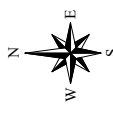
📍 The sites where the existing primary schools are damaged by the flood or continuous rainfall

SITE PLAN 配置図
SITE: MI03
GGES Deh-294

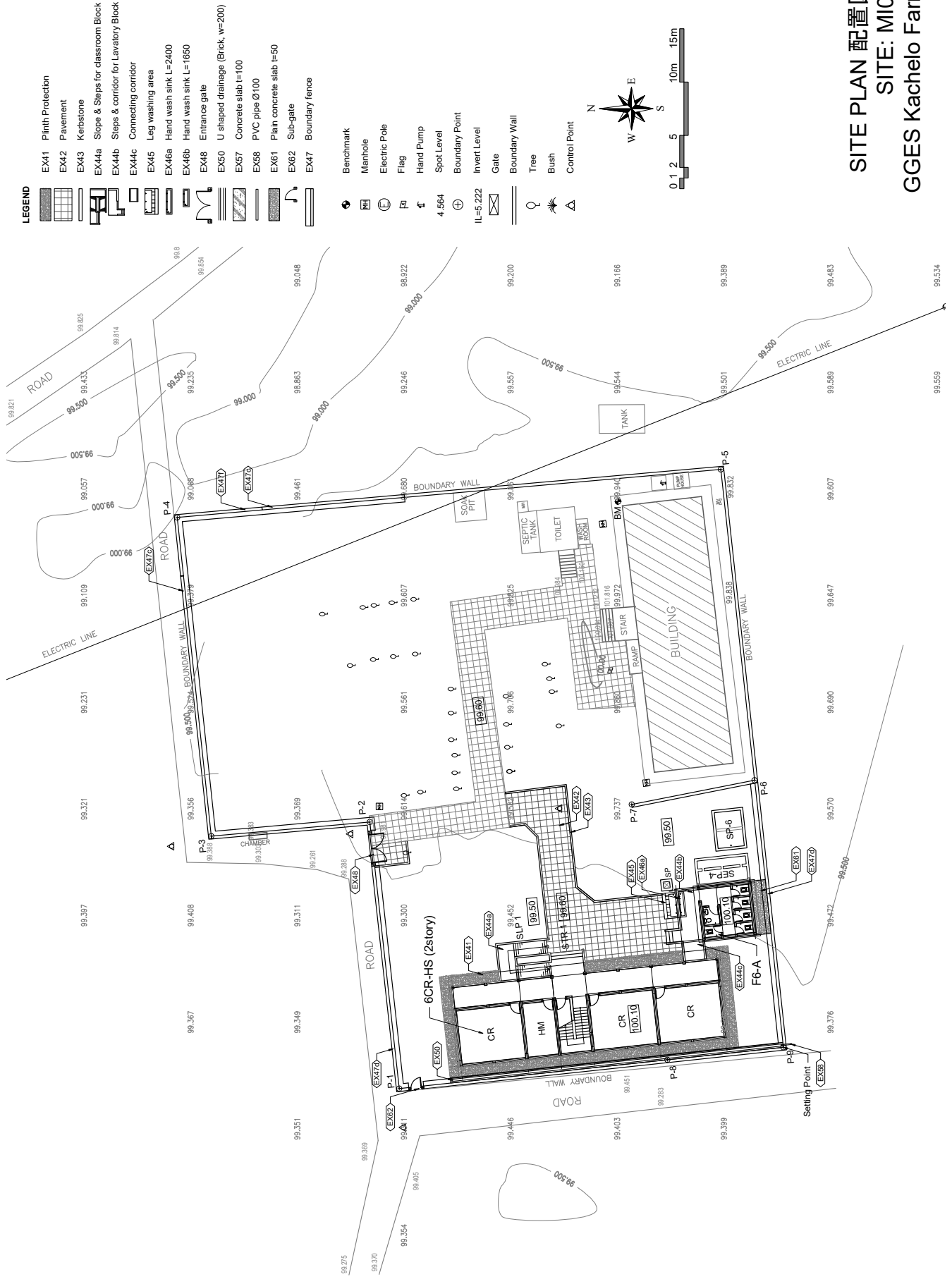
LEGEND

- EX41 Plinth Protection
- EX42 Pavement
- EX43 Kerbstone
- EX44a Slope & Steps for classroom Block
- EX44b Slope & coridor for Lavatory Block
- EX44c Connecting coridor
- EX45 Leg washing area
- EX46a Hand wash sink L=2400
- EX46b Hand wash sink L=1650
- EX48 Entrance gate
- EX50 U shaped drainage (Brick, w=200)
- EX57 Concrete slab l=100
- EX58 PVC pipe Ø100
- EX61 Plain concrete slab l=50
- EX62 Sub-gate
- EX47 Boundary fence

- Benchmark
- Manhole
- Electric Pole
- Flag
- Hand Pump
- Spot Level
- Boundary Point
- Invert Level
- Gate
- Boundary Wall
- Tree
- Bush
- Control Point



SITE PLAN 配置図
SITE: M104
GGES Kachelo Farm



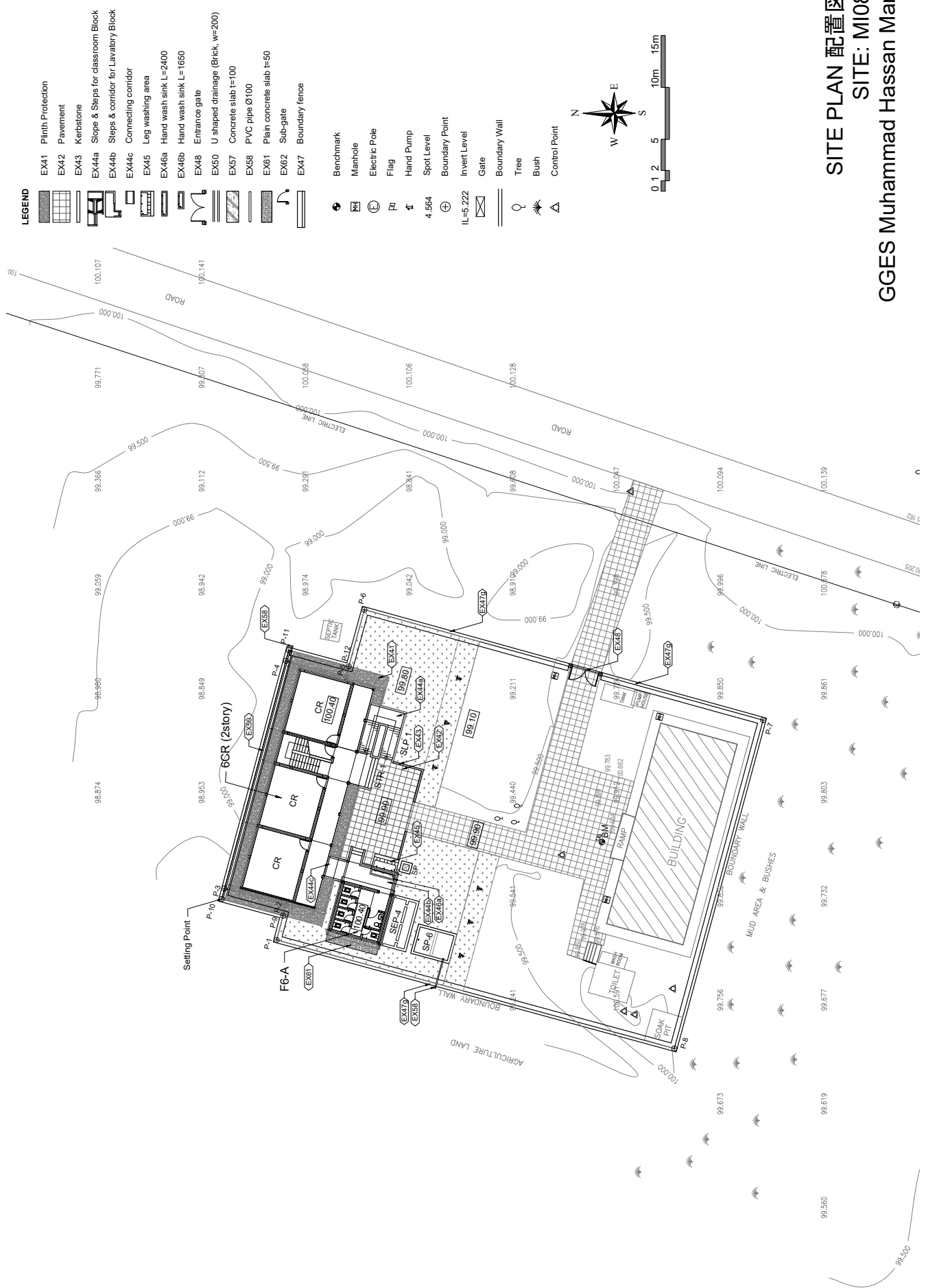
LEGEND

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- EX47 Boundary fence

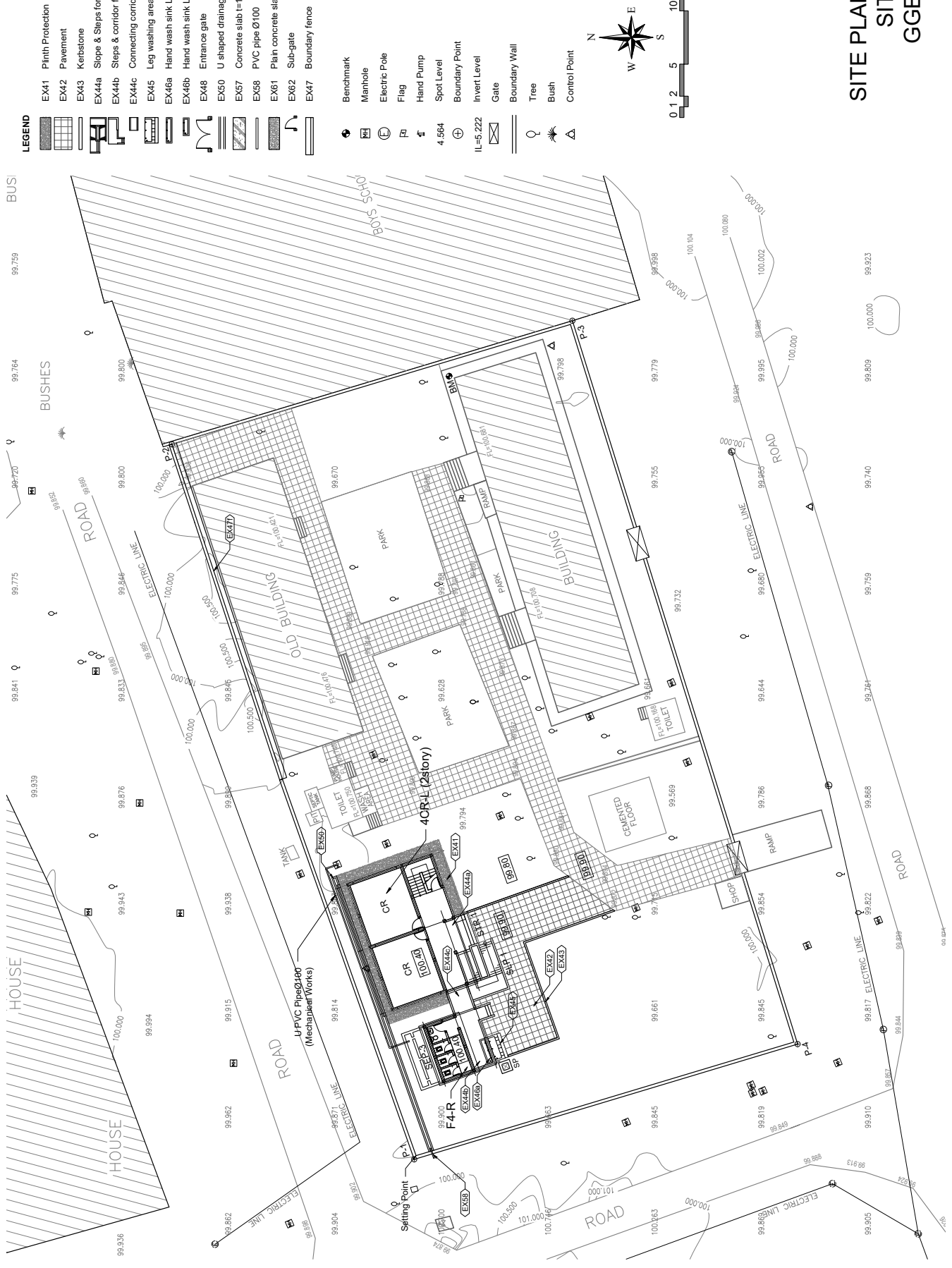
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- Invert Level
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- Tree
- Bush
- Control Point



SITE PLAN 配置図
SITE: MI08
GGES Muhammad Hassan Mari



SITE PLAN 配置図
SITE: NAO1
GGES Quest



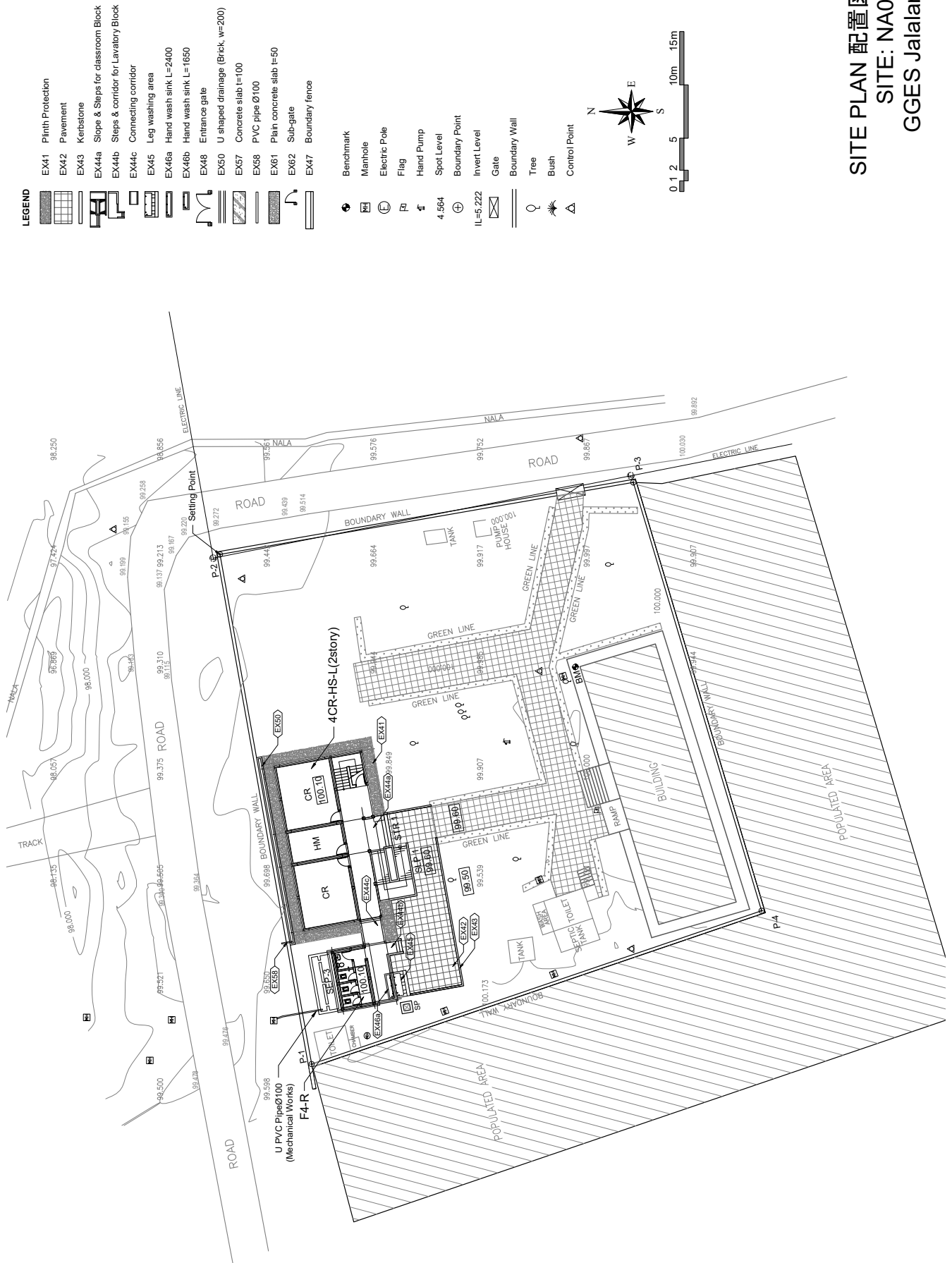
LEGEND

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- Control Point

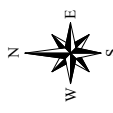


SITE PLAN 配置図
SITE: NAO3
GGES Jalalani



- LEGEND**
- EX41 Plinth Protection
 - EX42 Pavement
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 - EX44a Slope & Steps for classroom Block
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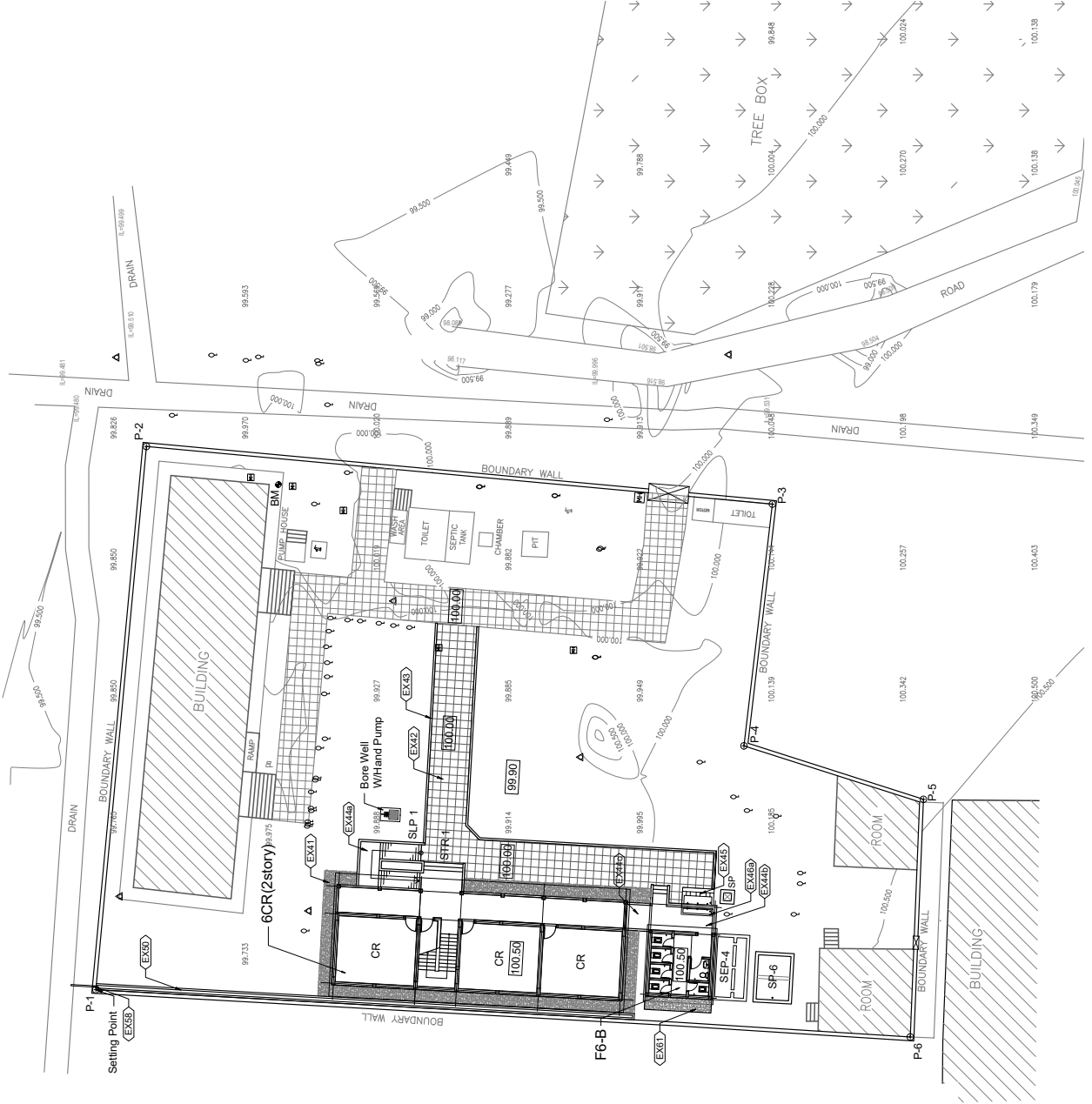


SITE PLAN 配置図
SITE: KH05
GGES Bajeed Fakir

LEGEND

- EX41 Plinth Protection
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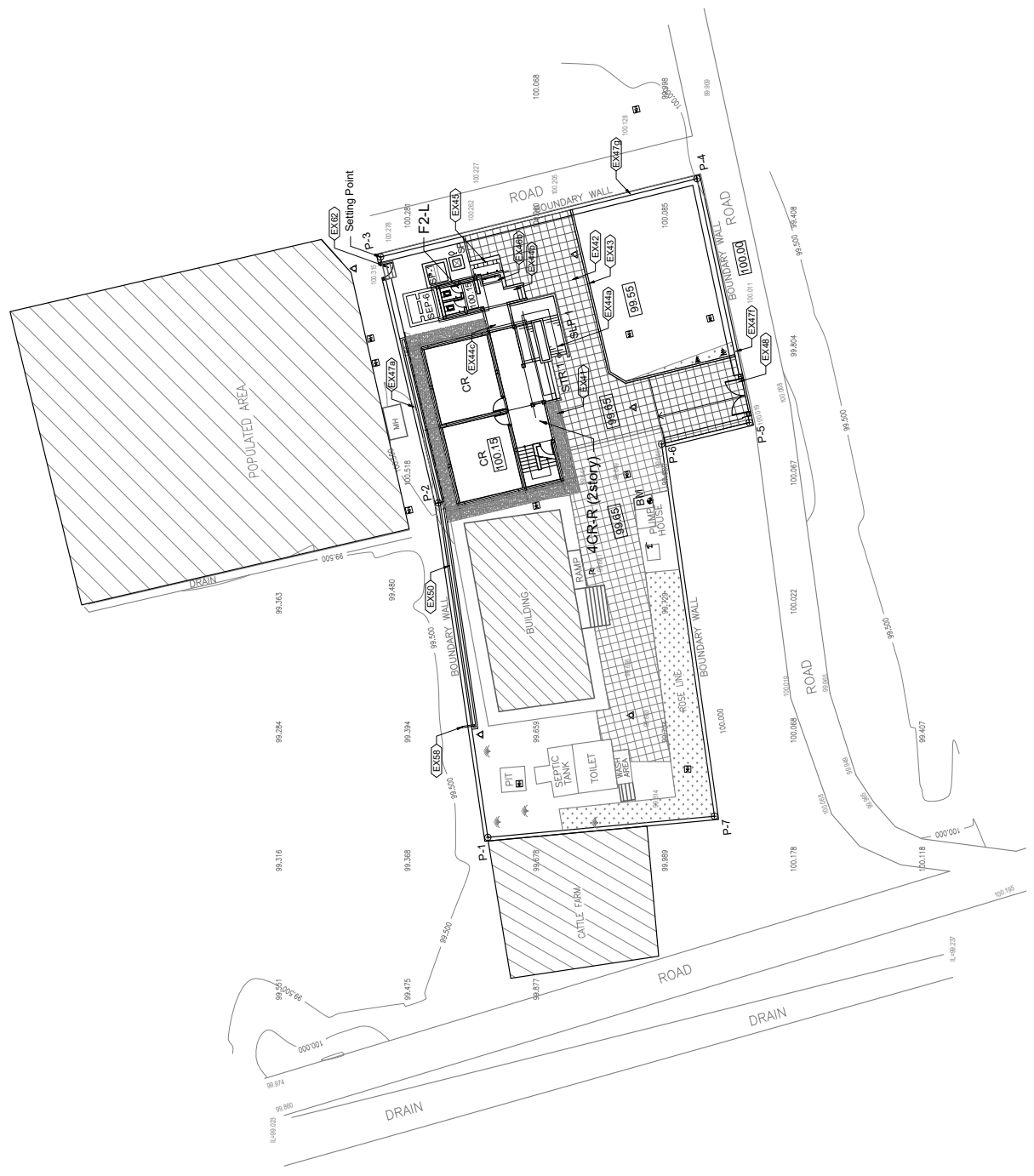
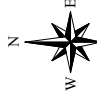
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LEGEND

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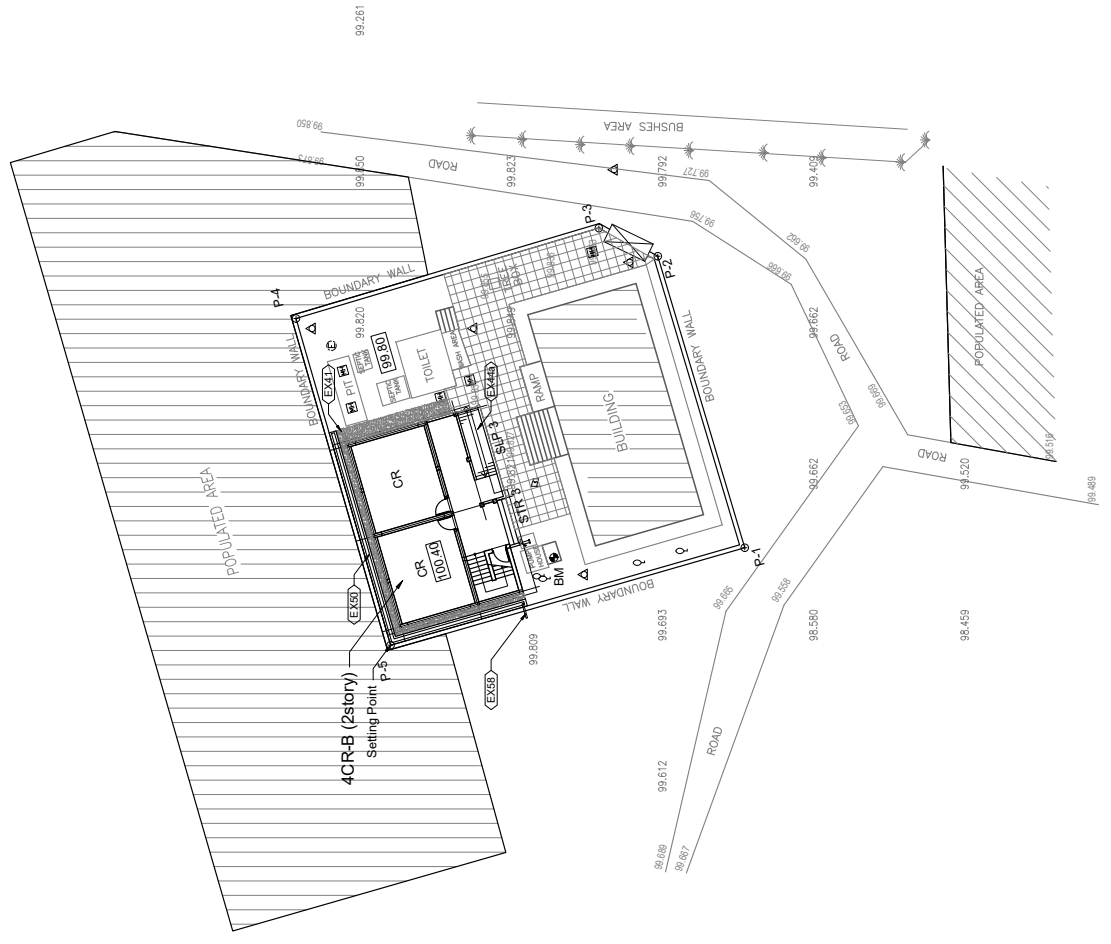
SITE PLAN 配置図
SITE: KH09
GGES Jani Boro

SITE PLAN 配置図
SITE: SU04
GGES Moto Mirbahar

LEGEND

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- EX48 Entrance gate
- EX50 U shaped drainage (Brick, w=200)
- EX57 Concrete slab l=100
- EX58 PVC pipe Ø100
- EX61 Plain concrete slab l=50
- EX62 Sub-gate
- EX47 Boundary fence

- Benchmark
- Manhole
- Electric Pole
- Flag
- Hand Pump
- Spot Level
- Boundary Point
- Invert Level
- Gate
- Boundary Wall
- Tree
- Bush
- Control Point

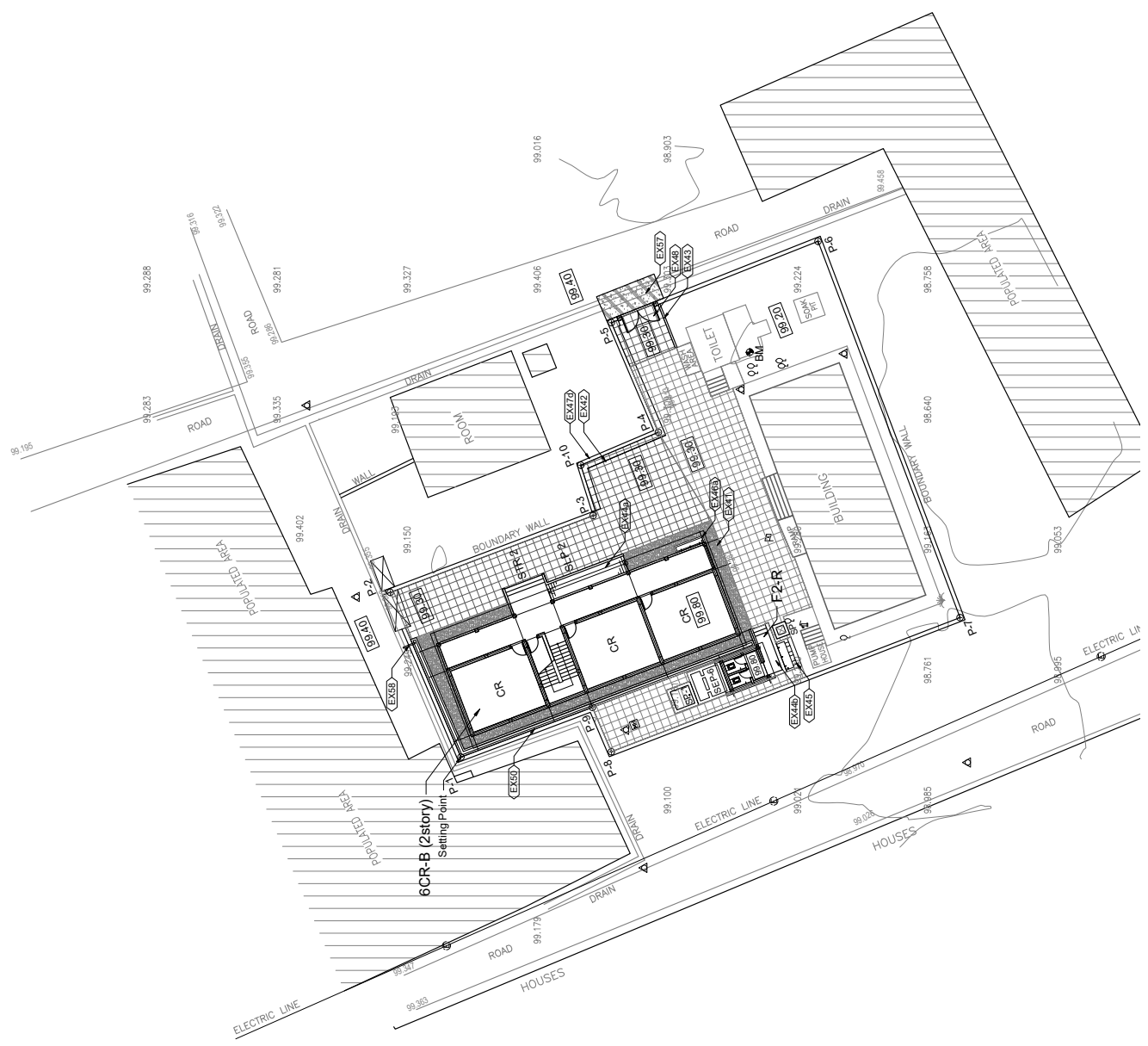


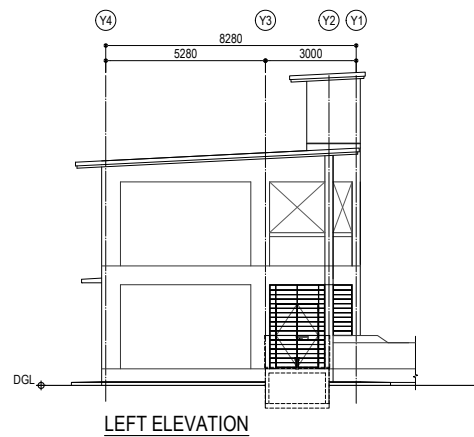
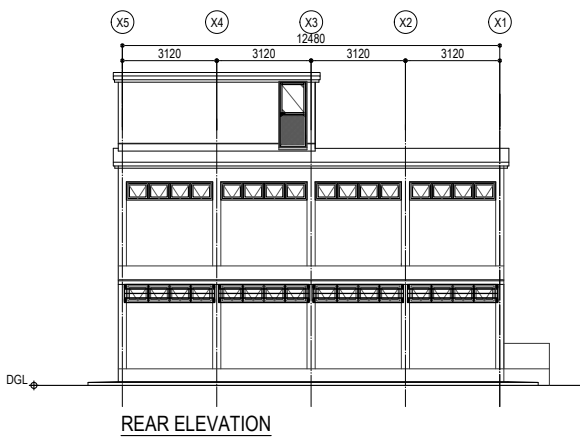
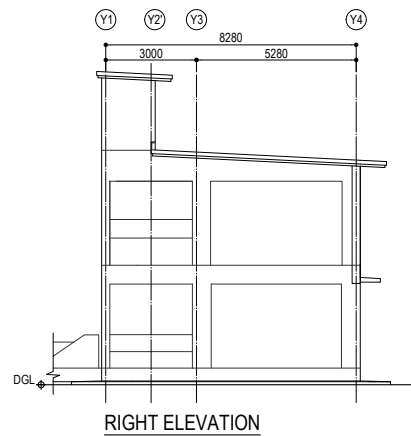
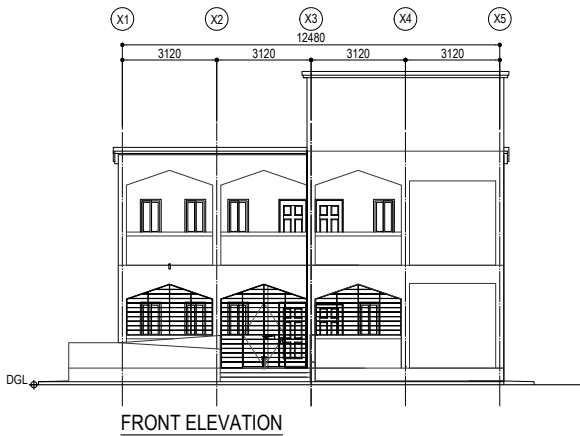
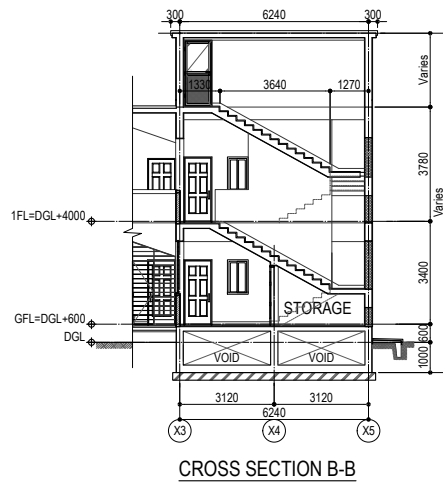
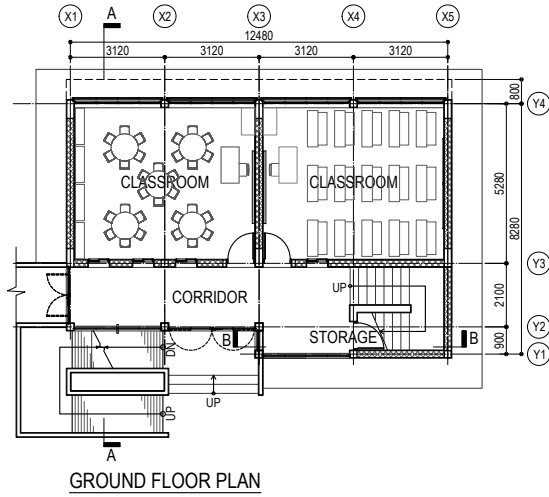
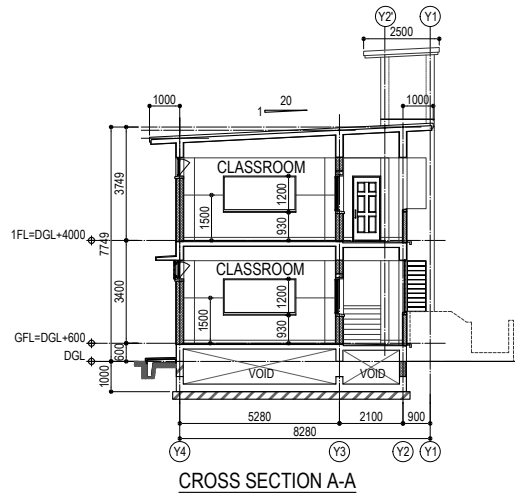
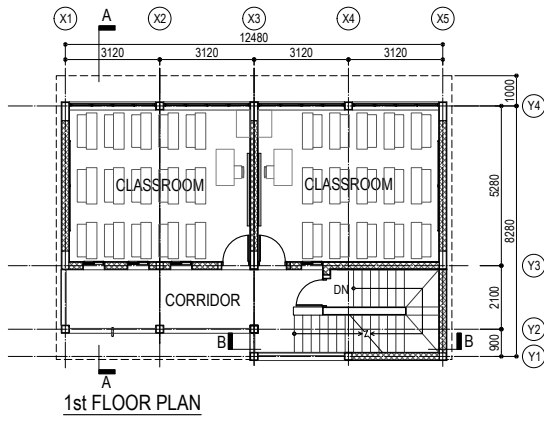
SITE PLAN 配置図
SITE: GH01
GGES Officer Colony Ghotki

LEGEND

| | |
|-------|-------------------------------------|
| EX41 | Plinth Protection |
| EX42 | Pavement |
| EX43 | Kerbstone |
| EX44a | Slope & Steps for classroom Block |
| EX44b | Steps & corridor for Lavatory Block |
| EX44c | Connecting corridor |
| EX45 | Leg washing area |
| EX46a | Hand wash sink L=2400 |
| EX46b | Hand wash sink L=1650 |
| EX48 | Entrance gate |
| EX50 | U shaped drainage (Brick, w=200) |
| EX57 | Concrete slab l=100 |
| EX58 | PVC pipe Ø100 |
| EX61 | Plain concrete slab l=50 |
| EX62 | Sub-gate |
| EX47 | Boundary fence |

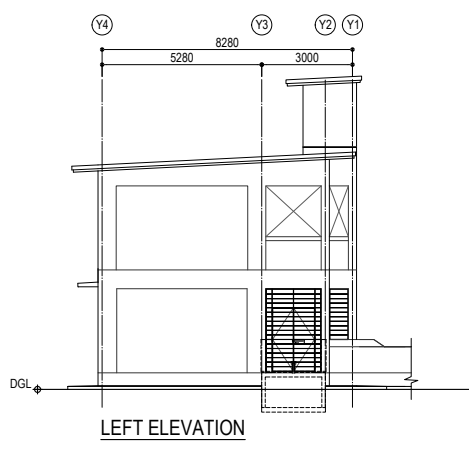
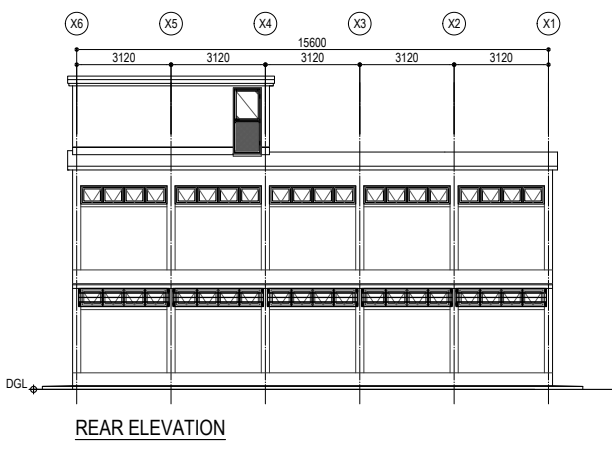
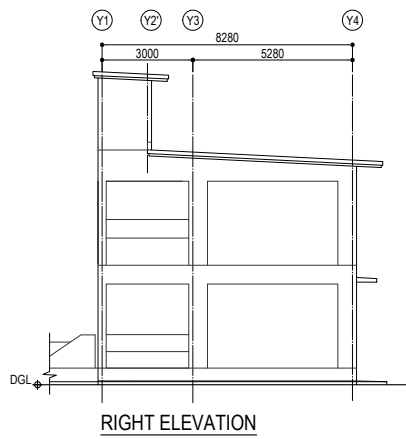
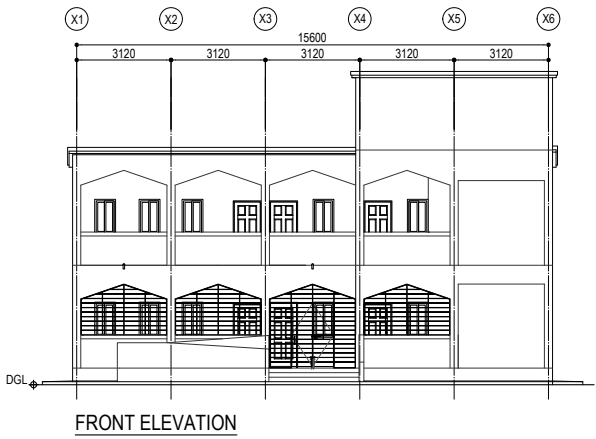
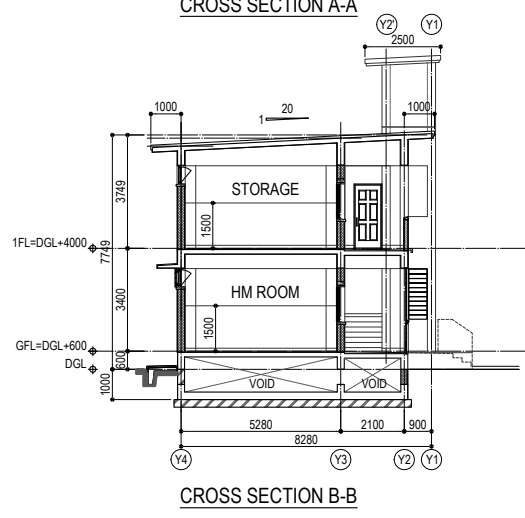
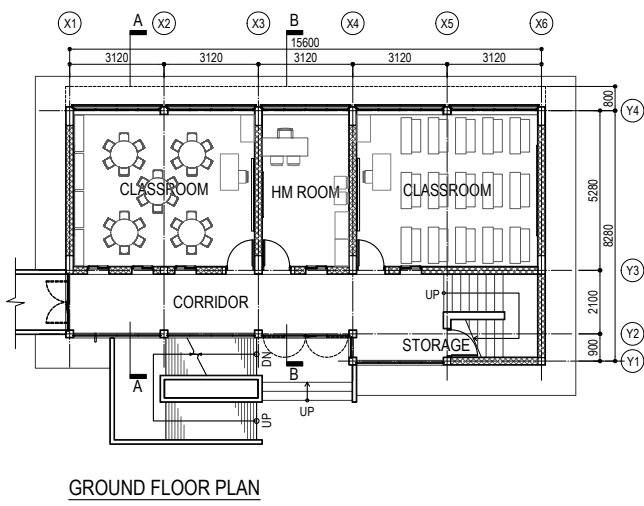
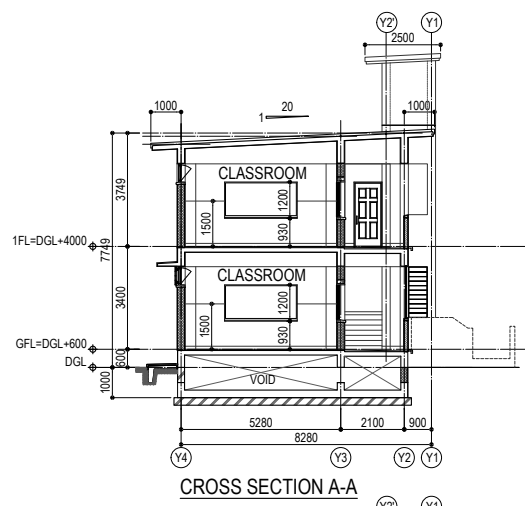
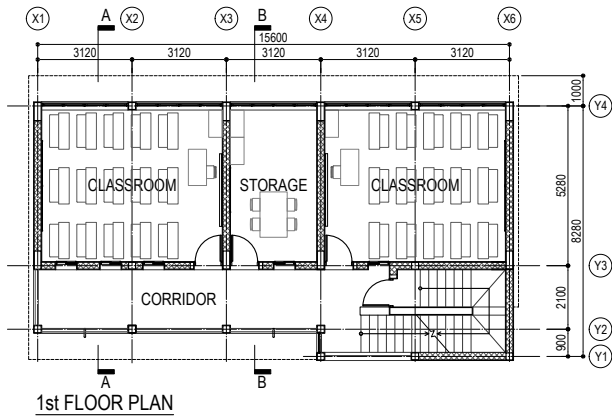
| | |
|---|----------------|
| ⊕ | Benchmark |
| ⊕ | Manhole |
| ⊕ | Electric Pole |
| ⊕ | Flag |
| ⊕ | Hand Pump |
| ⊕ | Spot Level |
| ⊕ | Boundary Point |
| ⊕ | Invert Level |
| ⊕ | Gate |
| ⊕ | Boundary Wall |
| ⊕ | Tree |
| ⊕ | Bush |
| ⊕ | Control Point |





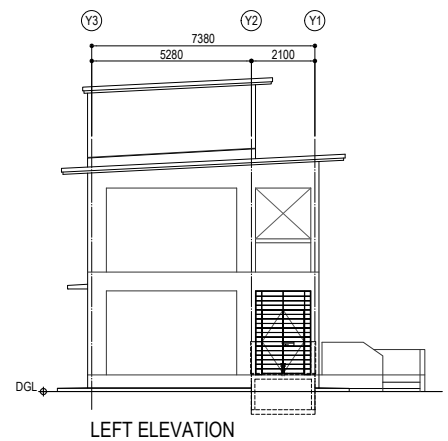
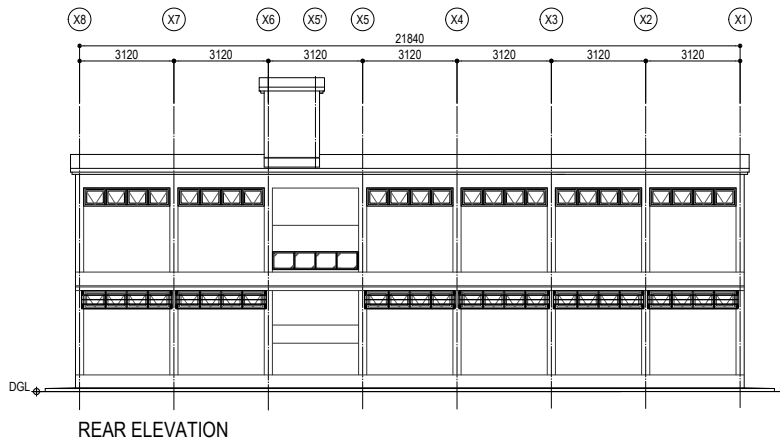
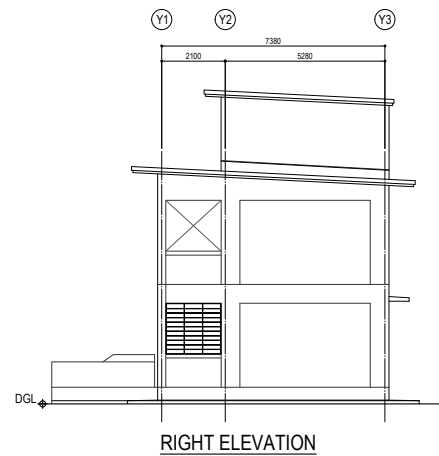
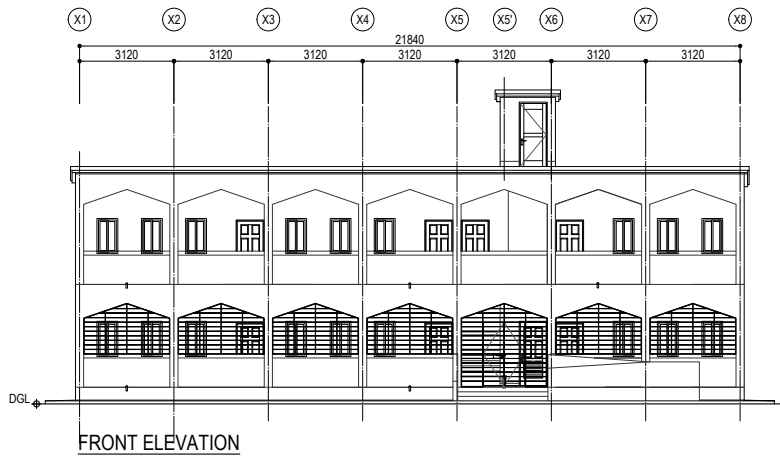
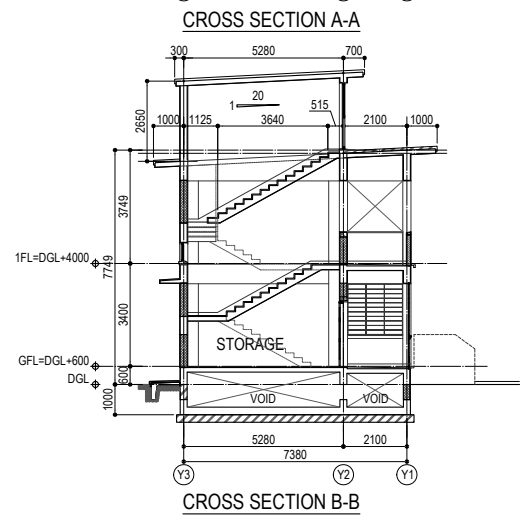
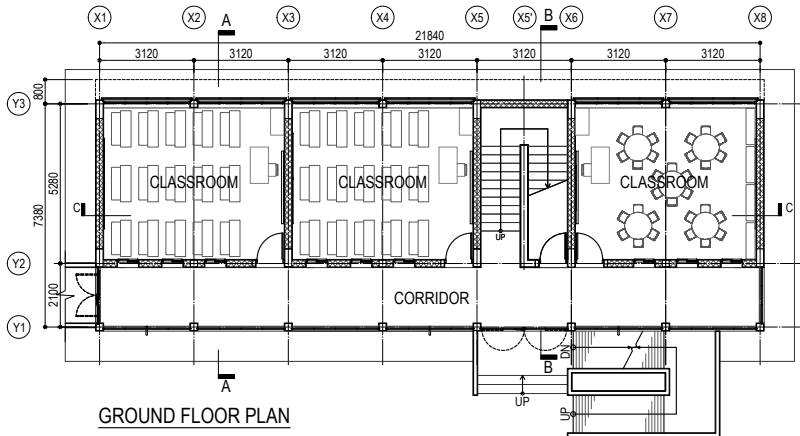
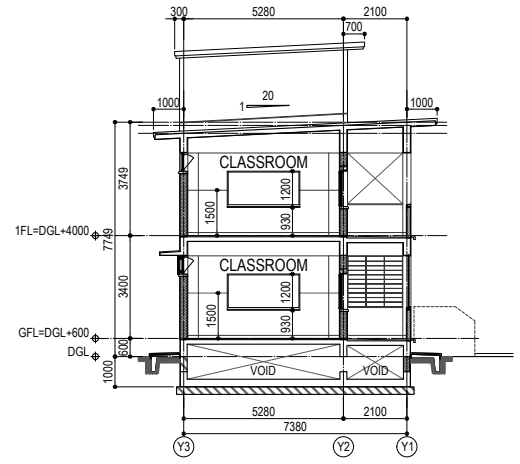
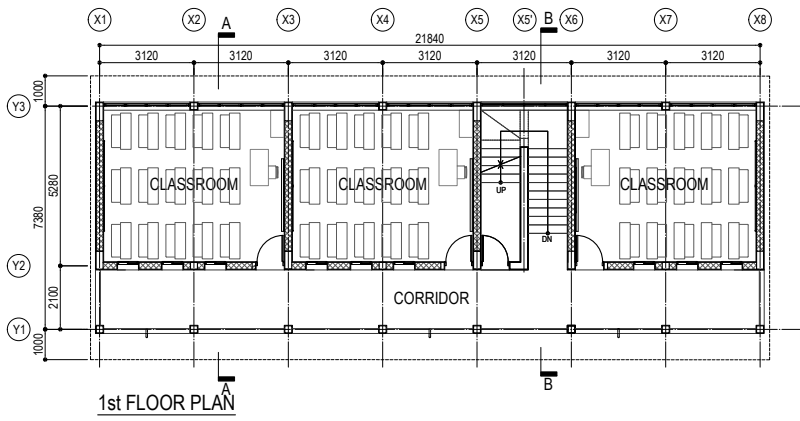
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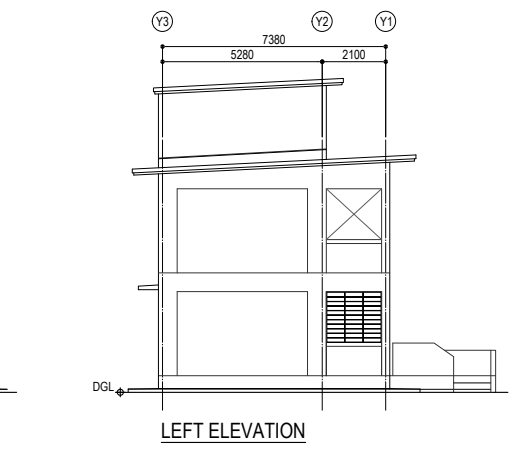
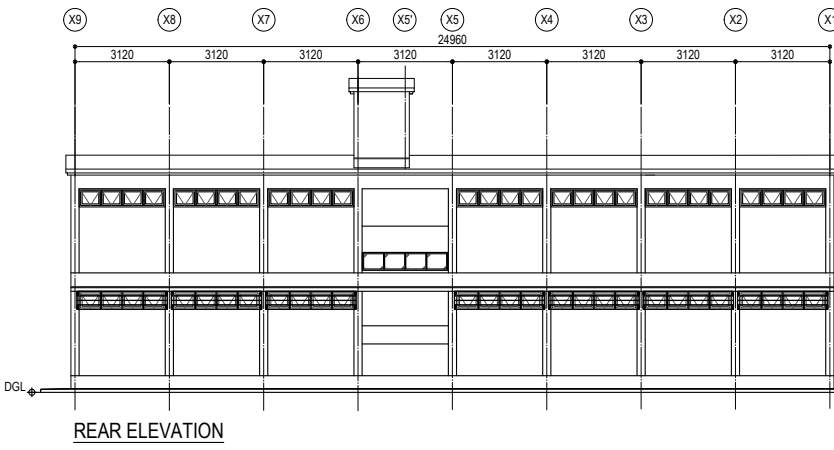
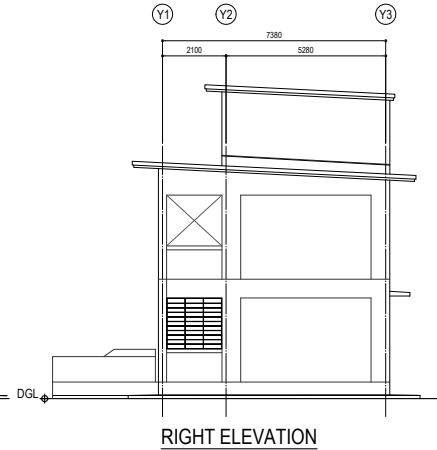
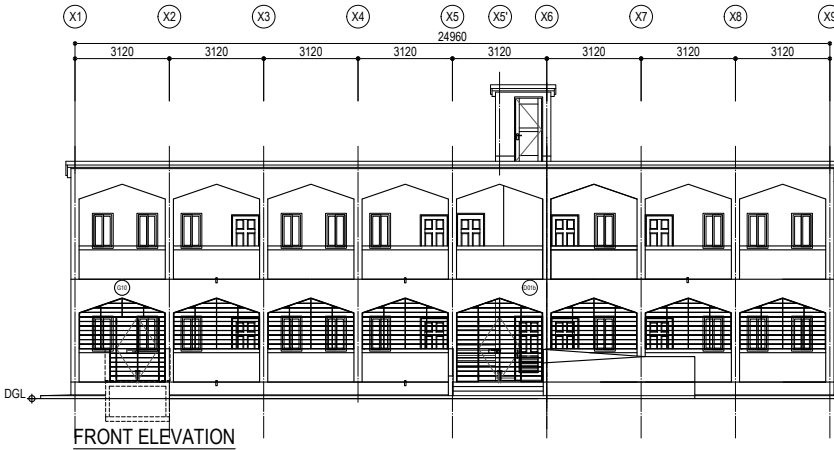
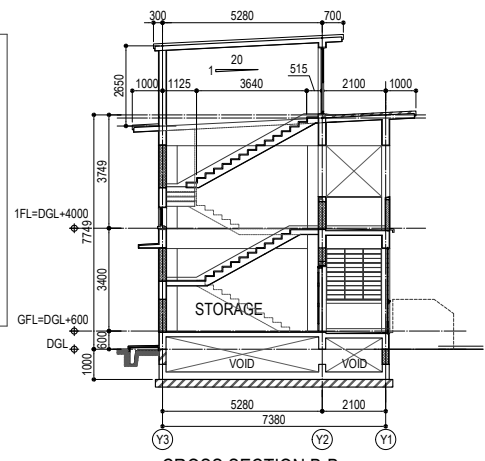
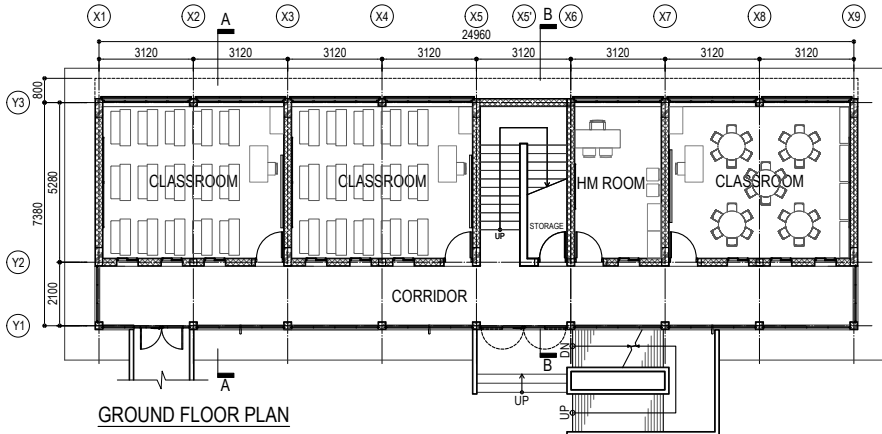
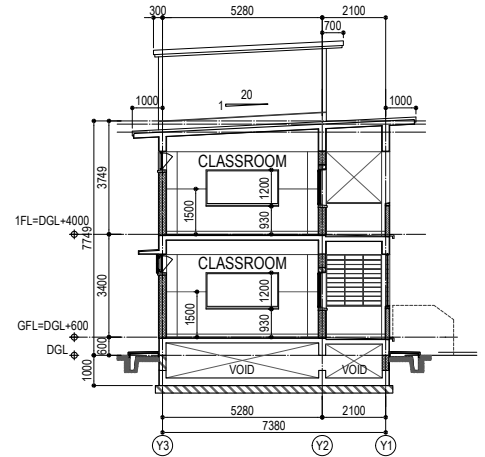
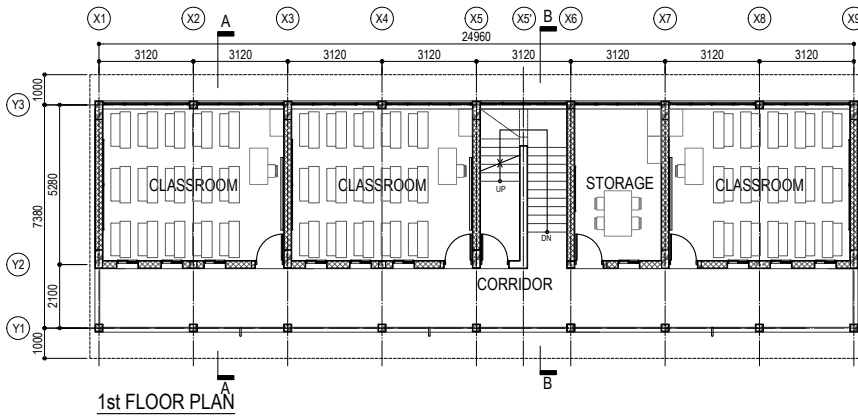
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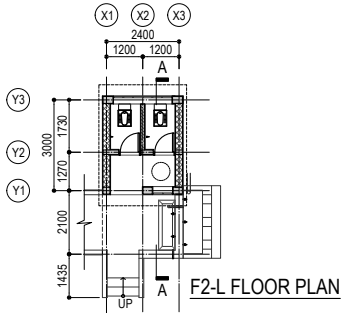




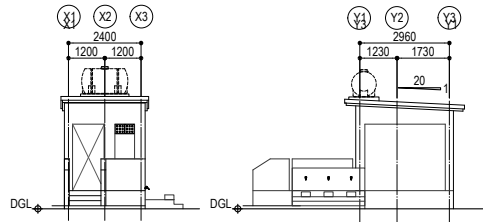
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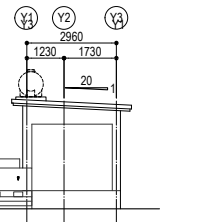




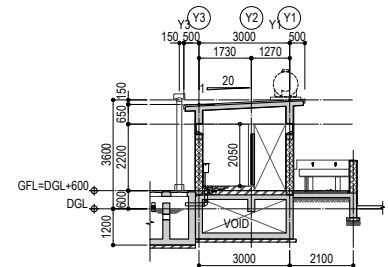
F2-L FLOOR PLAN



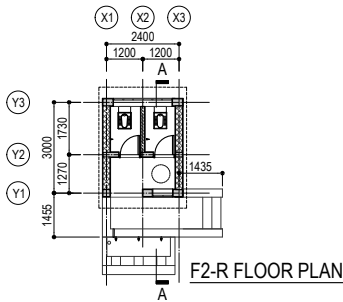
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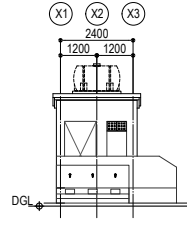
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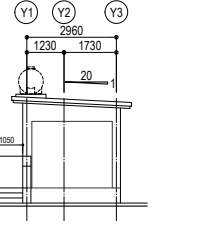
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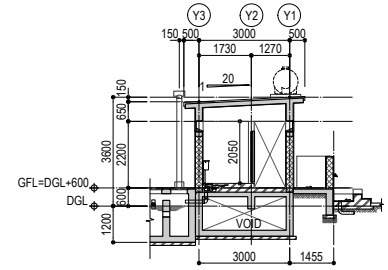
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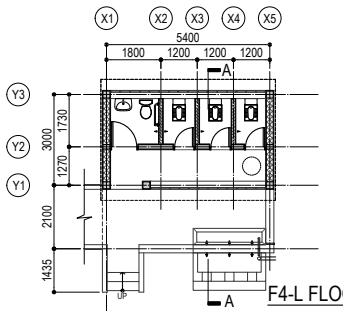
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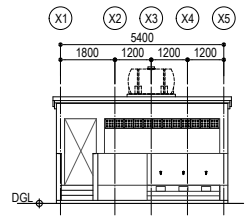
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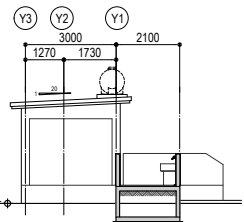
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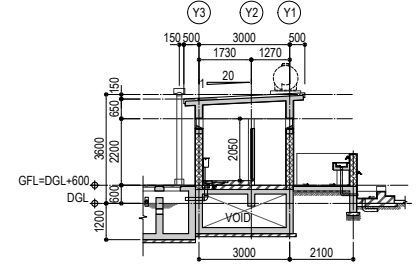
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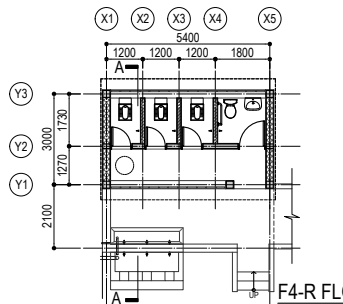
F4-L WEST ELEVATION



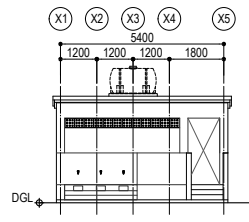
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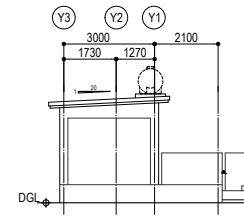
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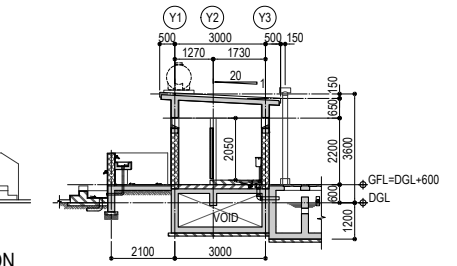
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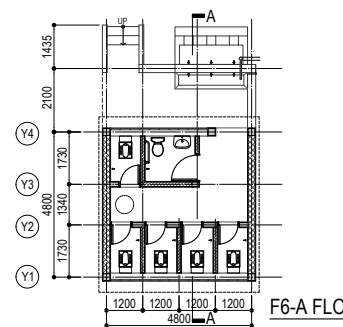
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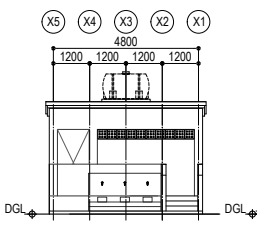
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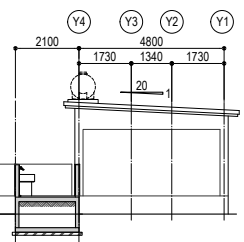
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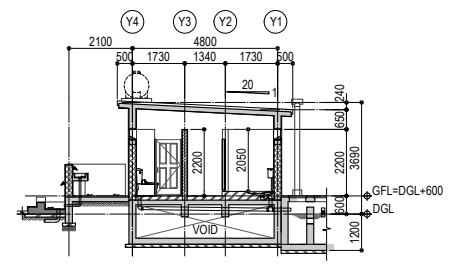
F6-A FLOOR PLAN



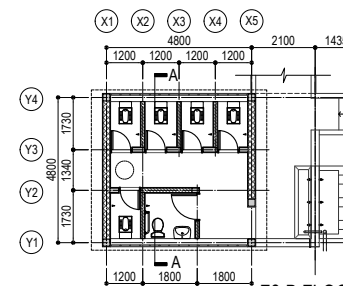
F6-A NORTH ELEVATION



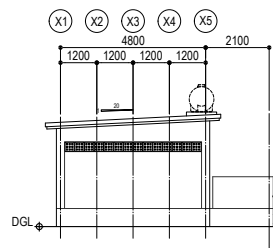
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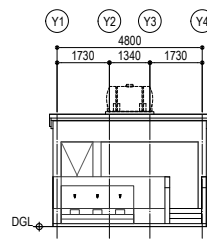
F6-A SECTION A-A



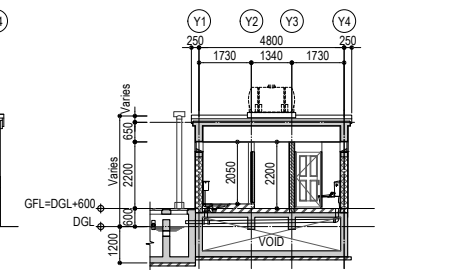
F6-B FLOOR PLAN



F6-B SOUTH ELEVATION



F6-B EAST ELEVATION



F6-B SECTION A-A

2.2.4. Implementation Plan

2.2.4.1. Implementation policy

(1) Basic items for project implementation

The Project has already been approved by the Japanese Cabinet as a comprehensive Official Development Assistance (ODA) Grant, and the Exchange of Notes (E/N) for the implementation of the project between the governments of the two countries has been established, as well as a Grant Agreement (G/A) being concluded between the Government of Pakistan and JICA based on the E/N. The Project will be implemented in accordance with the grant aid system of the Government of Japan (for Japanese consultant and local contractors). Then, the Government of Pakistan will conclude an agreement with a Japanese-incorporated consulting firm for preparation of the bidding documents. After bidding documents are completed, a competitive bid will be held in Pakistan, and the winning company and the Government of Pakistan will conclude construction work and equipment procurement contracts under which the construction of the facilities and procurement of equipment will be carried out. In accordance with the principles of grant aid, the policy under the Project is to hold separate bids for the construction work and equipment procurement.

(2) Project implementation system

1) Pakistan side implementation system

SELD is the responsible agency and implementing agency on the Pakistan side for the Project. The department, which is headed by the Planning, Development and Research (PDR) section under the supervision of the secretary, is responsible for the overall coordination and management of the Project. SELD will be the contracting party for the various procedures of the supervision agreement with the consultant, the construction contract with the contractor, and the equipment procurement contract with the equipment procurement company. SELD will implement the Pakistan side's responsibilities and obtain the necessary permits and approvals as well as agreements with relevant organizations. Additionally, the department will accept support from the consultant as they request payments from JICA in response to local contractors' requests for payment.

2) Japan International Cooperation Agency (JICA)

The Japan International Cooperation Agency (JICA) will conclude a G/A with the Pakistan side agency and monitor the implementation of the Project to ensure that it is properly implemented in accordance with the Japanese grant aid system. JICA will also make decisions as to providing grants in response to requests from the Pakistan side implementing agency, and request payments from Japanese banks.

3) Construction supervision consultant

The consultant will supervise the construction and procurement of facilities and equipment based on the details of this report in accordance with the design supervision agreement it concludes with the Pakistan side implementing agency. The consultant will also prepare bidding documents and assist in the selection of construction and procurement companies and conclusion of construction and equipment procurement contracts. To implement these tasks efficiently, the consultant will establish a relationship with SELD and work closely with the department in addition to dispatching the necessary supervisory engineers to the sites during construction and procurement.

4) Contractors and furniture suppliers

The contractors and equipment suppliers will perform the construction work and equipment procurement within the performance period set out in the contract documents in accordance with the construction and procurement contracts they conclude with SELD.

5) Project implementation system

The following figure shows the relationships between each organization and the Project promotion system during the project implementation stage.

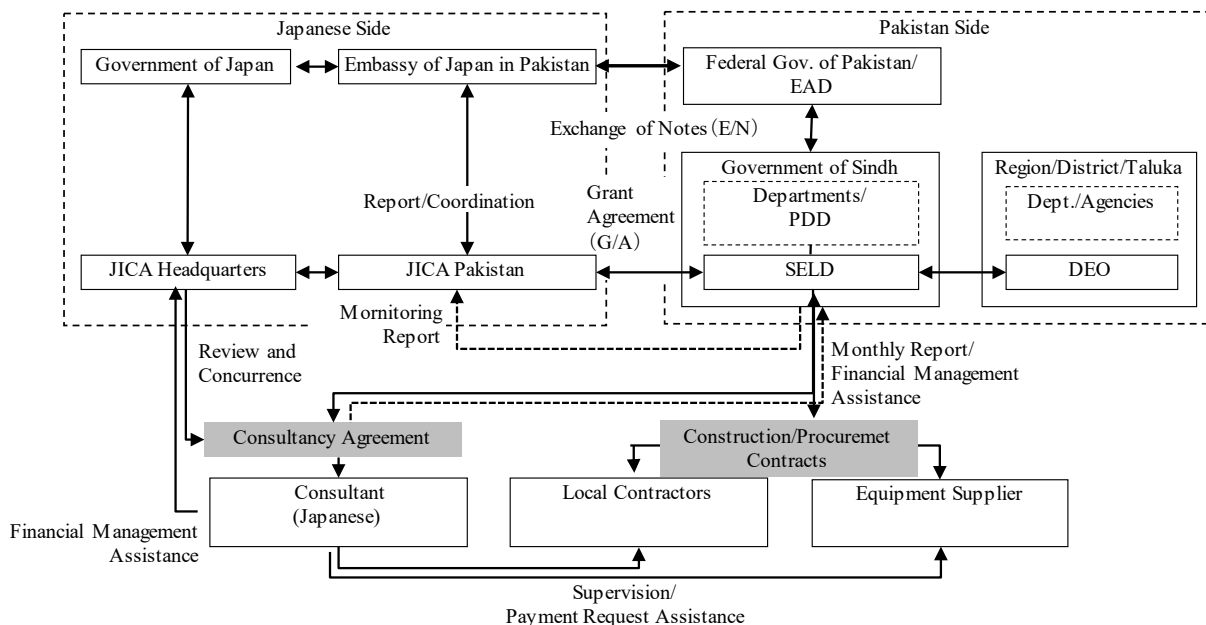


Figure 2-2: Project Implementation System

2.2.4.2. Implementation conditions

(1) General construction/procurement conditions and regional characteristics

1) Labor situation

Hyderabad and Sukkur, the core of the target area, is a conurbation with a population of more than 500,000 and good access to the Project sites; therefore, there are no problems securing labor. However, because it is a regional city more than 350 km away from Karachi, it is difficult to secure skilled workers and engineers who specialize in less common types of work locally. Therefore, it is essential to avoid the adoption of special construction methods and specifications, and for plans to be predicated on quality assurance using locally available labor.

2) Material and equipment procurement situation

As explained in Section 2.2.1.(5) 2) (Policies for Construction/procurement conditions), the target area—the province of Sindh—includes the commercial hub of Karachi, meaning that there are no problems procuring common construction materials and equipment. However, construction material prices continue to rise in line with the recent surge in raw material and fuel costs. It is necessary to properly forecast such risks when calculating estimated amounts. Additionally, although the arterial roads in the province are passable even during the rainy season, some sites are connected to them via feeders that become impassable during the rainy season; thus, it is necessary to take measures such as transporting major materials before the rainy season.

3) Contractors

In Pakistan, public works contractors are registered with the Pakistan Engineering Council (PEC) in eight ranks (CA to C6) that correspond to parameters such as the contract amounts they can receive; Sindh is home to 110 of the highest-ranking (CA) and 27 of the second-highest-ranking (CB) contractors, most of which have offices in Karachi. Additionally, many CA contractors are involved in major projects, have strong financial, quality, and schedule control capabilities, and are able to bid on all public works projects.

Given the track record of the Previous Project, under the Project, bids will be solicited from CA and CB contractors based in Karachi. Their financial status, construction capacity, technical abilities, and the like will be comprehensively verified, and the most suitable among them will be selected and utilized.

Table 2-16: Number of PEC-Registered Contractors and the Locations of Their Offices

| Rank | Area | | | | Totals Number of registered contractors |
|------|---------|-----------|--------|-------------|---|
| | Karachi | Hyderabad | Sukkur | Other areas | |
| C-A | 76 | 21 | 5 | 8 | 110 |
| C-B | 23 | 0 | 2 | 2 | 27 |

Source: Prepared by the survey team based on the PEC website

Table 2-17: PEC Registration System and Number of Contractors

| Rank | Maximum order amount (million PKR) | Capital (million PKR) | Minimum technical points* | Minimum number of engineers |
|------|------------------------------------|-----------------------|---------------------------|---|
| C-A | No limit | 150 | 200 | 2 specialist engineers (with 20 years of experience), 3 registered engineers with supervisory qualifications |
| C-B | Up to 4,000 | 100 | 120 | 2 specialist engineers (with 15 years of experience), 2 registered engineers with supervisory qualifications |
| C-1 | Up to 2,500 | 80 | 90 | 2 specialist engineers (with 10 years of experience), 1 registered engineer with supervisory qualifications |
| C-2 | Up to 1,000 | 50 | 35 | 1 specialist engineer, 1 registered engineer |
| C-3 | Up to 500 | 30 | 20 | 50% are registered engineers |
| C-4 | Up to 200 | 6 | 15 | 50% are registered engineers |
| C-5 | Up to 65 | 3 | 5 | One registered engineer |
| C-6 | Up to 25 | 1.5 | 5 | One registered engineer |

Source: PEC website, Guidelines for Constructors/Operators

*Professional Credit Points: Calculated based on the cumulative total of the number of full-time engineers, experience points, etc.

4) Furniture suppliers

Furniture manufacturers with their own plants typically assemble school furniture at their plants and then transport it to the sites. However, depending on the shape and quantity of furniture, it may be possible to save space in transport by transporting the furniture semi-assembled so that assembly can be completed with simple steps onsite. Early in the implementation of the Project, and before the furniture is manufactured, procurement plans—specifically considerations and requirements such as the dimensions of the furniture in transport to prevent damage in transport, and setting aside time to assemble it onsite—will be confirmed and finalized with furniture suppliers.

(2) Other important points for consideration

1) Tax exemptions

All procurement of construction work, materials, equipment, and services for the implementation of the Project are eligible for tax exemptions under the tax code of Pakistan. In discussions with SELD, the Pakistan side has committed to providing the tax exemptions necessary to implement the Project. As for the tax exemption procedure, SELD asks the Economic Affairs Department (EAD) to issue a tax exemption letter, and EAD issues the letter to the customs office. In particular, government agencies applying for tax exemptions must receive a Free Tax Number (FTN) from the Federal Board of Revenue (FBR) under the EAD. The following is an overview of the scope of tax exemptions.

Table 2-18: Scope of Tax Benefits

| Item | Name of tax | Government agency to which to send applications | Tax benefits |
|-------------------|--------------------|---|--------------------------------------|
| Imports | Customs duties | FBR/EAD | Tax exemption |
| | Import duties | FBR | Tax exemption |
| | Withholding tax | FBR | Tax exemption |
| | Infrastructure tax | FBR/EAD | Tax exemption |
| Local procurement | Value-added tax | FBR/EAD | Tax exemption (rebar is not exempt) |
| | Federal excise tax | FBR | Tax exemption (cement is not exempt) |

2) Delays in construction

According to interviews with contractors, delays in construction are frequent. The main reasons for construction delays include delays in payment by the client, inability to procure due to contractors' financial problems, lack of input of labor and other management resources, and the effects of the rainy season. Of the above, contractors—regardless of PEC rank—indicated delays in payments by the client as the most significant factor, and those in worse financial shape could not prepare for subsequent processes on time, leading to construction delays.

Additionally, risks in the Previous Project include difficulty securing labor at rural sites, delays in procuring materials due to site inaccessibility during the rainy season, stalled construction progress due to observance of Ramadan and Eid, and temporary suspension of construction work due to demonstrations and strikes. The overall schedule will be planned while appropriately anticipating these risks.

3) Agreements and dispute resolution

In Pakistan, disputes involving construction work are resolved first through discussions between the contracting parties, then through arbitration by the mediating body named in the agreement, and finally through the courts; however, disputes are generally resolved by independent mediators because there are no established mediating bodies. Since delays in payment by the client—the root of most disputes involving construction contracts—are unlikely to be a problem in the Project, no advisory agreements with attorneys are envisioned for the Project.

2.2.4.3. Scope of Works

In the course of implementing the Project under Japanese grant aid, the respective tasks to be performed by the Japan and Pakistan sides are classified as follows.

(1) Construction work to be performed by the Japan side**1) Facility construction**

- Constructing the facilities described in this report

- Developing electrical, water supply, wastewater, and sanitary systems incidental to the aforementioned facilities
- Minimal exterior facilities incidental to the aforementioned facilities (land development, outdoor pathways, perimeter fences, wells, stormwater/wastewater treatment systems)
- Removing existing facilities and fences that obstruct facility construction (only at target sites)

2) Furniture procurement

- Procuring school furniture for facilities

(2) Construction work to be performed by the Pakistan side

- Securing land for facility construction (all sites)
- Relocation of existing trees and vegetation that inhibit facility construction
- Securing temporary classrooms at sites where existing classrooms are to be reconstructed and sites where the use of existing classrooms is restricted to ensure safety during construction
- Bearing the cost of the bid announcement and securing a bidding venue
- Providing land for temporary facilities (e.g. temporary offices, material storage, workshops) (if necessary)
- Connecting Project sites to electric power supplies
- Maintaining furniture, fixtures, equipment, and supplies not included in the construction work to be performed by the Japan side
- Maintaining exterior facilities and plantings not included in the construction work to be performed by the Japan side
- Obtaining permits and approvals needed to implement the Project (permits and approvals for construction, if necessary)
- Tax exemption procedures
- Banking arrangements and fee payments
- Providing special services for the entry, departure, and stays of people involved in the Project
- Properly and effectively operating and maintaining facilities and equipment
- Bearing the cost of other related tasks not included in the grant aid
- Installing solar panel systems

(3) Bidding planning

Bids for the Project will be solicited in accordance with the JICA Procurement Guidelines for the Japanese Grants (for Japanese consultant and local contractors), while taking into consideration the

local procedures and conditions for ordinary bidding conducted by SELD.

1) Bidding system for local public procurement

In the province of Sindh, the Sindh Public Procurement Regulatory Authority (SPPRA) has set out rules pertaining to public procurement, standard bidding documents, and guidelines for their utilization. Generally, Education Works under SELD, is responsible for the process of constructing educational facilities from design to bidding and construction supervision; bidding in such cases is also conducted in line with SPPRA guidelines. Although the bidding for the Project will be conducted by applying the Japan side's distinct guidelines, it has been confirmed with SELD that the conditions and procedures shown in Table 2-19 will be followed in accordance with the guidelines.

In the past, the bidding process for construction of educational facilities conducted by other donors or SELD has used a restricted competitive bidding process in which eligible contractors are identified by designating PEC ranks according to the expected bidding price. The qualification and technical evaluation will be conducted using a scoring formula indicating acceptance/rejection or a minimum standard score, and the contractor offering the lowest price among qualifying bidders will receive the right of first negotiation. Table 2-20 shows the local standard qualification criteria and figures used for the Previous Project.

Table 2-19: Application of SPPRA Procurement Criteria

| Item | Description |
|----------------------------------|---|
| Applicable procurement criteria | - JICA procurement guidelines can be applied |
| Bid announcement | - In three newspapers in three major languages (English/Sindhi/Urdu) and SPPRA's website (English) |
| Prequalification | - Generally, the standard is roughly 60 days from announcement to approval (Announcement to deadline: 15 days or more for domestic bids, 45 days or more for international bids) |
| Composition of bidding documents | - Bidding instructions, bid submittal form, draft contract document, contract terms and conditions, technical specifications, bill of quantities (BQ), drawings |
| Bidding period | - Generally, the standard is roughly 30 days from announcement to opening (15 days or more for domestic bids, 45 days or more for international bids) |
| Bid bonds | - 1%–5% of the bid amount (roughly 2% is standard for the Project), issued by a bank or guarantee company |
| Bid evaluation/publication | - Organize an evaluation committee with representatives from relevant organizations - No restrictions on the evaluation period (Average of 30–45 days from evaluation to award issuance) - Publish results report on SPPRA's website 7 days prior to award issuance |
| Advance payment security | - Standard is 10%, maximum is 15% |

| | |
|--------------------------------------|--|
| Compensation for construction delays | - 0.05%–0.10% of contract amount per day, maximum of 10% |
| Performance bonds | - 10% of the contract amount or less |

Table 2-20: Standard Qualification Criteria

| Item | Description (specific figures are for reference) | Previous Project |
|------------------------------|---|---|
| Eligibility | - Valid PEC registration in the relevant field and PEC rank identified as eligible for bidding | General building construction field, Rank: CA or CB |
| Nationality | | Corporate register (in Pakistan) |
| Work/construction experience | - Construction experience as the original contractor (at least 1–3 projects in the past 5 years) Construction of similar facilities, construction work at similar sites or under similar geographical conditions | Same as left (at least 2 projects in the past 10 years) |
| Human capacity of personnel | - Staffing plans (qualifications and experience of key personnel and other technical personnel) Educational backgrounds (qualifications held), work experience (years of experience, similar work experience) | Same as left (only for project managers and chief architectural/electrical engineers) |
| Equipment ownership | - Plans for owning, leasing, or purchasing necessary equipment | Same as left |
| Financials status | - Financial documents (for the past 2-3 years) - Overview of active construction projects/contracts - Annual sales (at least 1–2 times the expected price for the past 3 years) | Same as left (for the past 5 years) Same as left (evaluate bid capacity) Same as left (roughly the same as the estimated price) |
| Other | - Dispute/arbitration history, blacklisting status | Same as left |

2) Policy for bid lot

The Project site is characterized by small properties and differing site conditions due to the wide dispersal of sites. Given that construction management must be tailored to the circumstances, the size of orders must be set according to geographical conditions and the capabilities of local contractors. It is also necessary to structure lots based on the reach of the consultant’s visits and supervision.

Project components comprise classroom blocks, lavatory blocks, perimeter fences, and school furniture, and the details of the requested facilities are the same as those for the Previous Project. Plans will be implemented in line with the following policies, with improvements based on the construction management and supervision results of the Previous Project and the circumstances of the Project taken into account.

- Facility construction (Lot 1): With Hyderabad and Sukkur as the construction supervision base, the project will be expanded to each site in due order. The plan is to set groups of three

geographically proximal sites, and to form a rotating schedule whereby teams (foundation, framing, finishing) rotate to the next group after finishing their work at a given site so that, in principle, and taking into account the contractors’ abilities, construction work at other sites does not overlap at the same time.

- **Furniture procurement (Lot 2):** Classroom furniture (desks, chairs, cabinets, etc.) to be placed in classrooms, principal’s offices, and storerooms/teachers' rooms. This was made into its own lot in consideration of furniture suppliers’ abilities and to ensure uniform quality at each site; delivery times will be planned according to the lots to which the facilities belong.

The table below shows the contract lot structure.

Table 2-21: Proposed Bid Lot Structure

| Agreement lot | Project components: Facilities and school furniture/Target schools | Number of schools | Components |
|---------------|--|-------------------|-----------------------|
| Lot 1 | 3 schools in the district of Mirpurkhas 2 schools in the district of Nawabshah 2 schools in the district of Khairpur 1 school in the district of Sukkur 1 school in the district of Ghotki | 9 | Facility construction |
| Lot 2 | Schools contracted under Lot 1 | 9 | School furniture |
| 2 lots | Total number of target schools in the 5 districts | 9 | |

2.2.4.4. Consultant’s Supervision

(1) Facilities

To maintain consistency with the Design and ensure efficient construction supervision, the Japanese consultant that was in charge of the preparatory survey was recommended by JICA to continue supervising construction. The construction supervision system for the Project is planned as follows based on the construction system of the Ongoing Project and taking into account the work of the Japanese consultant, including payment support under the new scheme.

1) Bidding support

The consultant will provide support for the bidding process, which will be implemented primarily by the Pakistan side implementing agency. Notably, procurement for the Project will be implemented in accordance with JICA’s guidelines, and thus differs from the procurement details and procedures implemented in Pakistan. Therefore, coordination is necessary to further relevant organizations’ understanding of the guidelines and facilitate the bidding process. Additionally, the consultant will work with SELD to evaluate the bids.

- Support for creating bidding documents: Provide support for finalizing bidding documents that have been approved by SELD.
- Assistance in the bidding process: Provide technical support for the series of tasks pertaining to

the bidding documents (e.g. announcements, Q&A, additional instructions, bid evaluations) implemented by SELD.

2) Construction supervision system

The following construction supervision system—in which the consultant will dispatch one Japanese architectural engineer (two during peak seasons) to Pakistan as a resident supervisor for the duration of the construction and procurement and assign the necessary local engineering staff members—is planned to ensure proper management of the progress of the Project, construction supervision, and assistance for the Pakistan side implementing agency’s management of funds.

- Construction supervision base: In consideration of accessibility to the sites, construction supervision offices will be established in Hyderabad and Sukkur, and activity bases to which directly hired local engineers are assigned will be set up in areas near the sites.
- Site supervision teams: Site supervisory engineers will be selected and assigned to groups covering roughly three sites each, and an engineer will visit and supervise sites in an effort to check the progress and ensure the quality of the construction work.
- Head office support system: The Japanese consultant will establish a system to support the resident supervisor by assigning an engineering charge for each area of expertise, centered on the chief consultant. Additionally, engineers in appropriate fields for the progress of the construction work will be dispatched on an ad hoc basis at the start, midway through, and at the completion of construction to attend major inspections and the like.
- The Japanese Resident Engineer will primarily supervise construction in the Project area of Sindh, but will travel to Karachi for monthly reports to SELD.

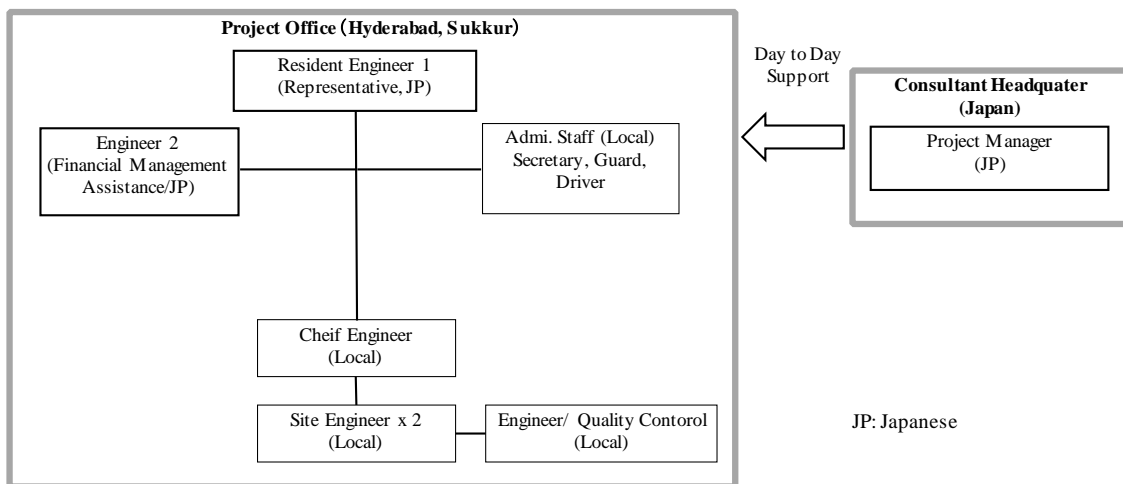


Figure 2-3: Construction Supervision System

3) Construction supervision and fund management

A construction supervision system will be established in Hyderabad, the central city of the Project

area, with a sub-system in Sukkur, to provide the following services, with local architectural engineers and the necessary local support staff members directly hired to work under the Japanese Resident Engineer.

- Preparation of documents: A checklist summarizing the key points of construction supervision and standard forms for reporting the results of various tests and inspections and for regular reports will be created to standardize and ensure the quality of construction supervision at different sites by different site supervisory engineers.
- Approval of construction plan, etc: Construction plans, construction schedules, samples, and other documents submitted by the contractors will be examined and approved without delay. Additionally, if the contractors have any questions regarding the contract documents, explanations will be provided to them promptly.
- Site construction supervision: Site supervisory engineers will be appointed to groups covering roughly four sites to conduct inspections to ensure quality, adherence to schedules, and safety of the construction work in accordance with the construction supervision form described previously. Additionally, the Japanese Resident Engineer will regularly visit all sites to inspect the status of construction supervision (e.g. inspections for ensuring the quality, adherence to schedules, and safety of the construction work). Furthermore, if there are any defects or delays, the Japanese Resident Engineer will instruct the contractors to improve, provide guidance, and take other appropriate measures.
- Visits and supervision: The Japanese Resident Engineer will have an office in the base city, and regularly visit all sites to supervise the progress of the Project as a whole and ensure a uniform standard of construction quality at each site.
- Supervision of installation of equipment and systems: For specialized areas such as equipment and systems, local specialist engineers will regularly visit all sites while monitoring the progress of construction at each and provide advice to the full-time site supervisors, conduct inspections, and witness the implementation of test operations and the like.
- Quality control testing: Quality is confirmed by testing materials that significantly impact the quality of construction work. Notably, compression testing of concrete, which is conducted frequently, will be conducted in a laboratory established in the consultant's office.
- Holding meetings: Regular meetings will be held with the contractors to confirm the progress and schedule of the construction work, and regular meetings will be held with the Pakistan side implementing agency and relevant organizations to report on the status of construction. Additionally, if necessary, construction progress and quality control meetings attended by the Pakistan side implementing agency, JICA, the contractors, and the consultant will be held to share and discuss solutions to various problems that arise during the construction work.

- Payment support: The details of payment requests from the contractors will be assessed, certificates will be issued, and support will be provided for the procedures for requesting payments from JICA to be carried out by the Pakistan side implementing agency.
- Preparation of reports, etc.: In addition to monthly reports on the progress of the construction work, reports will be prepared and submitted to the Pakistan side implementing agency as set out in the contract. Assistance will also be provided for Project Monitoring Reports (PMR) to be prepared by SELD.
- Completion inspections and inspections for defects: Upon completion of the construction work, a completion inspection will be conducted and a completion report, facility operation and maintenance manual, and other completion documents will be submitted to SELD. Additionally, when the defect warranty period expires, a defect inspection will be conducted to confirm the completion of the defect remediation work, after which a final inspection report will be submitted to SELD.

2.2.4.5. Quality Control Plan

(1) Facility construction

The plan under the Project, which is predicated on the construction of Project facilities by local contractors using standard designs and construction methods for the Project area, is for quality control to be implemented according to the following, with the focus on building frames, which significantly impact the strength, durability, and other components of the basic performance of the facilities. Notably, although the testing methods, material standards, and the like will conform to the standards generally applied in Pakistan, the frequent compressive strength and slump tests of concrete will be directly supervised (managed) by the Japanese consultant as in the Previous Project.

The major quality control items in the table below will be organized on a checklist in advance by the construction supervision consultant so that the same items are used at all sites, and will be kept on file after they are confirmed by both the consultant's supervisor and local contractors' engineers at each stage.

Table 2-22: Quality Control Items

| Item | Method |
|-----------------------------|---|
| Ground | <ul style="list-style-type: none"> • Visually check the subgrade after foundation excavation and compare with the test results. • If there is a possibility that the bearing capacity may be less than the design bearing capacity, conduct a bearing capacity test to check. |
| Building location | <ul style="list-style-type: none"> • Use surveying equipment to perform benchmarking and building location roping, and confirm in the presence of the consultant and contractors. |
| Steel reinforcement | <ul style="list-style-type: none"> • Use mill sheets for each supplier and type of material to confirm material quality, and conduct one tensile test for each size (diameter) of steel reinforcement at an official testing laboratory. |
| Bar arrangement inspections | <ul style="list-style-type: none"> • Before concrete is placed, conduct bar arrangement inspections in the presence of the consultant and contractors to check the quantity, location, precision, joint and anchorage lengths, and installation status of spacers. |
| Cement | <ul style="list-style-type: none"> • Obtain test result reports from manufacturers to confirm material quality. • Provide guidance on appropriate storage environment and numbers of stacked bags to prevent hardening due to moisture. |
| Aggregates | <ul style="list-style-type: none"> • Conduct one test of mass, grain size distribution, and water absorption for each site at an official testing laboratory. • For each delivery, visually check the maximum grain size, silt content, water content, and other attributes. |
| Concrete | <ul style="list-style-type: none"> • Conduct water quality tests of mixing water for each site at an official testing laboratory. • Mix proportions are determined based on volumetric mixing under standard proportions, and also by using test mixes to confirm the prescribed strength after 28 days. • Moisture content will be determined by conducting slump tests using testing equipment procured in Japan, and will be kept at or below the maximum values set out in the specifications. • The Japanese consultant will directly conduct compressive strength tests using testing equipment such as compression testers and cylinder molds procured in Japan to confirm that the 4-week average strength exceeds the design strength (F_c) + 6 by taking 6 specimens (from 2 lots) at 7 and 28 days. |

(2) Furniture and fixtures

Furniture and fixture procurement will be supervised by the Japanese consultant. Specific tasks include confirming the specifications of manufactured samples, consistency with samples at the time of delivery, and quantities.

2.2.4.6. Procurement Plan

There are no problems with procuring or transporting the construction materials and equipment to be used under the Project because materials that satisfy local specifications and standards and

general materials commonly used for standard school facilities in the area can be procured through local suppliers. However, since most of the materials and equipment (including imported materials) will be procured by long-distance transport overland from Karachi to the sites in the northern part of the province, there are risks in terms of cost and safety that must be taken into consideration in the procurement plan. The following table shows the classifications of the main materials and equipment to be procured.

Table 2-23: Classifications of Procured Materials

| Name of equipment and materials | Supplier classification | | Remarks |
|--|-------------------------|---------------|---|
| | Pakistan | Third country | |
| Building construction materials | | | |
| Cement | ✓ | | Procure domestically produced products |
| Sand (fine aggregate) | ✓ | | Procure products produced in the province of Sindh |
| Crushed stone (coarse aggregate) | ✓ | | Procure products produced in the province of Sindh |
| Steel reinforcement | ✓ | | Procure PS-compliant*1 products commonly distributed locally |
| Bricks | ✓ | | Procure PS-compliant*1 products commonly distributed locally |
| Lumber | ✓ | | Procure Pakistani products commonly distributed locally |
| Plywood for formwork | ✓ | | Procure Pakistani products commonly distributed locally |
| Wooden/steel door and window frames | ✓ | | Manufactured at domestic plants with technical and production capacity. |
| Hardware | ✓ | | Procure commercially available, maintainable local products |
| Paint and coating | ✓ | | Procure Pakistani products commonly distributed locally |
| Equipment/system installation materials | | | |
| Piping/ironware | ✓ | | Procure Pakistani products commonly distributed locally |
| Sanitary fixtures | ✓ | | Procure Pakistani products commonly distributed locally |
| Mechanical equipment (e.g. pumps) | ✓ | ✓ | Procure commercially available, maintainable local products |
| Electrical wiring materials | ✓ | | Procure commercially available, maintainable local products |
| Lighting fixtures | ✓ | | Procure commercially available, maintainable local products |
| Ceiling fans | ✓ | | Procure commercially available, maintainable local products |
| Switchboards | ✓ | | Procure Pakistani products commonly distributed locally |

*1 Pakistan Standard

2.2.4.7. Implementation Schedule

(1) Project Implementation Schedule

If the Project is to be implemented through grant aid from the government of Japan, it will be implemented by taking the following steps after the signing of the Exchange of Notes (E/N) and the Grant Agreement (G/A) between the two countries.

Table 2-24: Steps in the Implementation Process

| Item | Description | Duration |
|--|--|--|
| 1 Construction supervision agreement | From negotiation to conclusion of the agreement between the Japanese consultant and the partner country government | 2.0 months |
| 2 Prequalification | From bid announcement to prequalification | 2.0 months |
| 3 Selection of contractors (Lot 1 bid) | Selection of local contractors through domestic competitive bidding with qualification requirements From distribution of bid documents to Q&A to bid opening | 1.5 months |
| 4 Construction agreements | From bid evaluation to approval in Pakistan to negotiation and conclusion of construction contracts | 3.0 months |
| 5 Facility construction | Construction of facilities at each site (simultaneous commencement at different sites on a rotating schedule) | 18.0 months |
| 6 Selection of furniture suppliers (Lot 2 bid) | Selection of furniture suppliers through general competitive bidding with qualification requirements From bid announcement to distribution of documents to Q&A to bid opening | 1.0 months (Conducted in parallel with facility construction) |
| 7 Procurement agreements | From bid evaluation to approval in Pakistan to negotiation and conclusion of procurement contracts | 2.0 months |
| 8 Furniture procurement | Procurement to coincide with completion of Lot 1 | 6.0 months |

(2) Bidding process

Based on the rules and regulations pertaining to public procurement in the province of Sindh and the time required during the Previous Project, the bidding plan for the work ordered under the Project from bidding preparation to concluding contracts with contractors is as follows.

Table 2-25: Local Bidding Plan

| Item | Facilities | Furniture and equipment |
|--|----------------------|-------------------------|
| Prequalification | 8 weeks (2.0 months) | |
| From bidding preparation to distribution of bid documents (bid announcement) | 2 weeks (0.5 months) | 2 weeks (0.5 months) |
| From distribution of bid documents (bid announcement) to bid opening | 6 weeks (1.5 months) | 4 weeks (1.0 months) |

| | | |
|--|-----------------------|-----------------------|
| Creation and approval of bid evaluation report | 10 weeks (2.5 months) | 6 weeks (1.5 months) |
| Preparation of contract documents (e.g. performance guarantees), conclusion of contracts | 2 weeks (0.5 months) | 2 weeks (0.5 months) |
| Total | 28 weeks (7.0 months) | 14 weeks (3.5 months) |

(3) Construction/Procurement Schedule

Based on the results of the Previous Project, the construction and procurement schedules for the Project are planned as follows.

Facility Construction

- The actual construction period per site is set to 12 months for two-story buildings—the critical path—taking into account factors such as reduced work efficiency during the rainy season (June–September) and Ramadan (roughly 60% of dry-season progress) (From site preparation and material ordering to procurement and temporary construction preparation: 1 month, Foundation construction: 2 months, First-floor frame construction: 2 months, Second-floor frame construction: 2.5 months, From roof slab installation to finishing work to inspections and delivery: 4.5 months).
- As for the schedule for the contract lot (9 sites), the plan is a standard construction schedule predicated on construction work proceeding while effectively rotating temporary materials and specialists for each type of work through three sites for each group, with a maximum of three groups rotating through each type of work on a roughly three-month staggered schedule.
- Based on the above, the construction period is set to 18 months for the main work of Lot 1.

Equipment Procurement

- Because the furniture will be manufactured, and because local distributors will procure and import ready-made products, it is expected to take 2.0 months from when the furniture is ordered to when it is delivered to the distributors.
- It is expected to take 1.0 month for the various procedures (e.g. tax exemptions, customs clearance).
- It is expected to take 1.0 month to transport the furniture to the sites, assemble it after delivery, and clean and install it.
- Adding 1.0 month to the above as the time required for inspecting and delivering the furniture to all sites, the schedule for procuring the furniture for the schools in the lot from ordering to completion is set to 5.0 months.

(4) Project Implementation Schedule

A summary of the above project implementation schedule is shown in the table below. The total

project period is 27 months (30 months from E/N and G/A).

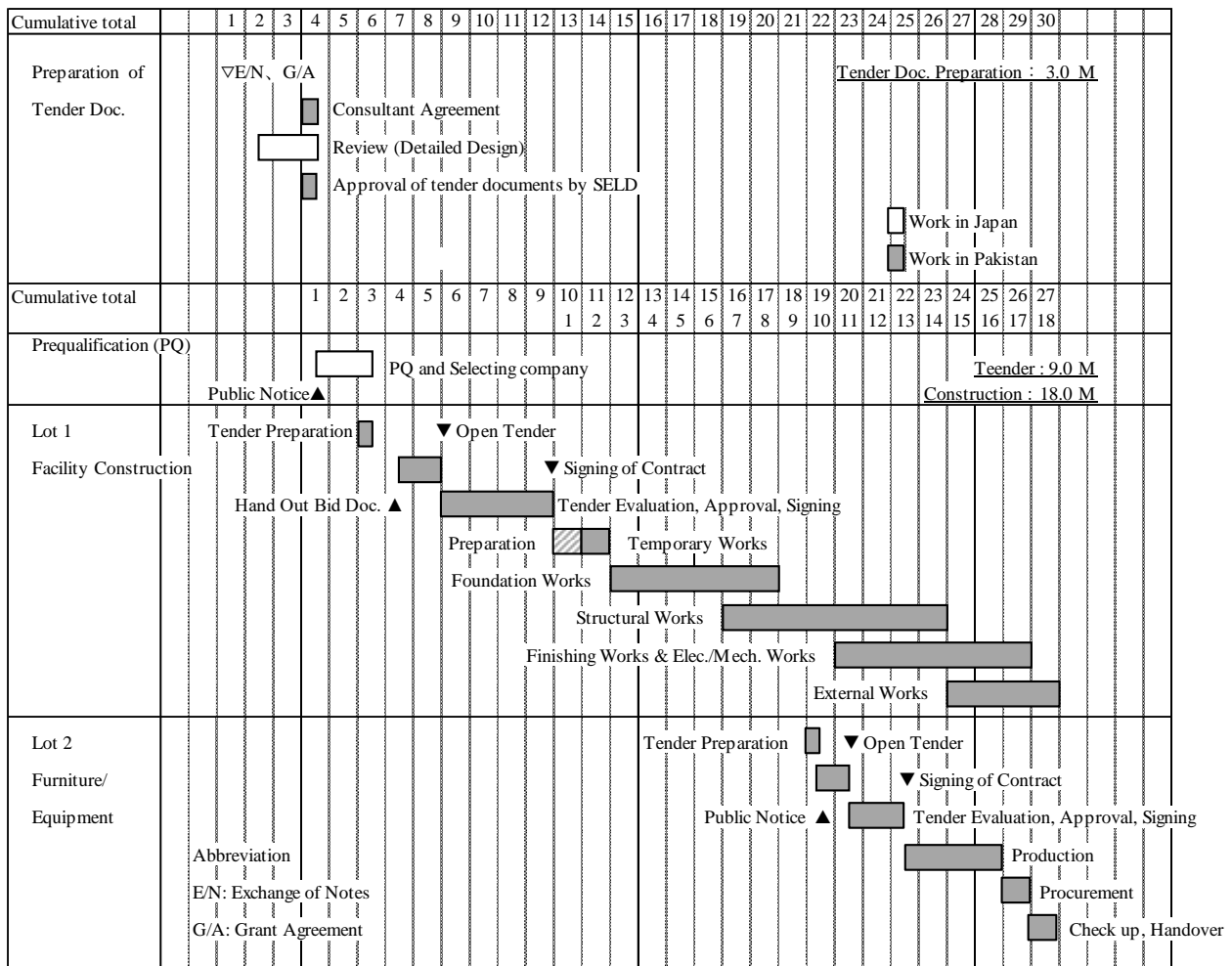


Figure 2-4: Implementation Schedule

2.2.5. Security Plan

(1) Ensuring security

In terms of additional expenses for safety measures, Pakistan qualifies as a conflict-affected country defined by JICA. According to the Overseas Travel Safety Information of the Japanese Ministry of Foreign Affairs, the danger level of the Jacobabad district in the northernmost part of Sindh is Level 3 (Avoid all travel), while it is Level 2 (Avoid nonessential travel) in other areas of the province. Although Sindh is considered less dangerous than northern Pakistan, Karachi—the country’s largest city—experiences terrorist attacks, airport closures, robberies, and other violent crimes; tribal and political conflicts; and civil disturbances, to name some of the safety issues. Accordingly, during the implementation stage, the Project will be implemented while keeping the following items in mind in accordance with the manual for safety measures provided by the JICA Pakistan Office.

- The implementation system will be structured to maximize the local resources (e.g. security

companies, police) while minimizing the number of Japanese personnel working in the area and the duration of their activities.

- Plans will appropriately incorporate additional measures needed as safety measures, including security measures for offices and residences, deploying appropriate vehicles for security purposes, stationing armed guards in transit, and having armed police officers or company personnel.
- Close contact will be maintained with local Japanese government agencies and the Pakistan side counterparts to stay informed as the security situation unfolds, and actions will be taken in compliance with the items identified as critical matters for security measures.
- An emergency security management system (including Japan) will be established to ensure safety during construction supervision, namely by (1) prohibiting workers from going on non-work-related outings, (2) making workers have multiple mobile phone numbers to ensure that they are reachable at all times, and (3) implementing rigorous traffic safety measures for vehicles (daily vehicle and fuel inspections, loose travel itineraries).

2.3. Obligations of the Recipient Country

The following are the responsibilities of the Pakistan side pertaining to the implementation of the Project identified during the field surveys. The policy under the Project is to include work that bears a particular risk of schedule delays—namely removing remaining building foundations and the removal of trees (including roots)—as tasks to be performed by the Japan side during Project implementation.

(1) Before bidding

| No. | Responsibility | Timing of implementation |
|-----|---|--|
| 1 | Conclude a Bank Arrangement (B/A) and pay procedural fees | Promptly after the conclusion of the G/A |
| 2 | Issue an Authorization for Payment (A/P) for the consultant agreement | Promptly after signing the agreement |
| 3 | Pay the following fees to Japanese banks for banking services under the B/A | |
| | 1. Fees for issuing A/P | Promptly after the conclusion of the G/A |
| | 2. Pay the following fees to Japanese banks for banking services under the B/A | For each payment |
| 4 | Obtain environmental impact assessments and development permits (covering costs associated with conducting the assessments) (if necessary) | Promptly after the conclusion of the G/A |
| 5 | Secure, level, etc. sites 1. Secure sites 2. Secure temporary construction facilities and stock yards 3. Secure temporary classrooms (at sites where reconstruction is required) | Before bid announcement |

| No. | Responsibility | Timing of implementation |
|-----|---|--------------------------|
| 6 | Obtain planning and construction permits (if necessary) | Before bid announcement |
| 7 | Remove obstacles 1. Equipment/system obstructions (cables) (if necessary) | Before bid announcement |
| 8 | Submit a Project Monitoring Report (Vol. 1) | Before bid announcement |
| 9 | Implement the following items and pay the costs pertaining to the implementation of the bidding process 1. Secure a bidding venue 2. Publish notices about the bidding in newspapers etc. | Before bid announcement |

(2) During Project implementation

| No. | Responsibility | Timing of implementation |
|-----|---|--|
| 1 | Pay the following fees to Japanese banks for banking services under the B/A | |
| | 1) Fees for consultant agreement payments | For each payment |
| | 2) Fees for facility construction agreements and equipment procurement payments | For each payment |
| 2 | Perform necessary procedures: Request payments to JICA based on agreements with construction and procurement companies (suppliers) and apply for remittances to banks | During Project implementation |
| 3 | Provide assistance for rapid unloading and customs clearance at ports in Pakistan, and for overland transport in Pakistan | During Project implementation |
| 4 | Provide the necessary accommodations for the entry and stay of Japanese and third-country nationals engaged in the Project. | During Project implementation |
| 5 | Pakistan authorities will pay customs duties, domestic taxes, and other financial levies on purchases of products and services without using Project funds. | During Project implementation |
| 6 | Pay all expenses outside the scope of Project funds as necessary for implementing the Project | During Project implementation |
| 7 | 1) Submit a Project Monitoring Report | Monthly |
| | 2) Submit a Project Monitoring Report | At delivery |
| | 3) Submit the (final) Project Monitoring Report | When the work completion certificate is issued based on agreements |
| 8 | Submit a Project Completion Report | Promptly after completing the Project (immediately after facilities go into service) |
| 9 | Install equipment and system infrastructure (electric power and other required offsite equipment) | |
| | 1) Electric power Install solar power systems Connect from the power supply to the requisite locations at sites | Before completing facility construction |

| No. | Responsibility | Timing of implementation |
|-----|--|-------------------------------|
| 10 | Ensure the safety of people engaged in the project | During Project implementation |

(3) After Project

| No. | Responsibility | Timing |
|-----|--|--|
| 1 | Properly and effectively maintain and use the facilities and equipment provided under the grant aid 1) Secure maintenance costs 2) Establish operation and maintenance systems 3) Conduct daily and scheduled inspections | After completing facility construction |
| 2 | Assign new teachers and staff members | After completing facility construction |
| 3 | Campaign activities to improve enrollment | After completing facility construction |
| 4 | Planting work | After completing facility construction |
| 5 | Procure equipment not included in the Project (general furniture) | After completing facility construction |

The following are partner country responsibilities for each site.

Table 2-26: Description of Construction Work to be Performed by the Recipient for each Site

| District | S.N. | School name | Construction work to be performed by the partner country | | Remarks |
|------------|------|------------------------------|--|----------------|-----------------------------------|
| | | | Temporary classrooms | Electric power | |
| Mirpurkhas | Mi03 | GGES - Deh - 294 | Required | Solar | |
| | Mi04 | GGES - Kachelo Farm | Required | Solar | Remove existing electrical cables |
| | Mi08 | GGES - Muhammad Hassan Mari | Required | Solar | |
| Nawabshah | Na01 | GGES - Quest | Required | Solar | |
| | Na03 | GGES - Jalalani | Required | Solar | Remove existing electrical cables |
| Khairpur | Kh05 | GGES - Bajeed Fakir | Required | Solar | |
| | Kh09 | GGES - Jani Buriro | Required | Solar | Remove existing electrical cables |
| Sukkur | Su04 | GGES - Moto Mirbahar | Required | Solar | |
| Ghotki | Gh01 | GGES - Officer Colony Ghotki | Required | Solar | |

2.4. Project Operation Plan

2.4.1. Operation Plan

(1) Operation System

Operation and maintenance of the school facilities to be added under the Project will be carried out by the schools, led by their principals and School Management Committees (SMC) under the guidance and supervision of the Government of Sindh and educational administration authorities at the Division, District and Taluka levels.

SMC activities vary from school to school, but in the schools covered by the plan under this Project, SMCs have been established in all schools and Executive Committee members have been elected. The majority of schools have minimum activities such as holding meetings, managing funds, and developing school improvement plans.

A fixed amount of money, called the SMC Fund, is allocated directly from the SELD-RSU to the SMC. However, from 2016, the allocation was temporarily suspended due to misuse of funds in some schools. Allocations to some schools resumed in 2019, and the main expenditure details include: 1) repairs and maintenance of school facilities (ceiling fans, roofing, wall repainting, etc.); 2) repairs and maintenance of electricity (purchase of solar panels) and water supply facilities (well pumps, etc.); and 3) purchase of furniture, stationery, and other equipment and supplies.

In addition, SELD has introduced a public-private partnership (PPP) scheme to the education sector aimed at addressing low budgets and teacher shortages through private sector know-how; the "Education Management Organization (EMO) Project," in which school management is outsourced to selected private school organizations and NGOs, is being implemented to improve school management efficiency.

The introduction of the EMO project to general public schools has just started, and the operation and maintenance of the facilities to be developed in the plan under this Project will continue as before under the supervision of SELD and the Directorate of School Education, with the active participation of SMCs led by school principals.

2.4.2. Teacher and school official staffing

The middle school level has already been established at the target sites, and schools with the minimum number of primary teachers required for operation have been selected. However, there are some variations in teacher assignments from school to school in light of SELD standards, and the school as a whole must be supplemented with primary and middle school teachers in order to achieve proper operation. The plan is to make up for shortfalls by following the proposal (see table below) for the standard teachers and school officials needed to establish the planned primary school classes.

Table 2-27: Standard Teacher and School Official Staffing for Girls' Elementary Schools

| Classification (Teachers) | Number of teachers | Classification (School officials) | Number of school officials |
|---|--------------------|-----------------------------------|----------------------------|
| ECT Early Childhood Teacher | 1 | OT Oriented Teacher (Arabic) | 1 |
| PST Primary School Teacher | 5 | AWI Assistant Workshop Instructor | 1 (IT, etc.) |
| SST/HST Secondary School Teacher/ High School Teacher | 1 (principal) | Miscellaneous duties Naib Qasid | 1 |
| JEST Junior Elementary School Teacher | 3 | Security Chowkidar | 1 |

Of these, SSTs/HSTs, JESTs, and PSTs will be selected and hired in accordance with the policies for hiring and reassigning teachers issued in 2021. In these cases, the standard assignment is 30 students per teacher. Although teachers and school officials in the other categories are employed as full-time civil servants under district budgets, few schools have a specially trained OT, while schools equipped with computer labs have new contract-based assistant teachers (AWI).

In light of the above, the following plan sets out the minimum number of new teachers and school officials required for the proper operation of the facilities to be developed under the Project.

- The number of teachers required to teach middle classes is based on the standard of 30 students per teacher. Staffing plans call for four teachers, three of whom are JESTs and one of whom is an SST/HST (principal).
- The number of OT and ICT (Information & Communication Technology) staff are not included in the plan as it was deemed difficult to assign them in rural areas.
- For the supplemental teachers for the primary classes, it is assumed that there will be five primary school teachers (PSTs) and one preschool teacher (ECT). Schools that have secured six primary school teachers shall be regarded as having the required number of teachers.
- As for non-teacher school officials, one security guard and one official for miscellaneous duties will be staffed in accordance with the standard, and new officials will be assigned only where there are no such staff members at girls' elementary schools.

Table 2-28 shows the estimated number of new teachers and school officials that would need to be assigned at each site.

Table 2-28: Estimation of the Required Number of Teachers

| S. No. | School name | Current situation | | | | | Required number of teachers and school officials (by school) | | | | |
|------------|----------------------------|-------------------|-----------------|---------|------|-------------------------|--|---------------------|---------|------|-------------------------|
| | | No. of students | No. of teachers | | | No. of school officials | No. of teachers | | | | No. of school officials |
| | | | GI-VIII total | ECT/PST | JEST | | SST/HST | Guard/General staff | ECT/PST | JEST | |
| Mirpurkhas | | | | | | Total | 4 | 0 | 2 | 6 | |
| Mi03 | GGES Deh 294 | 125 | 5 | 3 | - | - | 1 | - | 1 | 2 | |
| Mi04 | GGES Kachelo Farm | 249 | 6 | 4 | - | - | - | - | 1 | 2 | |
| Mi08 | GGES Muhammad Hassan Mari | 215 | 3 | 3 | 1 | - | 3 | - | - | 2 | |
| Nawabshah | | | | | | Total | 0 | 0 | 1 | 2 | |
| Na01 | GGES Quest | 335 | 15 | 12 | - | 3 | - | - | 1 | - | |
| Na03 | GGES Jalalani | 91 | 6 | 3 | 1 | - | - | - | - | 2 | |
| Khairpur | | | | | | Total | 5 | 0 | 1 | 2 | |
| Kh05 | GGES Bajeed Fakir | 248 | 2 | 3 | - | 4 | 4 | - | 1 | - | |
| Kh09 | GGES Jani Boro | 140 | 5 | 3 | 1 | - | 1 | - | - | 2 | |
| Sukkur | | | | | | Total | 3 | 3 | 1 | 2 | |
| Su04 | GGES Moto Mirbahar | 164 | 3 | - | - | - | 3 | 3 | 1 | 2 | |
| Ghotki | | | | | | Total | - | 3 | 0 | 2 | |
| Gh01 | GGES Officer Colony Ghotki | 226 | 13 | | 1 | - | - | 3 | - | 2 | |
| Total | | | | | | | 12 | 6 | 5 | 14 | |

2.4.3. Maintenance Plan

(1) Methods of operation and maintenance

Regarding the maintenance of school facilities, under the management of SELD-DEO-TEO, routine maintenance of school facilities is performed by school officials for miscellaneous duties employed by the school under the direction of the principals. School officials for miscellaneous duties are also responsible for operating and maintaining water supply systems, electrical systems, and other equipment and systems in the buildings as well as maintaining equipment, furniture, and the like. Although these officials generally do not have special technical capabilities, the building equipment and systems included in the Project are as basic as those in ordinary residences (with the exception of solar panel systems) and should be maintainable with the help of local community members with specialized skills. Additionally, to keep buildings in good condition over the long term, daily cleaning and routine inspections must be conducted, and wear and tear, damage, and deterioration must be repaired properly; plans call for SMCs, which include parents, guardians, and community members, to provide support for school and facility maintenance as necessary, with the following important items incorporated into the school improvement plans to be developed by the SMCs.

- Routine cleaning: Students will clean the classroom blocks every day under the guidance of teachers. Additionally, school officials for miscellaneous duties will clean administrative

departments and common areas at each school, and SMCs will regularly engage in group cleanup at least several times per year.

- Recurring facility repairs: Project facilities generally have maintenance-free materials and finishes to minimize the necessary maintenance items, and repairs will not be necessary for several years after delivery if scheduled inspections and routine cleaning are encouraged and proper daily maintenance is carried out. Thereafter, regular repairs will be required, including repairing and repainting painted areas (roughly once every 10 years) and inspecting and adjusting furniture (roughly once per year).
- Maintenance of building equipment and systems: Daily operation management and scheduled inspections are critical for building equipment and systems before they break down and require repairs or replacement parts. Although most of the equipment and systems in Project facilities are widely used in the area and are not complex, it is necessary for each school—with the help of their SMC—to establish a system to ensure routine management, including inspections, simple repairs, replacement of parts, and more. Additionally, although solar panel systems are essentially maintenance-free, they require scheduled inspections (roughly once every four years) by specialists to prevent sudden declines in power generation efficiency and for safety.
- Maintenance of exterior facilities: In addition to daily cleaning of building perimeters, plantings and the like should be properly maintained roughly two times per year in an effort to stabilize the ground and maintain stormwater drainage systems. Additionally, roughly one time per year, sewage catch basins and other components of sewage treatment systems will be cleaned by removing sludge and cleaning the interiors.

Recurring budgets for school operation and maintenance are financed from four sources: (1) maintenance and repair budgets provided to districts by the provincial finance department, (2) the development budget from the Annual Development Plan when major repairs are needed, (3) the SMC Fund allocated directly to SMCs from the central budget as a non-development budget, and (4) donations from prominent locals. The budgets can only be used for limited purposes, and given that the routine maintenance of school facilities rarely appears as a recurring budget line item (Maintenance & Repair) for school operations as originally planned, and is almost never included at the middle school level, the SMC Fund is used mainly for this purpose. However, the amount of PKR 50,000 per year is not sufficient for middle schools and is being contributed on an ad hoc basis from the budget managed by the RSU, which raises concerns about its consistency and long-term availability.

While the school operating maintenance budgets had fallen behind with the suspension of SMC Fund allocations for the past several years, the SMC Fund was resumed in 2021. In the future, the SMC Fund should be regularly allocated and the budgeted amounts should be expanded. Specifically, to properly maintain the facilities to be developed under the Project into the future, it is necessary to ensure that a sufficient budget for ordinary repairs of school facilities is continuously secured and properly allocated in accordance with the sizes of the schools. Notably, facility

expansion and major repairs will be handled through separate budgets such as the development budget funded by the Annual Development Plan.

2.5. Project Cost Estimation

2.5.1. Initial Cost Estimation

(1) Cost to be borne by the Japanese side

Not to be disclosed until construction and procurement contracts are approved.

(2) Cost to be borne by the Pakistan side

Table 2-29: Cost to be borne by Pakistan side

| Item | Estimated cost (Million PKR) | (Million JPY) |
|--|------------------------------|---------------|
| Cost of installing new solar panel systems (New installation for 9 primary school reconstruction sites) | 10.800 | 5.176 |
| Cost of upgrading solar panel systems (Upgrades for 54 middle school sites) | 30.000 | 14.377 |
| Bank charges for banking arrangements, payments, etc. | 1.570 | 0.752 |
| Cost for public announcement for bid | 1.000 | 0.479 |
| Total | 43.370 | 20.784 |

(3) Conditions of estimation

Timing of aggregation: June 2023

Exchange rates: USD 1 = JPY 135.88, USD 1 = PKR 283.54, PKR 1 = JPY 0.47922

(PKR: Pakistani Rupee)

Construction/procurement period: The construction period is as indicated in the construction schedule.

Other: The Project will be implemented in accordance with the grant aid system of the Government of Japan.

2.5.2. Operation and Maintenance Cost

The following is an estimate of the costs required to operate and maintain the Project facilities.

(1) Operating costs

1) Personnel costs

Implementation of the Project will require 5 administrative officials (principals), 6 junior elementary teachers, and 12 primary teachers as the minimum number of newly assigned personnel required at the 9 target schools. Additionally, the plan calls to assign 14 security guards and school officials for miscellaneous duties as the minimum required to manage and operate school facilities, and also to add these officials to schools where they are not presently assigned. Furthermore, all

other teachers and school officials included among civil servants will earn salaries and benefits in accordance with the standard salary scale and commensurate with their position and grade. Notably, 12 additional primary teachers (ECTs/PSTs) must be assigned to properly operate the girls' elementary school facilities, but a net increase in teachers is not expected because the additional teachers will be reassigned from target schools with more than the standard number of teachers. Assuming that all the required teachers and school officials are newly hired, the new personnel costs for each district are estimated as follows.

Table 2-30: Estimated Personnel Costs for Teachers and School Officials

| District | No. of sites | Required number of teachers and school officials | | | Monthly salary/benefits (thousand PKR) | | | Annual personnel cost (Mill. PKR) (Mill. JPY) | |
|---|--------------|--|----------|---------------------|--|--------------|---------------------|--|------------|
| | | Teachers | | School officials | Teachers | | School officials | | |
| | | JEST | SST/HST | Guard/General staff | JEST | SST/HST | Guard/General staff | | |
| Standard salary level/salary and benefits | | BPS-14 | BPS-16 | BPS-1 | 37.698 | 47.492 | 25.249 | | |
| Mirpurkhas | 3 | 0 | 2 | 6 | | 95.0 | 151.5 | 2.958 | 1.4 |
| Nawabshah | 2 | 0 | 1 | 2 | | 47.5 | 50.5 | 1.176 | 0.6 |
| Khairpur | 2 | 0 | 1 | 2 | | 47.5 | 50.5 | 1.176 | 0.6 |
| Sukkur | 1 | 3 | 1 | 2 | 113.1 | 47.5 | 50.5 | 2.533 | 1.2 |
| Ghotki | 1 | 3 | 0 | 2 | 113.1 | | 50.5 | 1.963 | 0.9 |
| Total | 9 | 6 | 5 | 14 | 226.2 | 237.5 | 353.5 | 9.806 | 4.7 |

- Salary levels for each position were established in accordance with the official request.

- Salaries are based on first-year salaries from the 2021 revised standard salary schedule; benefits include an adjustment allowance, a housing allowance, a commuting allowance, and a medical allowance.

The estimation resulted in a total cost for the required new personnel for the nine target sites of PKR 9.806 million. This is equivalent to 0.005% of the PKR 215,679-million personnel cost in the operating budget (ordinary expenses) for the school education sector in Sindh for 2023–24.

2) Facility operating costs

The cost of operating facilities is estimated as follows.

- Water service cost: Not estimated in this section because the plan calls for water to be supplied from wells to be drilled at all sites or from established city water supplies.
- Telecommunications cost: Not estimated in this section because the plan calls for the partner country to install telephones and other telecommunication facilities at their own expense as needed.
- Electricity charges: Not estimated in this section because the plan calls for the partner country to install solar panels at all sites at their own expense.

3) Maintenance Costs

Facility and furniture maintenance costs

The cost of maintaining the facilities and furniture to be developed and installed under the Project is estimated as shown on the following table. These maintenance costs are for recurring maintenance such as partial repairs to exterior walls and the coatings of interior and exterior steel and wooden parts, partial repairs to finishing materials, replacement of damaged hardware, partial replacement of equipment parts, repairs of broken systems equipment, and replacement of damaged furniture components. Costs for major repairs needed over the long term are covered separately by an investment budget managed by SELD.

Table 2-31: Estimated Maintenance Costs

| Province | No. of sites | Number of classrooms | Floor area Total (m ²) | Annual maintenance cost (Million PKR) | | | |
|------------------------------|--------------|----------------------|------------------------------------|---------------------------------------|-----------------------------|-----------------------------|------------------|
| | | | | Building maintenance costs | Equipment maintenance costs | Furniture maintenance costs | Total |
| Mirpurkhas | 3 | 16 | 1,020.38 | 0.707 | 0.148 | 0.430 | 1.285 |
| Nawabshah | 2 | 8 | 488.05 | 0.318 | 0.081 | 0.211 | 0.610 |
| Khairpur | 2 | 10 | 565.64 | 0.350 | 0.085 | 0.248 | 0.683 |
| Sukkur | 1 | 4 | 204.80 | 0.107 | 0.036 | 0.098 | 0.241 |
| Ghotki | 1 | 6 | 337.80 | 0.183 | 0.044 | 0.150 | 0.377 |
| Total (Amount per school) | 9 | 44 | 2,616.67 | 1.665 (0.185) | 0.394 (0.044) | 1.137 (0.126) | 3.196 (0.355) |

* Assuming the following recurring facility maintenance costs (annual) determined from the details and specifications of Project facilities in reference to data on building maintenance costs in Japan.

- Building maintenance cost: Construction cost x 0.2%
- Equipment maintenance cost: Equipment construction cost x 1.5%
- Furniture maintenance cost: Furniture cost x 1.5%

(2) Total Operation & Maintenance Costs

Summarizing the aforementioned estimates, the minimum increase in annual operation and maintenance costs required to implement the Project are estimated as shown in Table 2-32.

Personnel expenses, which account for the largest amount of this total, are included in the state budget as an operating budget (recurrent expenses), and the budgeted amount for 2023-24 is 215,679 million PKR for personnel expenses, including salaries and benefits. The increase due to project implementation is 0.005% of the same budgeted amount, which is sufficient to cover the cost of the Project. On the other hand, repair and maintenance of facilities and furniture is considered to be the role of the SMC, and is expected to be carried out by allocating SMC funds. In fact, many schools have used SMC funds to maintain and improve their facilities and furniture. However, the annual requirement estimated above is seven times the amount paid out of the fund, which is not necessarily sufficient. Looking at the overall operation and maintenance costs excluding personnel expenses, the increase due to the Project accounts for 0.006% of the school

education sector operating budget, meaning that securing the necessary budget is eminently possible if it is allocated appropriately within the expansion of the overall education budget. Toward that end, the cooperation of the Government of Sindh is necessary.

Table 2-32: Estimated Annual Operation and Maintenance Costs

| Province | Number of sites | Annual maintenance cost (Million PKR) | | Total (Million PKR) |
|---------------------|-----------------|---|--|---------------------|
| | | Personnel costs for teachers and school officials = [A] | Facility and furniture maintenance costs = [B] | |
| Mirpurkhas | 3 | 2.958 | 1.285 | 4.243 |
| Nawabshah | 2 | 1.176 | 0.610 | 1.786 |
| Khairpur | 2 | 1.176 | 0.683 | 1.859 |
| Sukkur | 1 | 2.533 | 0.241 | 2.774 |
| Ghotki | 1 | 1.963 | 0.377 | 2.340 |
| Total | 9 | 9.806 | 3.196 | 13.002 |
| Increase per school | | - | (0.355) | - |

| Source budget expense item | Personnel cost | Non-personnel costs | SMC Fund |
|--|-------------------------|------------------------|---------------------------------------|
| Budgeted amount for 2023-24 academic year (Provincial education sector operating budget) | 215,679.0 (Million PKR) | 51,915.1 (Million PKR) | Elementary schools: PKR 50,000/school |
| Share of [A] [B] increase | 0.005% | 0.006% | 710% |

Chapter 3 Project Evaluation

Chapter 3. Project Evaluation

3.1. Preconditions

The following are the efforts the Pakistan side must make as preconditions for the implementation of the Project.

(1) Preservation of construction sites

Although the properties at relevant sites have already been surveyed in the presence of relevant people, and affidavits of land donation have already been submitted, SELD must maintain close contact with Project personnel at the district and taluka levels and exercise due diligence to ensure that the land on which facilities are to be constructed is not altered in ways that would impede construction, and in particular to ensure no overlap with the construction of other facilities.

(2) Fulfillment of Pakistan side responsibilities

In the course of implementing the Project, although plans call for the minimization of the workload of the Pakistan side mainly to facilitate work on small properties, land development must be implemented prior to the construction work, and to ensure safety, arrangements must be made for temporary classrooms at sites where existing classrooms will become unusable during construction. SELD must serve as the liaison for these matters, directing the district DSEs and coordinating with Japanese counterparts and contractors regarding the details and timing of implementation, and then securing a budget in advance to ensure proper implementation.

3.2. Necessary Inputs by Recipient Country

The following are the efforts the Pakistan side must make to produce and sustain the Project outcomes.

(1) Properly assign teachers and school officials

Under the Project, 44 primary education classrooms will be reconstructed at 9 schools in five districts in the province of Sindh. To fully utilize these facilities and equipment in the target schools, which are girls' elementary schools, the schools will need to bring in 23 new teachers (including principals) with the necessary qualifications for teaching primary and middle school, and 14 new school staff to serve as maintenance personnel. To ensure that these teachers and school officials are assigned as soon as possible after the completion of the facilities, a hiring plan including budget allowance (registration in the Schedule of New Expenditure (SNE) is required) must be developed in advance, and preparations for hiring and assignment must be made in a systematic manner. The Project is scheduled for completion in March 2026, and if the schools were to open in July 2026, SNE and recruitment would need to be completed by 2025. It is therefore essential to implement plans to ensure that the minimum number of teachers needed to operate girls' elementary schools

can be assigned without delay after the completion of the facilities, even if it requires temporary transfers from other schools and the temporary use of primary teachers with sufficient skills and qualifications.

(2) Ensure sufficient school operating budgets

The new costs for operation and maintenance of the facilities to be constructed under the Project will be paid from two sources: the SMC Fund, which is allocated directly to SMCs, and the basic education operating budget of schools or taluka education offices. Of this amount, the school operating budgets allocated from the provincial budget (operating expenditure) are limited, and school funding are largely dependent on SMCs. However, the SMC Fund used to maintain facilities and equipment and improve learning environments based on school improvement plans is small compared to its intended use, barely enough to cover the expected minimum maintenance costs for the new buildings, and not enough to maintain all existing and new school facilities. Additionally, in recent years, allocations from the SMC Fund have been suspended due to the misuse of funds, and delays in budget execution attributable to RSU management have also been problematic. Improvements in the financial management of the RSU and SMCs are required, as are systemic improvements, including appropriate standards for allocating funds according to demand, and organizing and reviewing the use of each budget.

(3) Efforts to promote girls' enrollment

The Project aims to improve the environment of basic education facilities in schools that have been upgraded to girls' elementary schools through grant aid to date, including girls' middle schools, by rebuilding existing schools that were damaged by the heavy rains of 2022. It also aims to eliminate disparities between genders and regions by improving girls' access to middle education, which was the original aim of previous projects. Interviews of target schools revealed the complexity of the factors preventing girls from enrolling in school despite gradual changes in parents' awareness of the need to educate girls; to fully realize the Project outcomes, in addition to developing facilities, it is necessary for involvement of DEO and TEO, mainly SELD, in promoting school enrollment. Currently, in each province of Sindh, a school enrollment promotion campaign is conducted once a year under the leadership of the DEO, TEO, and school principals. In order to further improve the enrollment rate of girls, it is essential to activate school enrollment promotion activities including schools in the vicinity of the target schools.

(4) Coordinate with technical cooperation

Japan has been cooperating to strengthen informal education in Sindh and prevent students from dropping out of public primary schools through Advancing Quality Alternative Learning Project Phase 2 (2021–2025), an ongoing technical cooperation project, and the Project for Gender Responsive Actions to Ensure Retention through Community Engagement and School Practices (2022–2026). These two projects are expected to coordinate with the middle schools constructed

under the Project for collaboration in continuing and promoting school enrollment at the time of transition to middle level. The areas where the schools to be developed in the Project are located are included in the target areas, and it is expected that coordination of the Project will deter dropouts and promote school attendance at the transition to middle school level. Additionally, specialist education policy advisors have been dispatched to SELD since the 2022 academic year and are expected to provide lateral support for the effective implementation of the Project and each of the technical cooperation projects.

3.3. Important Assumptions

(1) Stability of the security situation

Pakistan is a high-risk country with a constantly changing state of security due to changes in circumstances inside and outside the country; in addition to internal factors—namely a multilingual, diverse ethnic composition, a feudalistic social structure, and economic disparities between rural and urban areas—the situation is tense in the border areas with India and Afghanistan. Politically, the country has also been unstable since it seceded and declared independence from India, with frequent changes between military and civilian governments. However, in the target province of Sindh, security is relatively stable in rural areas despite the risk of frequent crime, attacks and murders associated with political conflict, and bombings by Islamic extremists in the provincial capital of Karachi and other urban areas. The sustained stability of security is essential for the successful implementation of the Project; the deterioration of security in the target area would be a grave concern that could lead to the suspension of the Project.

(2) Ongoing education reform

The Government of Sindh has implemented SERP and SERPII in accordance with the National Education Policy (2009), a higher-level national plan, and has undertaken reforms aimed at improving the quality of the delivery of educational services through improved governance and management. Additionally, the Project directly supports expanding school infrastructure development to meet data-driven needs, one of the key objectives of SESP&R (2019–2024), which is predicated on the goal of equitable access to education. Furthermore, the Project is expected to deliver better outcomes as this series of reforms is sustained or expanded, and the continuation of educational reforms in Sindh can be understood as an important condition for the successful realization of the Project.

3.4. Project Evaluation

3.4.1. Relevance

The relevance of the Project is recognized as follows.

(1) Recipients of Project benefits

The Project will directly benefit roughly 1,150 girls who will enroll in the newly established middle classes and roughly 490 students who will use the reconstructed primary school classrooms, and its implementation will benefit community members in the target areas—the broader public—by improving the environment in the facilities and enrollment conditions in middle education in the target areas.

(2) Project goals and urgency

The goal of the Project is to restore educational facilities, equipment, and materials in Sindh that were damaged by the 2022 floods, thereby creating a safe learning environment and improving disaster resilience, in turn contributing to ensuring human security and improving social infrastructure in Pakistan, and an urgent response is required.

(3) Consistency with higher-level plans

In response to the 2022 floods, the Government of Pakistan conducted a PDNA study, and based on the results of this study, the concept of "Build Back Better" was adopted. Recovery needs in the education sector include (1) access and learning environment, (2) teaching and learning, and (3) education policy as basic policies, and priorities are set with short-, medium- and long-term recovery processes, and this plan is consistent with the medium- and long-term goals in the plan under this Project. In addition, the 4RF, which presents strategies and approaches for recovery, has four goals, and the Project is consistent with the fourth of these, which is SRO4: "Restore and improve basic services and physical infrastructure in a resilient and sustainable manner." In light of the above, the Project is consistent with that policy.

(4) Consistency with Japan's aid policy and objectives

Japan views Pakistan as a key player in achieving peace and stability in South Asia, and as a country with great economic and social potential given its massive population. Accordingly, Japan provides assistance to Pakistan under its basic ODA policy to build stable, sustainable societies through the expansion of the middle class. In view of the risk of climate change, and in light of the fact that Pakistan and Japan often suffer from natural disasters, the Sendai Framework for Disaster Reduction 2015-2030, which was adopted at the Third United Nations World Conference on Disaster Reduction, sets forth an important subprogram within "Ensuring Human Security and Human Development" to support the strengthening of disaster reduction systems, focusing on preparedness and disaster reduction, utilizing Japan's knowledge and technology, and to build a resilient society that will be able to withstand disasters. The basic education sector is similarly positioned in this subprogram, with policies aimed at ensuring the quality of education through the improvement of educational opportunities and the provision of a safe learning environment. The Project is consistent with the policy of focusing on improving disaster resilience and safe learning environments.

3.4.2. Effectiveness

(1) Quantitative Effects

The following are the outputs expected to deliver quantitative effects as a result of the implementation of the work within the scope of the Project.

| Indicator | Baseline (2023) | Target (2029) [Three years after completion of the Project] |
|--|-----------------|--|
| The number of female students who can safely learn in the targeted schools | 491 students | 1,644 students |

(2) Qualitative Effects

The following are the outputs expected to deliver qualitative effects as a result of the implementation of the work within the scope of the cooperation.

- Educational services at supported facilities will be restored quickly.
- Damage to facilities to be supported by assistance will be reduced in the event of a disaster.

(3) Conclusion

In light of the above, the Project is deemed highly relevant and effective.

Appendices

- 1. Member of the Survey Team**
- 2. Study Schedule**
- 3. List of Parties Concerned in the Recipient Country**
- 4. Minutes of Discussions**
 - 4-1 Field Survey**
 - 4-2 Technical Notes (Field Survey)**
- 5. References**
- 6. Other Relevant Data**
 - 6-1 Site Plan for Alternative Sites (3 Sites)**
 - 6-2 Table of survey results by Project and District (Existing Facilities) [The Programme for Flood Response through Reconstruction of Education Facilities in Sindh]**
 - 6-3 Table of survey results by Project and District (Situation of Disaster) [The Programme for Flood Response through Reconstruction of Education Facilities in Sindh]**
 - 6-4 Table of survey results by Project and District (Enrollment) [The Programme for Flood Response through Reconstruction of Education Facilities in Sindh]**

6-5 Topographic Survey Map of the Project Site

6-6 Report of the Geotechnical investigation on the Site

1. Member of the Survey Team

Field Survey

| | | |
|----------------------|---|--|
| Ms. Yuko KUNO | Team Leader | Senior Representative, JICA, Pakistan Office |
| Mr. Masao HASHIMOTO | Project Manager/ Architectural Planning | Matsuda Consultants International Co., Ltd. |
| Ms. Izumi KASAI | Architectural Designer | KOKUSAI KOGYO CO., LTD. |
| Mr. Tomohiro OSAWA | Facility Planner | Matsuda Consultants International Co., Ltd. |
| Mr. Shogo ASAKAWA | Construction Planner/ Cost Estimation | Matsuda Consultants International Co., Ltd. |
| Mr. Takahiro YANO | Research on Natural Conditions | Matsuda Consultants International Co., Ltd. |
| Ms. Atsuko NONOGUCHI | Education Planner/ Gender | KOKUSAI KOGYO CO., LTD. |
| Mr. Tatsuji TSUCHIYA | Architectural Designer (Detailed Design) | Matsuda Consultants International Co., Ltd. |
| Mr. Naoto NISHIYA | Structural Designer (Detailed Design) | Matsuda Consultants International Co., Ltd. |
| Mr. Yasuharu Shinkai | Facility Planner (Detailed Design) | Matsuda Consultants International Co., Ltd. |
| Ms. Yuri AOKI | Coordinator | Matsuda Consultants International Co., Ltd. |

2. Study Schedule

2-1 Field Survey

| | JICA Leader | Chief Consultant/ Archi. Designer a | Construction Planner /Cost Estimation b | Education Planner/ Gender c | Archi. Designer d | Coordinator e | |
|----|-------------|--|---|--|--------------------------------------|------------------|-----------------|
| 1 | 7-May Sun | NRT→BKK→Karachi | | | | | NRT→BKK→Karachi |
| 2 | 8-May Mon | Courtesy visit to SELD | | | | | ←a |
| | | Survey on Facility Planning (Education Works) | | | | | |
| | | Receive the quotation of Sub-contract | | | | | |
| 3 | 9-May Tue | Negotiate w/Sub-contract (Standby at hotel) | | | | | ←a |
| 4 | 10-May Wed | Sign w/Sub-contract (Standby at hotel) | | 15:00 on-line meeting with Ms. Hanaya, JICA Education Advisor (Standby at hotel) | Document analysis (Standby at hotel) | ←a | |
| 5 | 11-May Thu | 14:45 Online discussion on IR w/SELD (Standby at hotel) | | | | | |
| 6 | 12-May Fri | Document analysis (Standby) | | 9:30 on-line meeting with unicef 12:00 on-line meeting with World Bank (Standby at hotel) | Document analysis (Standby at hotel) | | |
| 7 | 13-May Sat | Document analysis (Standby at hotel) | | | | | |
| 8 | 14-May Sun | Document analysis (Standby at hotel) | | | | | |
| 9 | 15-May Mon | Sign w/Sub-contract (Standby at hotel) | | Preparation for field survey (Standby) | ←a | | |
| 10 | 16-May Tue | 10:00 Survey on Similar Facility (GBHS Colony/ USAID SBEP) | | Preparation for field survey | ←a | | |
| | | Discuss w/ SELD for re-schedule | | | | | |
| 11 | 17-May Wed | Sites survey (Ba06, Ba01) | | | | | |
| 12 | 18-May Thu | Sites survey (M04, M03) | | | | | |
| 13 | 19-May Fri | Sites survey (M08, Na03) | | | | | |
| 14 | 20-May Sat | Karachi→Sukkur (by Airplane) | | | | | |
| 15 | 21-May Sun | Document analysis | | | | | |
| 16 | 22-May Mon | Sites survey (Kh09, Kh05) | | | | | |
| 17 | 23-May Tue | Sites survey (Su04, Gh01) | | | | | |
| 18 | 24-May Wed | Sites survey (Da05) | | | | | |
| 19 | 25-May Thu | Sukkur→Karachi (by Airplane) | | | | | |
| 20 | 26-May Fri | 11:00 meeting with Additional Secretary, PD&F/SELD | Construction Material Survey | ←a | Analysis of field survey | ←a | |
| 21 | 27-May Sat | Document analysis | | | | | |
| 22 | 28-May Sun | Document analysis | | | | | |
| 23 | 29-May Mon | 10:00_Discuss on MD | | Construction Cost Survey | ←a | | |
| 24 | 30-May Tue | Signature on MD | | Construction Cost Survey | Supplementary Survey, Karachi→BKK | | |
| 25 | 31-May Wed | Construction Cost Survey | | BKK→NRT | | | |
| 26 | 1-Jun Thu | Online report w/JICA & EOJ | | Construction Cost Survey | District for South Project | | |
| 27 | 2-Jun Fri | Construction Cost Survey | | District for North Project | | | |
| 28 | 3-Jun Sat | Document analysis | | | | | |
| 29 | 4-Jun Sun | Transition to other project | | | | | |

SELD= School Education & Literacy Dep.
 NRT= Narita
 HND= Haneda
 BKK= Bangkok
 KC= Karachi
 HY= Hyderabad
 EOJ= Embassy of Japan

| | |
|----------------------------|----------------|
| District for South Project | |
| | Badin |
| | Mirpurkhas |
| | Nawabshah |
| District for North Project | |
| | Sukkur, Ghotki |
| | Khairpur |
| | Dadu |

3. List of Parties Concerned in the Recipient Country

| Name | Institution | Title |
|---|---|----------------------------|
| School Education & Literacy Department (SELD) | | |
| Mr. Abdul Qadeer Ausari | Directorate of Planning, Development and Finance (PD&F) | Additional Secretary |
| Mr. Dilawar Ali Mangi | Directorate of Planning, Development and Research | Additional Director |
| Mr. Zahoor M Qazi | Sindh Teacher Education Development Authority | Deputy Director |
| Mr. Khalil Ahmed Shaikh | Education Works | Chief Engineer |
| Mirpurkhas District/ School/ Taluka Education Office | | |
| Ms. Nargis Basheer | Mi03/ GGES Deh 294 | Head Mistress |
| Ms. Sana Bibi | Mi03/ GGES Deh 294 | Teacher (PST) |
| Ms. Saba Rani | Mi03/ GGES Deh 294 | Teacher (JEST) |
| Ms. Naheed Akhter | Mi03/ GGES Deh 294 | Teacher (PST) |
| Ms. Jhami Mohan | Mi04/ GGES Kachelo Farm | Head Mistress (PST) |
| Ms. Hina Ayaz | Mi04/ GGES Kachelo Farm | Teacher (PST) |
| Ms. Noor Khatoon | Mi04/ GGES Kachelo Farm | Teacher (PST) |
| Ms. Fatima | Mi08/ GGES Muhammad Hassan Mari | Head Mistress (HST) |
| Ms. Aisha Ali | Mi08/ GGES Muhammad Hassan Mari | Teacher (PST) |
| Ms. Tooba | Mi08/ GGES Muhammad Hassan Mari | Teacher (ECE) |
| Mr. Amir Bux Narejo | | Taluka Education Officer |
| Badin District/ School/ Taluka Education Office | | |
| Ms. Shabana | Ba01/ GGES Gullan Khaskheli | Head Mistress |
| Ms. Gul Sanober | Female Elementary School/High School | Taluka Education Officer |
| Ms. Qurat-UI-Ain | Ba01/ GGES Gullan Khaskheli | Teacher (PST) |
| Ms. Mehreen | Ba01/ GGES Gullan Khaskheli | Teacher (JEST) |
| Ms. Nasreen | Ba01/ GGES Gullan Khaskheli | Teacher (PST) |
| Ms. Sumaira Gulfam | Ba06/ GGES Ibrahim Chandio | Head Mistress |
| Mr. Munawar Ali | Elementary School/ High School | Taluka Education Officer |
| Mr. Rajab Ali | | Chairman SMC |
| Nawabshah District/ School/ Taluka Education Office | | |
| Mr. Qurban Ali Rahu | Shaheed Benazirabad | District Education Officer |
| Ms. Rizwana Magsi | Sakrand | Taluka Education Officer |
| Ms. Rizwana Tunio | Na01/ GGES Quest | Head Mistress |
| Ms. Hamida Jalalami | Na03/ GGES Jalalani | Head Mistress |
| Ms. Shama | Na03/ GGES Jalalani | Teacher (JEST) |
| Ms. Isra Anwar | Na03/ GGES Jalalani | Teacher (PST) |
| Ms. Sana Mansha | Na03/ GGES Jalalani | Teacher (JEST) |

| | | |
|-------------------|---------------------|---------------|
| Ms. Seema Shaikh | Na03/ GGES Jalalani | Teacher (PST) |
| Ms. Saba Aslam | Na03/ GGES Jalalani | Teacher (PST) |
| Ms. Farhat Qayoom | Na03/ GGES Jalalani | Teacher (PST) |
| Ms. Qurat Ul Ain | Na03/ GGES Jalalani | Teacher (PST) |
| Ms. Shehla | Na03/ GGES Jalalani | Teacher (HST) |
| Ms. Komal | Na03/ GGES Jalalani | Teacher (PST) |

Khairpur District/ School/ Taluka Education Office

| | | |
|----------------------|-------------------------|--------------------------|
| Ms. Pathani Rajper | Kh05/ GGES Bajeed Fakir | Head Mistress |
| Ms. Noorillahi | Kh05/ GGES Bajeed Fakir | Teacher (PST) |
| Ms. Sanam Gul Rajper | Kh05/ GGES Bajeed Fakir | Volunteer |
| Ms. Abida Parveen | Kh09/ GGES Jani Boro | Head Mistress |
| Ms. Hunain Fatima | Female Kot Diji | Taluka Education Officer |

Sukkur District/ School/ Taluka Education Office

| | | |
|---------------------|--------------------------|----------------|
| Ms. Noor Afza | Su04/ GGES Moto Mirbahar | Head Mistress |
| Ms. Shafia | Su04/ GGES Moto Mirbahar | Teacher (PST) |
| Ms. Shahida Parveen | Su04/ GGPS Moto Mirbahar | Teacher (NCHD) |

Ghotki District/ School/ Taluka Education Office

| | | |
|----------------------|----------------------------------|---------------|
| Ms. Nusrat Ambreen | Gh01/ GGES Officer Colony Ghotki | Head Mistress |
| Ms. Komal Umer Daraz | Gh01/ GGES Officer Colony Ghotki | Teacher (PST) |
| Ms. Saira Abbasi | Gh01/ GGES Officer Colony Ghotki | Teacher (PST) |

Dadu District/ School/ Taluka Education Office

| | | |
|-------------------|--------------------------------|---------------------|
| Ms. Pireh Hafeez | Da05/ GGES Wali Muhammad Gorar | Head Mistress (PST) |
| Ms. Mehwish Ghani | Da05/ GGES Wali Muhammad Gorar | Teacher (PST) |

ADB

| | | |
|--------------------|--------------|----------------|
| Mr. Eisuke Tajima | ADB HQ | Mission Leader |
| Mr. Fayyaz A. Khan | ADB Pakistan | |
| Mr. Khuram Imtiaz | SSEIP/ADB | |

Unicef

| | | |
|----------------|---------------------------|----------------------|
| Mr. Asif Abrar | Unicef Sindh Field Office | Education Specialist |
|----------------|---------------------------|----------------------|

World Bank

| | | |
|----------------------|------------------------------|------------------------|
| Ms. Mina Zamand | World Bank Pakistan | |
| Ms. Sania Khursheed | SELECT/World Bank | Education Specialist |
| Mr. Mohammad Shirzoy | Homayon SELECT/World Bank | Civil Works Specialist |
| Mr. Khalid Muhammad | SELECT/World Bank | Civil Works Specialist |

GBSS Cattle Colony

| | | |
|---------------|--|--------------------|
| Ms. Safia Naz | | School Coordinator |
|---------------|--|--------------------|

| | | |
|-----------------------------------|--|--------------------------|
| Mr. Sher Muhammad | | Head Master |
| JICA Pakistan Office | | |
| Ms. Yuko KUNO | JICA Pakistan Office | Senior Representative |
| Ms. Nazia Sheher | JICA Pakistan Office | National Staff |
| Ms. Akiko HANAYA | School Education & Literacy Department (SELD) | Education Policy Advisor |
| Planning & Development Department | | |
| Mr. Muhammad Asghar Memon | Planning & Development Department | Chief Economist |

4. Minutes of Discussions

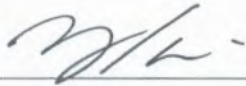
4-1 Field Survey

**Minutes of Discussions
on the Preparatory Survey for
the Programme for the Reconstruction of Educational Facilities
in Flood-affected Areas in Sindh**

With reference to the Minutes of Discussions signed between the School Education and Literacy Department (hereinafter referred to as "SELD"), Economic Affairs Division, Ministry of Economic Affairs and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on 31st March, 2023 and in response to the request from the Government of the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan") dated 14th April, 2023, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the Programme for the Reconstruction of Educational Facilities in Flood-affected Areas in Sindh (hereinafter referred to as "the Programme").

As a result of the discussions, both sides agreed on the main items described in the attached sheets.

Karachi, 30th May, 2023



Ms. Kuno Yuko
Senior Representative
Pakistan Office
Japan International Cooperation Agency




Mr. Hamid Karim
Deputy Secretary (Japan)
Ministry of Economic Affairs
Government of Pakistan




Mr. Gulam Akbar Laghari
Secretary
School Education and Literacy Department
Government of Sindh



Mr. Muhammad Asghar Memon
Chief Economist
Planning & Development Department
Government of Sindh



1



ATTACHEMENT

1. Objective of the Programme

The objective of the Programme is to establish safe and disaster-resilient learning environment through reconstruction of elementary schools which were heavily affected by the flood and heavy rain in 2022, thereby contributing to human security of people of Pakistan and improved social infrastructure.

2. Title of the Preparatory Survey

Both sides confirmed the title of the Preparatory Survey as “the Preparatory Survey for the Programme for the Reconstruction of Educational Facilities in Flood-affected Areas in Sindh”.

3. Subproject of the Programme

The Programme will be composed of one subproject as below;

- 1) The Subproject for the Reconstruction of Educational Facilities in Flood-affected Areas in Sindh (hereinafter referred to as “the Subproject”)

Details of the Subproject is shown in Annex 1.

4. Components of the Subproject

Both sides agreed on the possible components as follows;

| Item | Remarks |
|---|--|
| Reconstruction of existing primary section, lavatory block, furniture for education, and boundary wall *1 , for maximum 9 sites | Include removal of existing classrooms |

*1 : Average enrollment of 30 or more students in grades G1-5: 6 classrooms + storage room + headmistress/master’s (HM) room. HM room is planned for the site where there is no existing HM room in the middle school.

Average enrollment in grades G1-5 is between 12 and 29: Assume 4 classrooms + storage room + headmistress/master’s room. HM room is planned for the site where there is no existing HM room in the middle school.

Lavatory building: Assume 6 booths when the planned number of classrooms is 6, and 4 booths when the planned number of classrooms is 4.

2



5. Project site

Both sides confirmed that the sites of the Subproject are in district Mirpurkhas, Nawabshah, Khairpur, Sukkur, Ghotki, and Dadu (Badin as a alternative in case of cancellation of any of above). Locations of the sites are shown in Annex 2

6. Responsible authority for the Programme

Both sides confirmed the authorities responsible for the Programme are as follows:

- 6-1. Government of Pakistan (hereinafter referred to as "GOP") agreed to establish a consultative committee for the Programme (hereinafter referred to as "the Committee") in order to discuss any matter, at the Programme level, that may arise from or in connection with the Grant Agreement (hereinafter referred to as "G/A"). The details of the Committee are described in Annex 3.
- 6-2. GOP agreed to establish consultative committee for the Subproject (hereinafter referred to as "the Subcommittee") in order to discuss any matter related to the Subproject that may arise from or in connection with the G/A, unless the Committee covers the role of the Subcommittee. The details of the Subcommittee are described in Annex 3.
- 6-3. SELD will be the executing agency for the Subproject (hereinafter referred to as "the Executing Agency"). The Executing Agency shall coordinate with all the relevant authorities to ensure smooth implementation of the Programme and ensure that the undertakings for the Programme shall be managed by relevant authorities properly and on time. The organization charts are shown in Annex 4.

7. Cost estimate

Both sides confirmed that the cost estimates including the contingency mentioned in the 2. of Annex 8 and "indicative Amount of the Grant allocated" in the Annex 1 are provisional and will be examined further by the Government of Japan for its approval. The contingency would cover the additional cost against natural disaster, unexpected natural conditions, fluctuation of exchange rate, etc.

8. Confidentiality of the cost estimates

Both sides confirmed that the cost estimates of the Subproject should never be disclosed to any third parties until all the contracts under the Subproject are concluded.

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9. Procedures and Basic Principles of Japanese Grant

The Pakistani side agreed that the procedures and basic principles of Japanese Grant (hereinafter referred to as “the Grant”) as described in Annex 5 shall be applied to the Programme. In addition, the Pakistani side agreed to take necessary measures according to the procedures.

10. Timeline for the programme implementation

The Team explained to the Pakistani side that the expected timeline for the programme implementation is attached in Annex 7.

11. Expected outcomes and indicators

Both sides agreed that key indicators for expected outcomes are as follows. The Pakistani side will be responsible for the achievement of agreed key indicators targeted in year 2029 and shall monitor the progress by the Executing Agency, SELD, based on those indicators.

[Quantitative indicators]

| Indicator | Baseline (2023) | Target (2029) |
|---|-----------------|---------------|
| The number of students studying in the safe environment at the targeted schools | 394 | 1,550 |

*After three years of the completion of the construction (the number of students of 2029-2030 academic year is targeted.)

[Qualitative indicators]

- Safe learning environment in targeted schools is recovered.
- Risk of damage by natural disasters to the targeted schools is mitigated.

12. Ex-Post Evaluation

JICA will conduct ex-post evaluation after three (3) years from the subproject completion, in principle, with respect to five evaluation criteria (Relevance, Coherence, Effectiveness, Efficiency, Impact, Sustainability). The result of the evaluation will be published. The Pakistani side is required to provide necessary support for the data collection.

13. Undertakings of the Programme

Both sides confirmed the undertakings of the Programme as described in Annex 8. With regard to exemption of customs duties, internal taxes and other fiscal levies as stipulated in (2) 5 of Annex 8, both sides confirmed that such customs duties, internal taxes and other fiscal levies, which shall be clarified in the bidding documents during the implementation stage of the Programme.

The Pakistani side assured to undertake the necessary procedures and coordination including allocation of the necessary operation and maintenance budget, which is precondition to start the Programme.

Both sides also confirmed that the Annex 8 will be used as an attachment of G/A.

14. Monitoring during the implementation

The Subproject will be monitored by the Executing Agency and reported to JICA by using the form of Project Monitoring Report (PMR) attached as Annex 9. The timing of submission of the PMR is described in Annex 8.

15. Project completion

Both sides confirmed that the Subproject completes when all the facilities constructed and equipment procured by the Grant are in operation. The completion of the Project will be reported to JICA promptly, but in any event not later than six months after completion of the Subproject.

16. Items and measures to be considered for the smooth implementation of the Programme;

16-1 The Pakistani side confirmed that when problems such as delay of construction works or procurement of equipment by contractor(s)/supplier(s) arises during the implementation of the Programme, the SELD will take necessary measures in accordance with technical opinion of the consultant in a timely manner.

16-2 The Pakistani side agreed that in case the amount of the Grant, which includes the contingency, is not enough to cover the entire cost of components as agreed in the Annex 1, the Pakistani side will agree such as revising specifications, reducing the Project scope, or absorbing the cost exceeding the amount of the Grant, based on technical analysis and opinions of the consultant.

17. Schedule of the Preparatory Survey

5

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Both sides confirmed the tentative schedule of the Preparatory Survey as follows;

| Date | Action |
|---------------|---|
| June-Nov 2023 | Cost estimation and Detailed Design |
| December 2023 | Finalization of the Preparatory Survey Report |

18. Environmental and Social Considerations

The Team explained that ‘JICA Guidelines for Environmental and Social Considerations (January, 2022)’ (hereinafter referred to as “the Guidelines”) is applicable for the Programme. The Programme is categorized as “C” because the Programme is likely to have minimal adverse impact on the environment under the Guidelines.

19. Application of “Build Back Better” concept

During design and reconstruction of the target schools, the below measures will be considered in order to reduce vulnerability of the target schools to future disasters and build resilience of communities where the schools are located.

- To set ground-floor levels in consideration of past maximum inundation levels
- To design a double-story building to mitigate the damage of the building when the building is overflowed.
- To design a storage so that it can be used as a private room when the school building is utilized as a shelter from a disaster.
- To design reinforced concrete post-and-beam frames for high earthquake resistance

Also, both sides agreed to consider making use of the reconstruction as learning opportunity for SELD engineers.

20. Gender Mainstreaming

Both sides confirmed that gender mainstreaming should be duly practiced for the Programme implementation as the Programme is categorized as GIP (Gender Equality Project or Project Targeting Women), or GIS (Gender Integrated Project). In particular, both sides agreed on the following gender elements to be integrated into the Programme.

- (a) Facility design that reflects gender-specific needs.
- (b) Selection of equipment that reflects gender-specific needs and ensure usability by women and girls.



- (c) Collection of gender-disaggregated data for monitoring and evaluation (in case gender-related data is included in the indicators for subproject objective).

21. Other Relevant Issues

21-1 Approval of PC-1

The Pakistani side will secure PC-1 approval from the Federal Government of Pakistan by mid-June 2023 so that the Programme will be submitted to the cabinet meeting of the GOJ in July 2023.

| Date | Action | Responsibility |
|---------------|--|-------------------------------|
| 15 June, 2023 | Approval of the PC-1 | GOP |
| Mid-June 2023 | Consent to E/N draft | GOP |
| July 2023 | Cabinet Decision (Official approval of the Programme) | GOJ |
| August 2023 | Signing of E/N and G/A | GOP and GOJ, SELD and JICA |

Both sides agreed that the PC-1 approval schedule will be closely monitored, followed up and supported by SELD. Any potential delays will be notified to JICA in a timely manner and SELD and Planning and Development Department will undertake all necessary countermeasures to ensure deadline compliance for timely approval of the PC-1.

21-2 Ensure for the security

Both sides confirmed that SELD shall undertake appropriate measures and necessary coordination with relevant government authorities in Sindh to ensure security of the Programme sites and the persons related to the programme implementation in line with the standard government procedures and protocols. Such security measures shall reasonably reflect needs of the Consultants/ Contractors engaging in the Programme, as shown in Annex 7.

Both sides agreed that in case the additional security cost would be necessary for the implementation of the Programme, such cost shall be borne by the Recipient without using the Grant.

21-3 Arrangements/ actions to ensure utilization of schools

(deployment of teachers and staff)

Both sides agreed to deploy sufficient number of teachers and support staff to the

assisted schools 6 months before the schools handing over.

(enrollment)

SELD will take necessary actions to ensure enrollment in assisted schools, including enrollment campaign and timely communication with schools and communities in the catchment area.

(maintenance)

SELD will make sure proper regular maintenance and timely repair of the facilities and equipment provided by JICA. This includes clear guidance to the schools about the necessary procedures, and securing budget for maintenance and repair from other sources of funding, in case it is not covered by SMC fund.

(monitoring)

SELD will continue to monitor and follow up with the assisted schools and support them for the optimal operationalization of schools and report progress to JICA annually for three (3) years after the subproject completion.

Annex 1 Details of the Programme and the Subproject

Annex 2 Project Sites

Annex 3 Committee/Subcommittee

Annex 4 Organization Chart

Annex 5 Japanese Grant

Annex 6 Tentative Approval flow and required documents

Annex 7 Programme Implementation Schedule (tentative)

Annex 8 Major Undertakings to be taken by the Government of Pakistan

Annex 9 Project Monitoring Report (PMR) form

Handwritten signatures in blue ink, consisting of several stylized, overlapping strokes.

Section 1. Details of the Programme

(1) Objective:

The objective of the Programme is to establish safe and disaster-resilient learning environment through reconstruction of elementary schools which were heavily affected by the flood and heavy rain in 2022, thereby contributing to human security of people of Pakistan and improved social infrastructure.

(2) Location:

Sindh Province, Pakistan

Section 2. The Subproject and Indicative Amount of the Grant allocated under the Programme

Subproject No. 1

(1) Title of the Subproject:

The Subproject for the Reconstruction of Educational Facilities in Flood-affected Areas in Sindh

(2) Indicative Amount of the Grant allocated (million Japanese Yen):

(3) Components (the products and/or the services):

- (a) reconstruction of existing primary section and lavatory block of nine (9) elementary schools
- (b) procurement and installation of furniture
- (c) consulting services

(4) Implementation Type (Procurement by the Recipient / Procurement by the Agent):

Procurement by the Recipient

(5) Executing Agency:

The School Education and Literacy Department of the Government of Sindh (SELD)

The image shows three handwritten signatures or initials in blue ink. The first is a large, stylized signature on the left. The second is a smaller signature in the middle. The third is a set of initials on the right. Below the first signature is a small handwritten number '9'.

(6) Eligible nationality for the Supplier(s) that contract(s) directly with the Recipient:
Consultant: Japan, the Supplier(s) other than the consultant: Pakistan

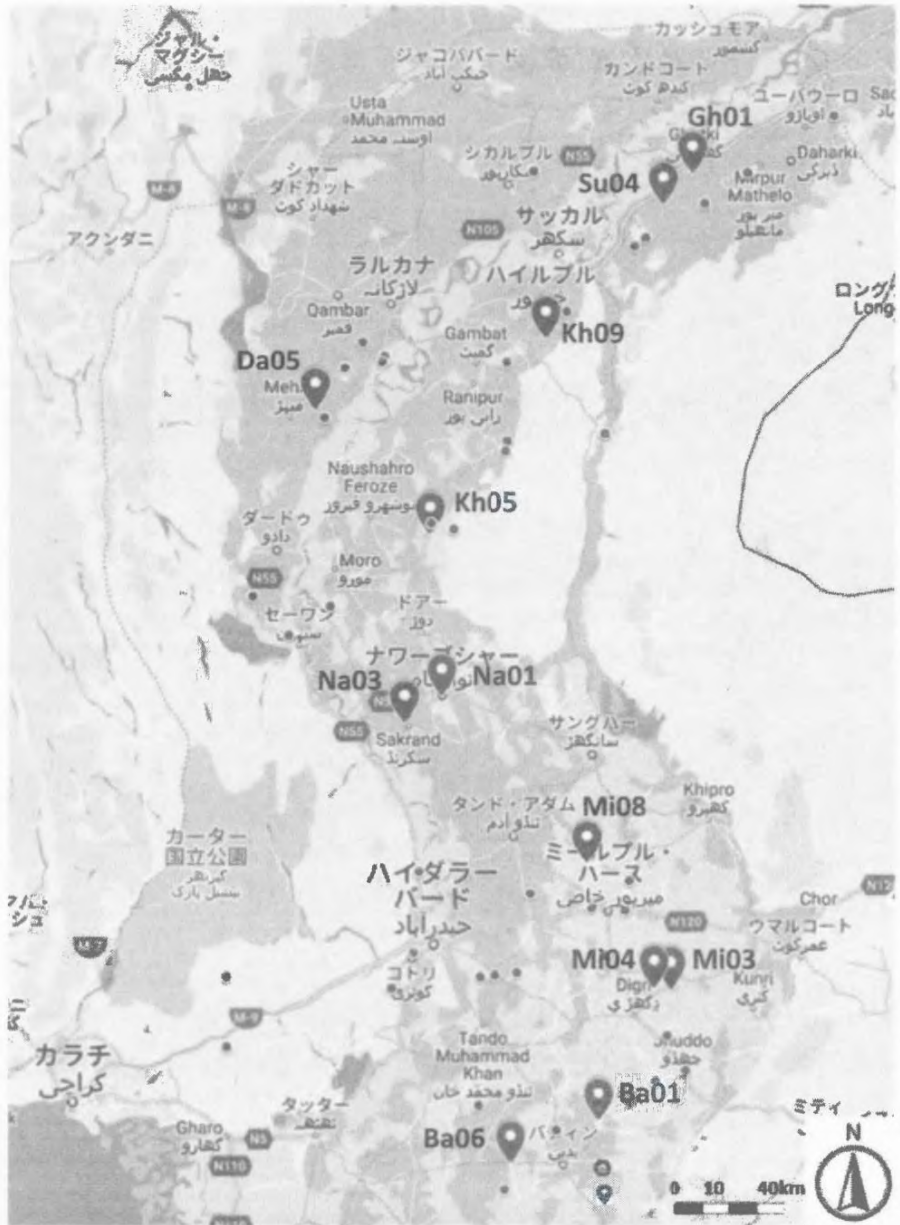
(7) JICA's Procurement Guidelines applied:
Procurement Guidelines for the Japanese Grants (for Japanese consultant and local contractors) (Tentative Type II)

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Annex 2: Candidate Sites



● Candidate Sites
(9 sites)

- Khairpur (2 Sites)
 - Kh05: GGES Bajeed Fakir
 - Kh09: GGES Jani Boro
- Sukkur (1 Site)
 - Su04: GGES Moto Mirbahar
- Ghotki (1 Site)
 - Gh01: GGES Officer Colony Ghotki
- Dadu (1 Site)
 - Da05: GGES Wali Muhammad Gorar
- Mirpurkhas (3 Sites)
 - Mi03: GGES Deh 294
 - Mi04: GGES Kachelo Farm
 - Mi08: GGES Muhammad Hassan Mari
- Nawabshah (1 Site)
 - Na03: GGES Jalalani

● Alternative Sites
(3 Sites)

- Badin (2 Sites)
 - Ba01: GGES Gullan Khaskheli
 - Ba06: GGES Ibrahim Chandio
- Nawabshah (1 Site)
 - Na01: GGES Quest

Source: Created by the Consultant

📍 The sites where the existing primary schools are damaged by the flood or continuous rainfall

(Handwritten signature and initials)

| SR | District | Taluka | SEMIS | School | Project Components | | | Rating |
|------|------------|---------------------|-----------|-------------------------------|--------------------|----------------|-----------|--------|
| | | | | | Classroom block | Lavatory block | Furniture | |
| | | | | | | | | |
| Mi03 | Mirpurkhas | Kot Ghulam Muhammad | 405020099 | GGES - Deh - 294 | 4CR-HS | 4 B | ✓ | B |
| Mi04 | Mirpurkhas | Kot Ghulam Muhammad | 405020096 | GGES - Kachelo Farm | 6CR-HS | 6 B | ✓ | A |
| Mi08 | Mirpurkhas | Hussain Bux Mari | 405060015 | GGES -- Muhammad Hassan Mari | 6CR | 6 B | ✓ | A- |
| Na03 | Nawabshah | Sakrand | 417030290 | GGES - Jalalani | 4CR-HS | 4 B | ✓ | B |
| Kh05 | Khairpur | Faiz Ganj | 415010517 | GGES - Bajeed Fakir | 6CR | 6 B | ✓ | A- |
| Kh09 | Khairpur | Kot Dijji | 415050286 | GGES - Jani Boro | 4CR | 4 B | ✓ | B |
| Su04 | Sukkur | Pano Akil | 418010225 | GGES - Moto Mirbahar | 4CR | 4 B | ✓ | B |
| Gh01 | Ghotki | Ghotki | 419010151 | GGES -- Officer Colony Ghotki | 6CR | 6 B | ✓ | A |
| Da05 | Dadu | Mehar | 402040143 | GGES -- Wali Muhammad Gorar | 4CR | 4 B | ✓ | B |

* 4CR-HS: 4Classroom+H.M room + Storage

NOTE: The Subproject shall cover maximum 9 sites within amount of the Grant allocation.

The following three sites will be considered as alternatives in case that one of the 9 candidate sites is cancelled because of the unforeseen circumstances.

| | | | | | | | | |
|------|-----------|-------------------|-----------|-------------------------|-----|-----|---|----|
| Ba01 | Badin | T.Bago | 401040123 | GGES - Gullan Khaskheli | 4CR | 4 B | ✓ | B- |
| Ba06 | Badin | S.F Raho/Golarchi | 401020124 | GGES - Ibrahim Chandio | 4CR | 4 B | ✓ | B- |
| Na01 | Nawabshah | Nawab Shah | 417020074 | GGES - Quest | 4CR | 4 B | ✓ | B- |

Annex 3_ Committee/Subcommittee

1. Committee

(1) The details of the Committee

1) The Committee shall be chaired by the Chairman/ or his/her nominee of P&D, Government of Sindh. The members of the Committee shall be as defined in paragraph (2) below.

2) In principle, a regular meeting of the Committee shall be held in Pakistan semiannually, and other meetings may be held upon the request of either JICA or the Recipient whenever JICA deems it necessary to call such meetings.

3) The terms of reference of the Committee shall be as follows:

(a) to confirm an implementation schedule for the Programme for the speedy and effective disbursement of the Grant and its accrued interest;

(b) to discuss modifications of the Programme, including modifications of the allocation of the Grant for the Subproject;

(c) to identify problems that may delay the implementation of the Programme or the disbursement of the Grant and its accrued interest, and to explore solutions to such problems;

(d) to exchange views on publicity related to the Programme; and

(e) to discuss any other matters that may arise from or in connection with the G/A.

(2) The Members of the Committee shall be as follows:

1) The Recipient side

Planning and Development Department, Government of Sindh (Chair)

Economic Affairs Division, Ministry of Economic Affairs

School Education and Literacy Department, Government of Sindh

2) JICA side

JICA Pakistan Office



2. Subcommittee

(1) The details of the Subcommittee

1) The Subcommittee shall be chaired by the Secretary or his/her nominee of SELD, Government of Sindh. The members of the Subcommittee shall be defined in paragraph (2) below.

2) In case of Procurement of the Agent, immediately after the employment contract referred to in paragraph (2) of Article 5 is concluded, the Agent shall appoint a representative who is to participate on behalf of the Agent in the meetings of the Subcommittee as an adviser. Representative(s) of organizations other than the Agent may be invited, whenever necessary, to participate and provide advice in the meetings of the Subcommittee.

3) In case of Procurement of the Agent, in principle, the first meeting of the Subcommittee shall be held in Pakistan immediately after JICA approves the employment contract referred to in paragraph (2) of Article 5. The meetings thereafter will be held upon the request of JICA, the Recipient, or the Executing Agency whenever JICA deems it necessary to call such meetings. The Agent may advise JICA, the Recipient, and the Executing Agency on the need to call a meeting of the Subcommittee.

4) The terms of reference of the Subcommittee shall be as follows:

(a) to confirm an implementation schedule for the Subproject(s) (Procurement by the Agent and/or the Recipient) for the speedy and effective disbursement of the Grant for the Subproject(s) (Procurement by the Agent and/or the Recipient) and its accrued interest;

(b) to discuss the need for and appropriateness of modifications of the Subproject(s) (Procurement by the Agent and/or the Recipient), including modifications of a plan and/or design of the Subproject(s) (Procurement by the Agent and/or the Recipient);

(c) to exchange views on allocations of the Grant for the Subproject(s) (Procurement by the Agent and/or the Recipient) and its accrued interest for the Subproject(s) (Procurement by the Agent), as well as on potential end-users related to the Subproject(s) (Procurement by the Agent);

(d) to identify problems related to the Subproject(s) (Procurement by the Agent and/or the Recipient) that may delay the disbursement of the Grant for the Subproject(s) (Procurement by the Agent and/or the Recipient) and its accrued interest, and to explore solutions to such problems;

(e) to exchange views on publicity related to the disbursement of the Grant for the Subproject(s) (Procurement by the Agent and/or the Recipient) and its accrued interest for the Subproject(s) (Procurement by the Agent and/or the Recipient);

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(f) to discuss any other matters related to the Subproject(s) (Procurement by the Agent and/or the Recipient) that may arise from or in connection with the G/A; and

(g) to provide the Committee for the Programme referred to in 1. above with information on the progress of the Subproject(s) (Procurement by the Agent and/or the Recipient) and problems related to the Subproject(s) (Procurement by the Agent/or the Recipient).

(2) The Members of the Sub-Committee for the Subproject for the Reconstruction of Educational Facilities in Flood-affected Areas in Sindh shall be as follows:

1) The Recipient side

School Education and Literacy Department, Government of Sindh (Chair)

Planning and Development Department, Government of Sindh

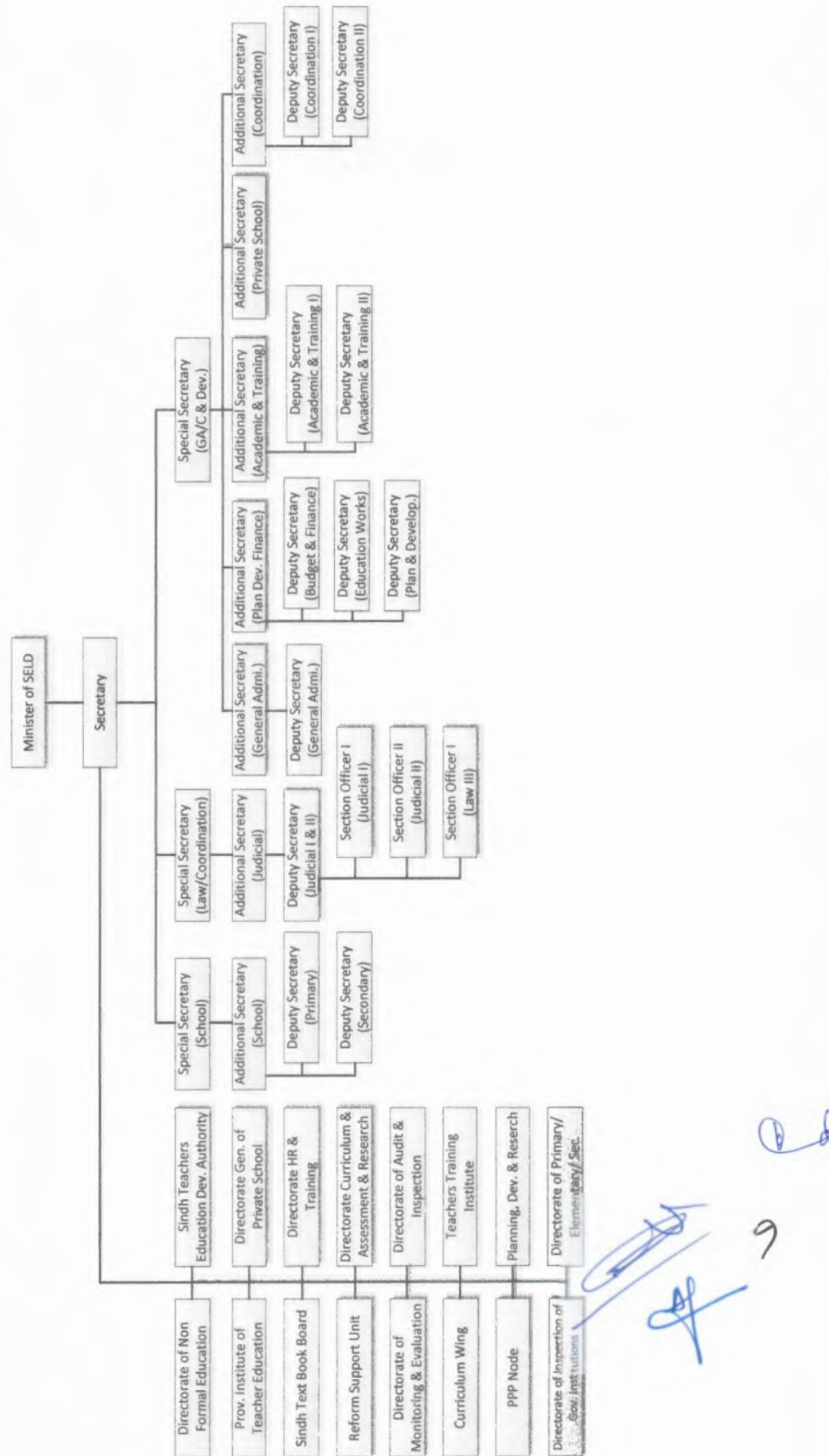
Economic Affairs Division, Ministry of Economic Affairs

2) JICA side

JICA Pakistan Office

Three handwritten signatures in blue ink are present. The first is a large, stylized signature with a long horizontal stroke. The second is a smaller, more compact signature. The third is a very small, simple signature.

ANNEX 4: Organization Chart of the Education & Literacy Department of the Government of Sindh (SELD), Pakistan



JAPANESE GRANT

The Japanese Grant is non-reimbursable fund provided to a recipient country (hereinafter referred to as “the Recipient”) to purchase the products and/or services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. Followings are the basic features of the project grants operated by JICA (hereinafter referred to as “Project Grants”).

1. Procedures of Project Grants

Project Grants are conducted through following procedures (See “PROCEDURES OF JAPANESE GRANT” for details):

(1) Preparation

- The Preparatory Survey (hereinafter referred to as “the Survey”) conducted by JICA

(2) Appraisal

- Appraisal by the government of Japan (hereinafter referred to as “GOJ”) and JICA, and Approval by the Japanese Cabinet

(3) Implementation

Exchange of Notes

- The Notes exchanged between the GOJ and the government of the Recipient

Grant Agreement (hereinafter referred to as “the G/A”)

- Agreement concluded between JICA and the Recipient

Banking Arrangement (hereinafter referred to as “the B/A”)

- Opening of bank account by the Recipient in a bank in Japan (hereinafter referred to as “the Bank”) to receive the grant

Construction works/procurement

- Implementation of the project (hereinafter referred to as “the Project”) on the basis of the G/A

(4) Ex-post Monitoring and Evaluation

- Monitoring and evaluation at post-implementation stage

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide basic documents necessary for the appraisal of the the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of

relevant agencies of the Recipient necessary for the implementation of the Project.

- Evaluation of the feasibility of the Project to be implemented under the Japanese Grant from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.
- Confirmation of Environmental and Social Considerations

The contents of the original request by the Recipient are not necessarily approved in their initial form. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant.

JICA requests the Recipient to take measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the executing agency of the Project. Therefore, the contents of the Project are confirmed by all relevant organizations of the Recipient based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA contracts with (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the feasibility of the Project.

3. Basic Principles of Project Grants (contract with Japanese consultant and local contractors)

(1) Implementation Stage

1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as “the E/N”) will be signed between the GOJ and the Government of the Recipient to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Recipient to define the necessary articles, in accordance with the E/N, to implement the Project, such as conditions of disbursement, responsibilities of the Recipient, and procurement conditions. The terms and conditions generally applicable to the Japanese Grant are stipulated in the “General Terms and Conditions for Japanese Grant (January 2016).”



2) Banking Arrangements (B/A) (See “Financial Flow of Grant” for details)

- a) The Recipient shall open an account or shall cause its designated authority to open an account under the name of the Recipient in the Bank, in principle. JICA will disburse the Japanese Grant in Japanese yen for the Recipient to cover the obligations incurred by the Recipient under the verified contracts.
- b) In case of Japanese consultant, the Japanese Grant will be disbursed when payment requests are submitted by the Bank to JICA under an Authorization to Pay (A/P) issued by the Recipient.
- c) In case of local contractors, the Japanese Grant will be disbursed when requests for disbursement are submitted by the Recipient to JICA.

3) Procurement Procedure

The products and/or services necessary for the implementation of the Project shall be procured in accordance with JICA’s procurement guidelines as stipulated in the G/A.

4) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the Recipient to continue to work on the Project’s implementation after the E/N and G/A.

5) Eligible source country

In using the Japanese Grant disbursed by JICA for the purchase of products and/or services, the eligible source countries of such products and/or services shall be Japan and/or the Recipient. The Japanese Grant may be used for the purchase of the products and/or services of a third country as eligible, if necessary, taking into account the quality, competitiveness and economic rationality of products and/or services necessary for achieving the objective of the Project. However, the prime consulting firm, which enter into contracts with the Recipient, are limited to "Japanese nationals", while the prime constructing firm(s), which enter into contracts with the Recipient, could be nationals of the recipient country or other country(ies) if deemed it necessary .

6) Contracts and Concurrence by JICA

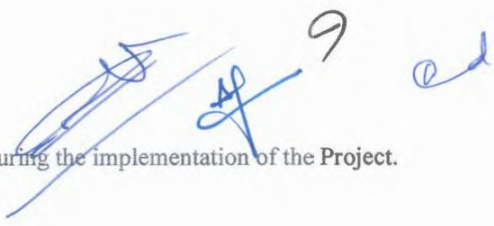
The Recipient will conclude the consultant contract() denominated in Japanese yen with Japanese nationals and the construction/supplier contracts dominated in other internationally traded foreign currency acceptable to JICA with the local contractors. Those contracts shall be verified by JICA in order to be eligible for the Japanese Grant.

7) Monitoring

The Recipient is required to take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and to regularly report to JICA about its status by using the Project Monitoring Report (PMR).

8) Safety Measures

The Recipient must ensure that the safety is highly observed during the implementation of the Project.



9) Construction Quality Control Meeting

Construction Quality Control Meeting (hereinafter referred to as the “Meeting”) will be held for quality assurance and smooth implementation of the Works at each stage of the Works, if necessary. The member of the Meeting will be composed by the Recipient (or executing agency), the Consultant, the Contractor and JICA. The functions of the Meeting are as followings:

- a) Sharing information on the objective, concept and conditions of design from the Contractor, before start of construction.
- b) Discussing the issues affecting the Works such as modification of the design, test, inspection, safety control and the Client’s obligation, during of construction.

(2) Ex-post Monitoring and Evaluation Stage

- 1) After the project completion, JICA will continue to keep in close contact with the Recipient in order to monitor that the outputs of the Project is used and maintained properly to attain its expected outcomes.
- 2) In principle, JICA will conduct ex-post evaluation of the Project after three years from the completion. It is required for the Recipient to furnish any necessary information as JICA may reasonably request.

(3) Others

1) Environmental and Social Considerations

The Recipient shall carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the Recipient and JICA Guidelines for Environmental and Social Considerations (April, 2010).

2) Major undertakings to be taken by the Government of the Recipient

For the smooth and proper implementation of the Project, the Recipient is required to undertake necessary measures including land acquisition, and bear an advising commission of the A/P and payment commissions paid to the Bank as agreed with the GOJ and/or JICA. The Government of the Recipient shall ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

3) Measures to ensure more efficient implementation of the Grant

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i) In the event that the E/N and the G/A concerning a project cannot be signed by the end of the following Japanese fiscal year of the cabinet decision concerned by the GOJ, the authorities concerned of the two Governments will discuss the cancellation of the project.

ii) In the event that the period, specified in the G/A, during which the grant is available expires before the completion of the disbursement, the authorities concerned of the GOJ will thoroughly review the status, situation and perspective of the implementation of the project concerned before extending the said period. The authorities concerned of the two Governments will discuss the termination of the project including a refund, unless there are concrete prospects for its completion.

iii) Regardless of the period mentioned in ii) above, the authorities concerned of the two Governments will, in the event that five years have passed since the cabinet decision concerned by the GOJ before the completion of the disbursement, except as otherwise confirmed between them, discuss the termination of a project including a refund, unless there are concrete prospects for its completion.

4) Proper Use

The Recipient is required to maintain and use properly and effectively the products and/or services under the Project (including the facilities constructed and the equipment purchased), to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Japanese Grant.

5) Export and Re-export

The products purchased under the Japanese Grant should not be exported or re-exported from the Recipient.

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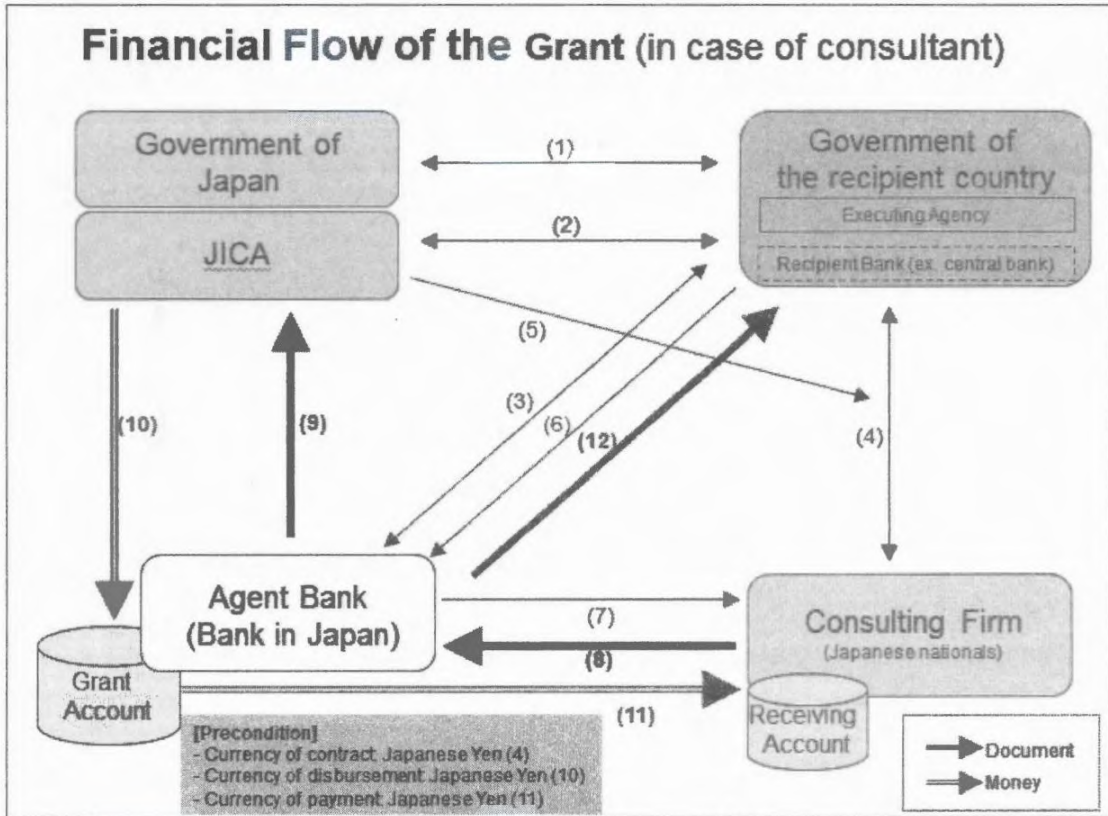
PROCEDURES OF JAPANESE GRANT

| Stage | Procedures | Remarks | Recipient Government | Japanese Government | JICA | Consultants | Contractors | Agent Bank |
|------------------------------------|--|--|----------------------|---------------------|---------|-------------|-------------|------------|
| Official Request | Request for grants through diplomatic channel | Request shall be submitted before appraisal stage. | x | x | | | | |
| 1. Preparation | (1) Preparatory Survey Preparation of outline design and cost estimate | | x | | x | x | | |
| 2. Appraisal | (2) Preparatory Survey Explanation of draft outline design, including cost estimate, undertakings, etc. | | x | | x | x | | |
| | (3) Agreement on conditions for implementation | Conditions will be explained with the draft notes (E/N) and Grant Agreement (G/A) which will be signed before approval by Japanese government. | x | x (E/N) | x (G/A) | | | |
| | (4) Approval by the Japanese cabinet | | | x | | | | |
| 3. Implementation | (5) Exchange of Notes (E/N) | | x | x | | | | |
| | (6) Signing of Grant Agreement (G/A) | | x | | x | | | |
| | (7) Banking Arrangement (B/A) | Need to be informed to JICA | x | | | | | x |
| | (8) Contracting with consultant and issuance of Authorization to Pay (A/P) | Concurrence by JICA is required | x | | | x | | x |
| | (9) Detail design (D/D) | | x | | | x | | |
| | (10) Preparation of bidding documents | Concurrence by JICA is required | x | | | x | | |
| | (11) Bidding | Concurrence by JICA is required | x | | | x | x | |
| | (12) Contracting with contractor/supplier | Concurrence by JICA is required Request for disbursement shall be made by the Recipient, in case of local contractor. | x | | x | | x | x |
| | (13) Construction works/procurement | Concurrence by JICA is required for major modification of design and amendment of contracts. | x | | | x | x | |
| (14) Completion certificate | | x | | | x | x | | |
| 4. Ex-post monitoring & evaluation | (15) Ex-post monitoring | To be implemented generally after 1, 3, 10 years of completion, subject to change | x | | x | | | |
| | (16) Ex-post evaluation | To be implemented basically after 3 years of completion | x | | x | | | |

notes:

1. Project Monitoring Report and Report for Project Completion shall be submitted to JICA as agreed in the G/A.
2. Concurrence by JICA is required for allocation of grant for remaining amount and/or contingencies as agreed in the G/A.

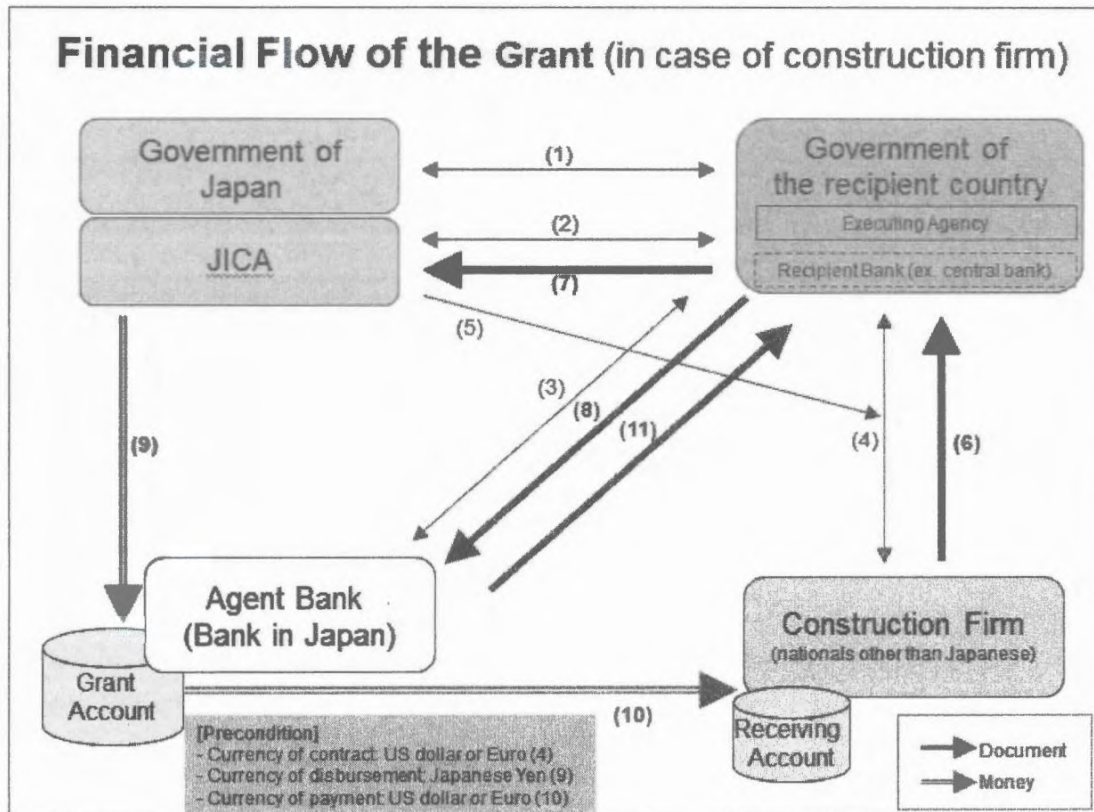
**Financial Flow of Japanese Project Grant
(contract with Japanese consultant and local contractors)**



- (1) E/N
- (2) G/A
- (3) Banking Arrangement/Opening an Grant Account
- (4) Contract
- (5) Concurrence and Verification of Contract
- (6) Issuing Authorization to Pay (A/P) upon contract
- (7) Notification of A/P
- (8) Request for Payment**
- (9) Request for the Disbursement**
- (10) Disbursement of the Grant**
- (11) Payment**
- (12) Statement of Account**

[Handwritten signatures and initials]

9



(1) E/N

(2) G/A

Submission of Evidence of Authority and Specimen Signatures from the Recipient to JICA (prerequisite for the process of no. (7))

(3) Banking Arrangement/Opening an Grant Account

(4) Contract

(5) Concurrence and Verification of Contract

(6) Request for Payment

(7) Request for Disbursement

(8) Transfer Instruction

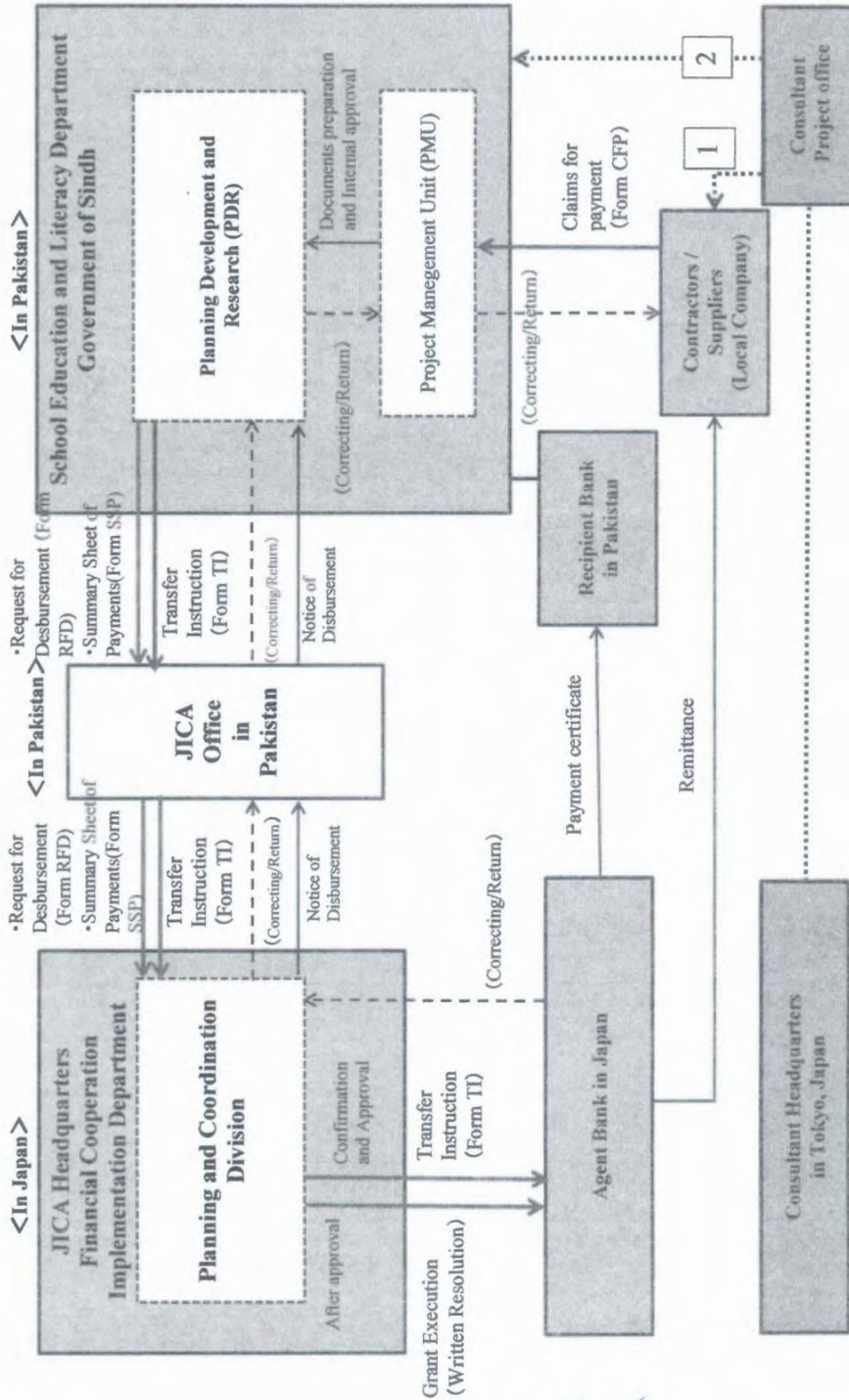
(9) Disbursement of the Grant *

(10) Payment

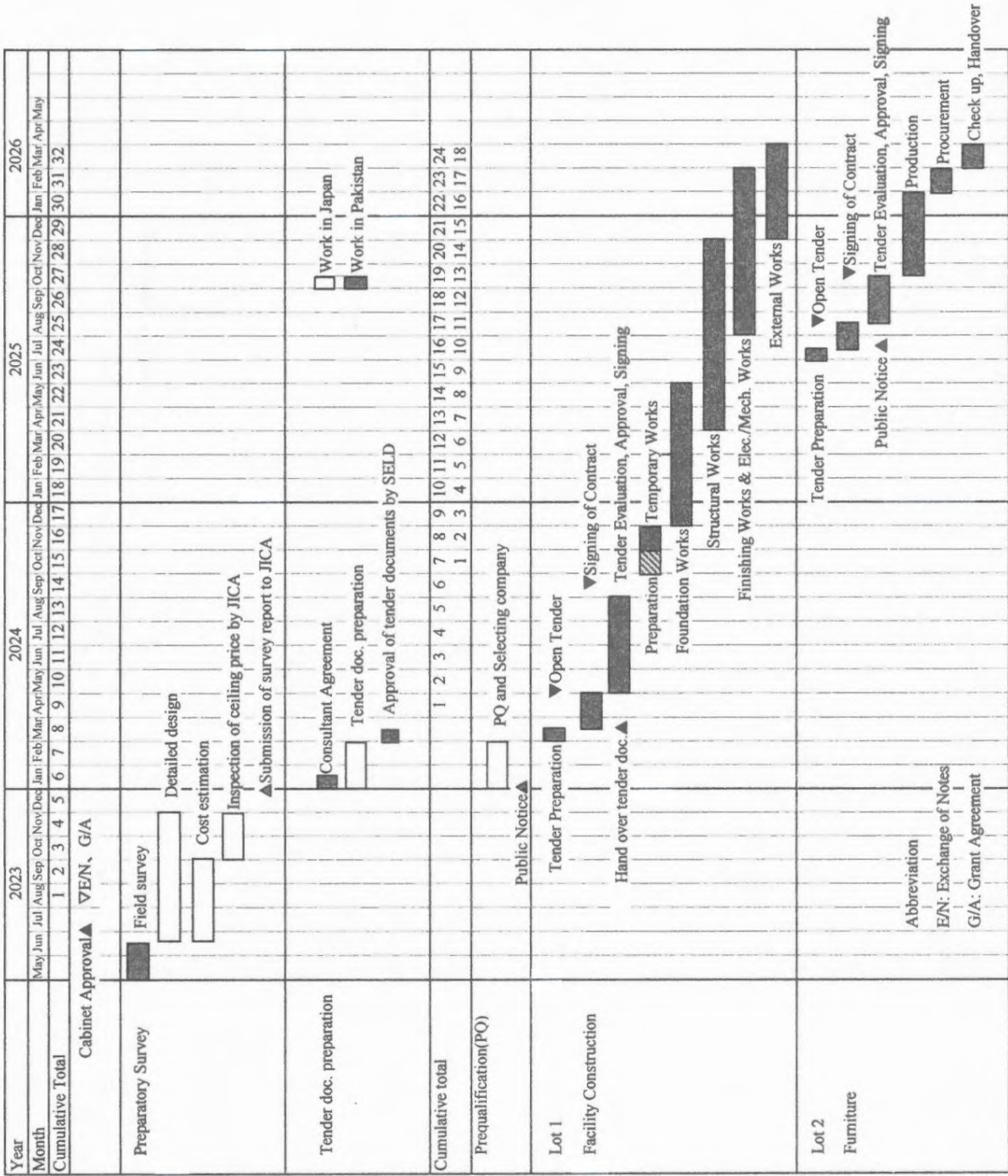
(11) Statement of Account

* The amount of disbursement in Japanese Yen ((9) in above chart) shall be calculated at the Telegraphic Transfer Selling (TTS) rate quoted by the Bank in Japan two business days before the date on which the disbursement is made.

Tentative Approval flow and required documents for payments to the contractors/suppliers (local company)



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Abbreviation
 E/N: Exchange of Notes
 G/A: Grant Agreement

ANNEX 8. Major Undertakings to be taken by the Government of Pakistan

1. Specific obligations of the Government of Pakistan which will not be funded with the Grant

(1) Before the Bidding

| NO | Items | Deadline | In charge | Estimated Cost (Mill. PKR) | Re f. |
|----|---|---|--------------|----------------------------|-------|
| 1 | To sign the banking arrangement (B/A) with a bank in Japan (the Agent Bank) to open bank account for the Grant | within three months after the signing of G/A | SELD | | |
| 2 | To issue A/P to the Agent Bank for the payment to the consultant | within one month after the signing of the contract(s) | SELD | | |
| 3 | To bear the following commissions to the Agent Bank for the banking services based upon B/A | | | | |
| | 1) Advising commission of A/P | within one month after the signing of the contract(s) | SELD | 0.100 | |
| | 2) Payment commission for A/P | every payment | SELD | 0.173 | |
| 4 | To approve IEE/EIA (Conditions of approval should be fulfilled, if any) and secure the necessary budget for implementation | before notice of the bidding document(s) | EPA/ SELD | | |
| 5 | To secure the necessary budget and implement land acquisition and resettlement (including preparation of resettlement sites), and compensation with full replacement cost in accordance with RAP (if necessary) | before notice of the bidding document(s) | SELD | | |
| 6 | To secure and clear the following lands 1) Project sites 2) Temporary construction yard and stockyard near the Project area 3) Temporary school sites in case of reconstruction | before notice of the bidding document(s) | SELD | | |
| 7 | To obtain the Building Permit | before notice of the bidding document(s) | SELD | | |
| 8 | To clear, level and reclaim the sites, if necessary. | before notice of the bidding document(s) | SELD | | |
| 9 | To submit Project Monitoring Report (with the result of Detail Design) | before notice of the bidding document(s) | SELD | | |
| 10 | To ensure smooth implementation of the bidding procedures and to bear necessary expenses relevant to the bidding procedures including, but not limited to, the following | | | | |
| | 1) Bid notices on major newspapers, governmental gazette and/or web site. | Every bidding Lot | SELD | 1.000 | |





(2) During the Subproject Implementation

| NO | Items | Deadline | In charge | Estimated Cost (Mill. PKR) | Re f. |
|----|---|---|----------------------------|----------------------------|-------|
| 1 | To bear the following commissions to the Agent Bank for the banking services based upon the B/A | | | | |
| | Advising commission of A/P | within 1 month after the signing of the contract(s) | SELD | | |
| | Payment commission for A/P | every payment for consultant | SELD | 1.153 | |
| | Remittance charge for local contractors and suppliers | every payment | SELD | 0.144 | |
| 2 | To conduct necessary procedures such as "Request for disbursement" to JICA (upon contract with construction firms and/or procurement firms (suppliers)), "Application of remittance" to Bank (upon contract with construction firms and/or procurement firms (suppliers)) | during the Subproject | SELD | | |
| 3 | To ensure prompt customs clearance and to assist the Supplier(s) with internal transportation in the country of the Recipient | during the Subproject | SELD EAD | | |
| 4 | To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work | during the Subproject | SELD EAD | | |
| 5 | To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services are exempted. | during the Subproject | EAD SRB/ FBR SELD | | |
| 6 | To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Subproject | during the Subproject | SELD | | |
| | To notify JICA promptly of any incident or accident, which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers. | during the Subproject | SELD | | |
| 7 | To submit Project Monitoring Report | Every month | SELD | | |
| 8 | To submit a report concerning completion of the Subproject | within 6 months after completion of the Subproject | SELD | | |
| 9 | To submit Project Monitoring Report (final) (including as-built drawings, equipment list, photographs, etc.) | within 1 month after signing of Certificate of Completion for the works under the contract(s) | SELD | | |

| | | | | | |
|----|---|---|------|--------|--|
| 10 | To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Subproject outside the site(s) | | | | |
| | 1) Electricity Installation of solar power system (9 sites for primary school) | 3 months before completion of the construction (procurement starts 6 months before completion of the construction) | SELD | 10.800 | |
| | 2) Electricity Repairment of solar power system (54 sites (including 9 target sites of the Subproject) for lower middle school) | 3 months before completion of the construction (procurement starts 6 months before completion of the construction) | SELD | 30.000 | |
| 11 | To ensure the safety of persons engaged in the implementation of the Subproject. | during the construction | SELD | | |
| 12 | To undertake procedure necessary for securing permanent teachers and support staff for schools with increased number of classrooms | during the construction | SELD | | |

(3) After the Subproject

| NO | Items | Deadline | In charge | Estimated Cost (Mill. PKR) | Ref. |
|----|---|--------------------------------------|--------------|----------------------------|------|
| 1 | To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection | After completion of the construction | SELD/ SMC | 2.832 per year | |
| 2 | To deploy teachers and support staff | After completion of the construction | SELD | | |
| 3 | To conduct enrollment campaign | After completion of the construction | SELD | | |
| 4 | Plantation/landscape work of the site | After completion of the construction | SELD | | |
| 5 | Installation of furniture General furniture | After completion of the construction | SELD | | |
| 6 | Monitor and follow up of the assisted schools | After completion of the construction | SELD | | |

Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXXX
20XX, Month

Organizational Information

| | |
|--|---|
| Signer of the G/A (Recipient) | Person in Charge <u>(Designation)</u> _____ Contacts <u>Address:</u> _____ <u>Phone/FAX:</u> _____ <u>Email:</u> _____ |
| Executing Agency | Person in Charge <u>(Designation)</u> _____ Contacts <u>Address:</u> _____ <u>Phone/FAX:</u> _____ <u>Email:</u> _____ |
| Line Ministry | Person in Charge <u>(Designation)</u> _____ Contacts <u>Address:</u> _____ <u>Phone/FAX:</u> _____ <u>Email:</u> _____ |

General Information:

| | |
|--------------------------|--|
| Project Title | |
| E/N | Signed date: Duration: |
| G/A | Signed date: Duration: |
| Source of Finance | Government of Japan: Not exceeding JPY _____ <u>mil.</u> Government of (_____): _____ |



 1 9 e

1: Project Description

1-1 Project Objective

1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

1-3 Indicators for measurement of "Effectiveness"

| Quantitative indicators to measure the attainment of project objectives | | |
|---|----------------|--------------|
| Indicators | Original (Yr) | Target (Yr) |
| | | |
| | | |
| Qualitative indicators to measure the attainment of project objectives | | |
| | | |

2: Details of the Project

2-1 Location

| Components | Original <i>(proposed in the outline design)</i> | Actual |
|------------|---|--------|
| 1. | | |

2-2 Scope of the work

| Components | Original* <i>(proposed in the outline design)</i> | Actual* |
|------------|--|---------|
| 1. | | |
| | | |
| | | |

Reasons for modification of scope (if any).

(PMR)

2
 9
 bt

2-3 Implementation Schedule

| Items | Original | | Actual |
|-------|----------------------------------|--|--------|
| | (proposed in the outline design) | (at the time of signing the Grant Agreement) | |
| | | | |

Reasons for any changes of the schedule, and their effects on the project (if any)

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations

See Attachment 2.

2-4-2 Activities

See Attachment 3.

2-4-3 Report on RD

See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant(Confidential until the Bidding)

| Components | Original | | Cost (Million Yen) | |
|------------|----------------------------------|--------------------------------------|--|--------|
| | (proposed in the outline design) | Actual (in case of any modification) | Original ^{1),2)} (proposed in the outline design) | Actual |
| 1. | | | | |
| | | | | |
| | | | | |
| Total | | | | |

Note: 1) Date of estimation:
 2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

| Components | Original | | Cost (1,000 Taka) | |
|------------|----------------------------------|--------------------------------------|--|--------|
| | (proposed in the outline design) | Actual (in case of any modification) | Original ^{1),2)} (proposed in the outline design) | Actual |
| 1. | | | | |
| | | | | |
| | | | | |

3

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original (at the time of outline design)

name:

role:

financial situation:

institutional and organizational arrangement (organogram):

human resources (number and ability of staff):

Actual (PMR)

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

Original (at the time of outline design)

Actual (PMR)

3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

Original (at the time of outline design)

Actual (PMR)

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks (at the time of outline design)

| Potential Risks | Assessment |
|--------------------------|--|
| 1. (Description of Risk) | Probability: High/Moderate/Low |
| | Impact: High/Moderate/Low |
| | Analysis of Probability and Impact: |
| | |
| | Mitigation Measures: |
| | |
| | Action required during the implementation stage: |
| 2. (Description of Risk) | Probability: High/Moderate/Low |
| | Impact: High/Moderate/Low |
| | Analysis of Probability and Impact: |
| | |
| | Mitigation Measures: |
| | |
| | Action required during the implementation stage: |
| 3. (Description of Risk) | Probability: High/Moderate/Low |
| | Impact: High/Moderate/Low |
| | Analysis of Probability and Impact: |
| | |
| | Mitigation Measures: |
| | |
| | Action required during the implementation stage: |

| | |
|---|-----------------------------------|
| | Contingency Plan (if applicable): |
| | |
| Actual Situation and Countermeasures | |
| (PMR) | |

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.



Attachment

1. Project Location Map
 2. Specific obligations of the Recipient which will not be funded with the Grant
 3. Monthly Report submitted by the Consultant
- Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
 - Contractor's Main Staff List
4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
 5. Environmental Monitoring Form / Social Monitoring Form
 6. Monitoring sheet on price of specified materials (Quarterly)
 7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final) only)
 8. Pictures (by JPEG style by CD-R) (PMR (final) only)
 9. Equipment List (PMR (final) only)
 10. Drawing (PMR (final) only)
 11. Report on RD (After project)
 12. Report on the Management of Safety for Construction Works



Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

| Items of Specified Materials | Initial Volume A | Initial Unit Price (Y) B | Initial total Price C=A×B | 1% of Contract Price D | Condition of payment Price | |
|------------------------------|---------------------|-----------------------------|------------------------------|---------------------------|----------------------------|----------------------|
| | | | | | (Decreased) E=C-D | (Increased) F=C+D |
| Item 1 | ●●t | ● | ● | ● | ● | ● |
| Item 2 | ●●t | ● | ● | ● | | |
| Item 3 | | | | | | |
| Item 4 | | | | | | |
| Item 5 | | | | | | |

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

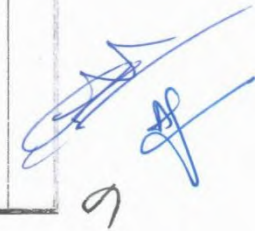
| Items of Specified Materials | 1st month, 2015 | | 2nd month, 2015 | | 3rd month, 2015 | | 4th | | 5th | | 6th | |
|------------------------------|-----------------|---|-----------------|---|-----------------|---|-----|---|-----|---|-----|---|
| | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Item 1 | | | | | | | | | | | | |
| Item 2 | | | | | | | | | | | | |
| Item 3 | | | | | | | | | | | | |
| Item 4 | | | | | | | | | | | | |
| Item 5 | | | | | | | | | | | | |

(3) Summary of Discussion with Contractor (if necessary)

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Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
 (Actual Expenditure by Construction and Equipment each)

| | Domestic Procurement (Recipient Country) A | Foreign Procurement (Japan) B | Foreign Procurement (Third Countries) C | Total D |
|-----------------------------|--|-------------------------------------|---|------------|
| Construction Cost | (A/D%) | (B/D%) | (C/D%) | |
| Direct Construction Cost | (A/D%) | (B/D%) | (C/D%) | |
| others | (A/D%) | (B/D%) | (C/D%) | |
| Equipment Cost | (A/D%) | (B/D%) | (C/D%) | |
| Design and Supervision Cost | (A/D%) | (B/D%) | (C/D%) | |
| Total | (A/D%) | (B/D%) | (C/D%) | |




Report on the Management of Safety for Construction Works

| Month/Year 2022年×月 | Cumulative number of labor 労働延人数 | Cumulative number of public accident 公衆災害件数 | Cumulative hours worked 延べ実労働時間数 | Number of deaths and injuries due to industrial accidents 労働災害による死傷者 | | | | Frequency rate 度数率 | Severity rate 強度率 |
|-------------------------------------|-------------------------------------|--|-------------------------------------|---|---|---|--|-----------------------|----------------------|
| | | | | Death and injuries 死傷者数 | Aggregated number of calendar days absent 延べ休業日数 | Aggregated number of work-days lost 延べ労働損失日数 | | | |
| This Month 当月 | | | | Death 死者 | | | | | |
| | | | | More than 4 calendar days absent 休業4日以上 | | | | | |
| | | | | 1 to 3 calendar days absent 休業1~3日 | | | | | |
| | | | | Total 計 | | | | | |
| Total including this month 当月迄累計 | | | | Death 死者 | | | | | |
| | | | | More than 4 calendar days absent 休業4日以上 | | | | | |
| | | | | 1 to 3 calendar days absent 休業1~3日 | | | | | |
| | | | | Total 計 | | | | | |
| | | | | Note 注) | | | | | |

1. Frequency rate is the frequency of occurrence of industrial accidents.
 度数率 = (労働災害による死傷者数 ÷ 延べ実労働時間数) × 100 万時間
 2. Severity rate is degree of seriousness of the industrial accident.
 強度率 = (延べ労働損失日数 ÷ 延べ実労働時間数) 1000 時間
 3. Aggregated number of work-days lost = Aggregated number of calendar days absent × (300 ÷ 365)
 延べ労働損失日数 = 延べ休業日数 × (300 ÷ 365) . . . 死亡 7500 日 (即死のほか負傷が原因で死亡したものを含む)
 4. Frequency rate and severity rate are rounding off the third decimal place.
 度数率・強度率は小数点第3位以下四捨五入



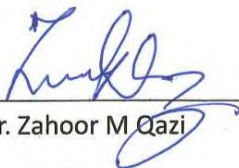

4-2 Technical Notes (Field Survey)

TECHNICAL NOTES
PREPARATORY SURVEY
FOR
THE PROJECT FOR RECONSTRUCTION OF EDUCATION FACILITIES IN FLOOD
AFFECTED AREAS IN SINDH
IN THE ISLAMIC REPUBLIC OF PAKISTAN

Through discussions on the findings of the field survey reported by the Consultant, the School Education and Literacy Department of the Government of Sindh (hereinafter called "SELD") and the Consultant confirmed the following issues:

- (1) Both sides discussed the followings items and agreed to reflect them in the project.
1. Consideration of Na01 as the 9th candidate site in the analysis in Japan for inclusion in the Project.
 2. A request letter from SELD regarding the inclusion of Na01 in the project will be prepared by Monday, June 29.
 3. The order of priority for the alternative sites in case of unforeseen event is 1. Ba06, 2. Da05, and 3. Ba01.

Karachi, June 13, 2023



Mr. Zahoor M Qazi

Deputy Director
Planning, Development and Research
Education and Literacy Department
Government of Sindh



Mr. Masao HASHIMOTO

Chief Consultant
Matsuda Consultants International
Co., Ltd.

5. References

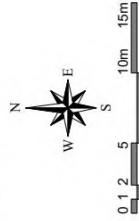
| No | Name | Type | Date | Issue/Writer |
|----|--|--------------|---------------|--|
| 1 | Pakistan Floods 2022, PDNA Main Report | Digital Data | October 2022 | Ministry of Planning Development & Special Initiatives |
| 2 | Resilient Recovery, Rehabilitation, and Reconstruction Framework, Pakistan (4RF) | Digital Data | December 2022 | Ministry of Planning Development & Special Initiatives |
| 3 | Budget Analysis 2022-23 | Digital Data | 2023 | Finance Department Government of Sindh |
| 4 | PAKISTAN ECONOMIC SURVEY 2022-23 | Digital Data | June 2023 | Economic Adviser’s Wing, Finance Division Government of Pakistan, Islamabad |
| 5 | ANNUAL BUDGET STATEMENT 2023-24 | Digital Data | June 2023 | Finance Department Government of Sindh |
| 6 | ANNUAL BUDGET STATEMENT 2022-23 | Digital Data | June 2022 | Finance Department Government of Sindh |
| 7 | Pakistan Education Statistics 2022-21 | Digital Data | February 2023 | National Education Management Information System Pakistan Institute of Education Ministry of Federal Education & Professional Training |
| 8 | FLOOD 2022 in Sindh | Digital Data | 2023 | Provincial Disaster Management Authority Rehabilitation Department Government of Sindh |
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6. Other Relevant Data

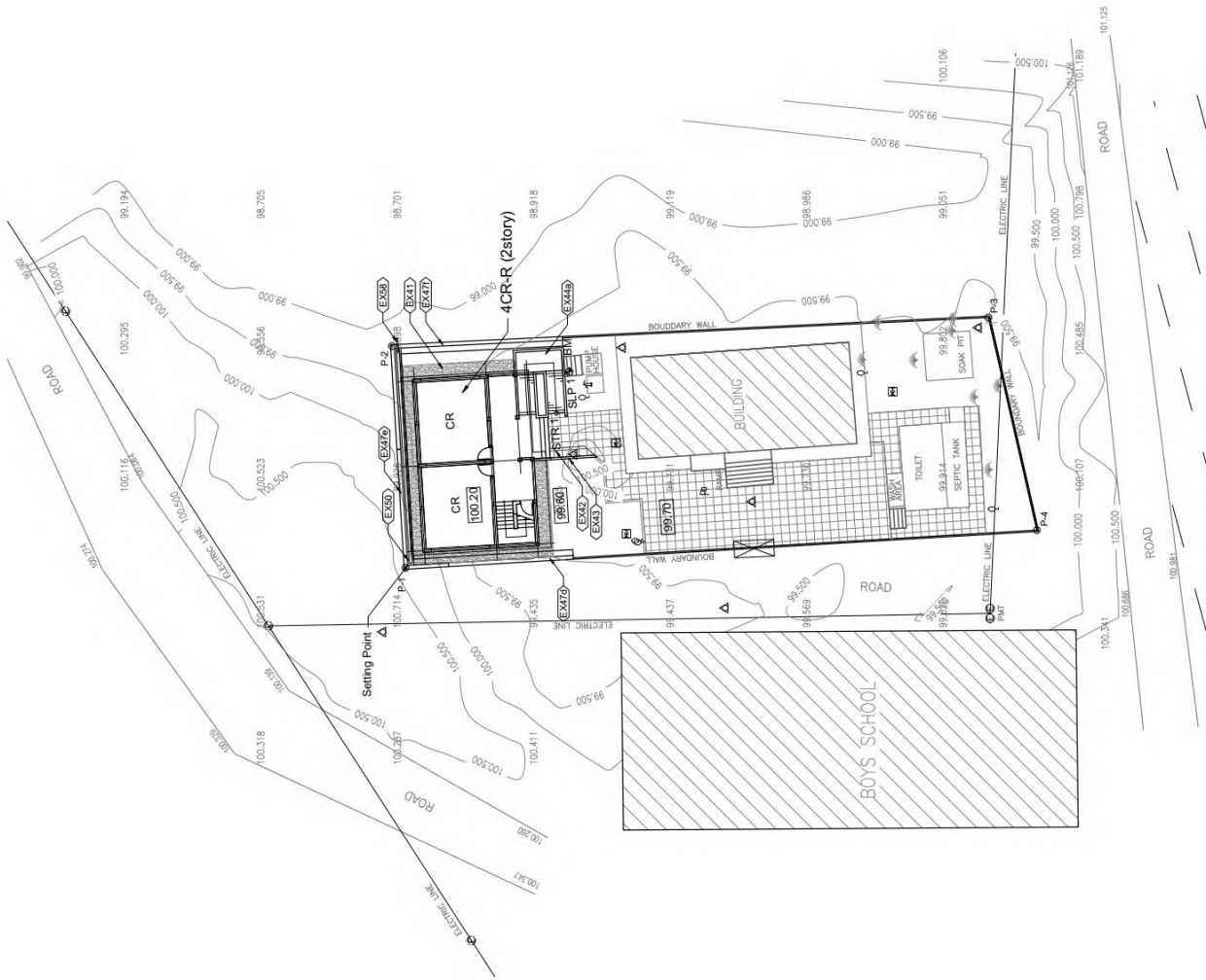
6-1 Site Plan for Alternative Sites (3 Sites)

- LEGEND**
- EX41 Plinth Protection
 - EX42 Pavement
 - EX43 Kerbstone
 - EX44a Slope & Steps for classroom Block
 - EX44b Steps & corridor for Lavatory Block
 - EX44c Connecting corridor
 - EX45 Leg washing area
 - EX46a Hand wash sink L=2400
 - EX46b Hand wash sink L=1650
 - EX48 Entrance gate
 - EX50 U shaped drainage (Brick, w=200)
 - EX57 Concrete slab l=100
 - EX58 PVC pipe Ø1 00
 - EX61 Plain concrete slab t=50
 - EX62 Sub-gate
 - EX47 Boundary fence

- Benchmark
- Manhole
- Electric Pole
- Flag
- Hand Pump
- Spot Level
- Boundary Point
- Invert Level
- Gate
- Boundary Wall
- Tree
- Bush
- Control Point

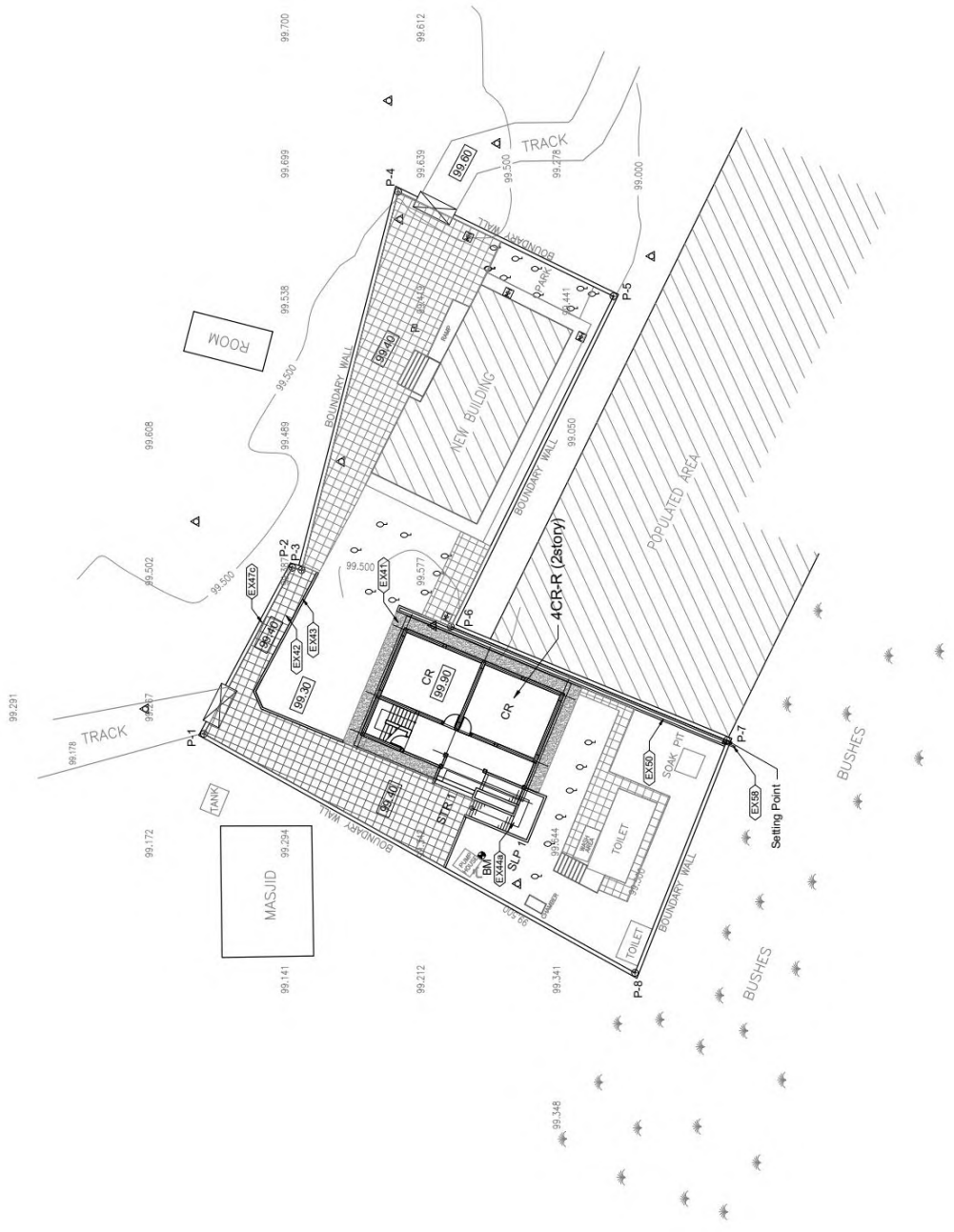
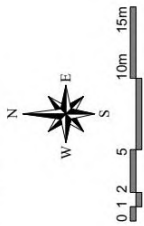


SITE PLAN 配置図
SITE: DA05
GGES Wali Muhammad Gorar

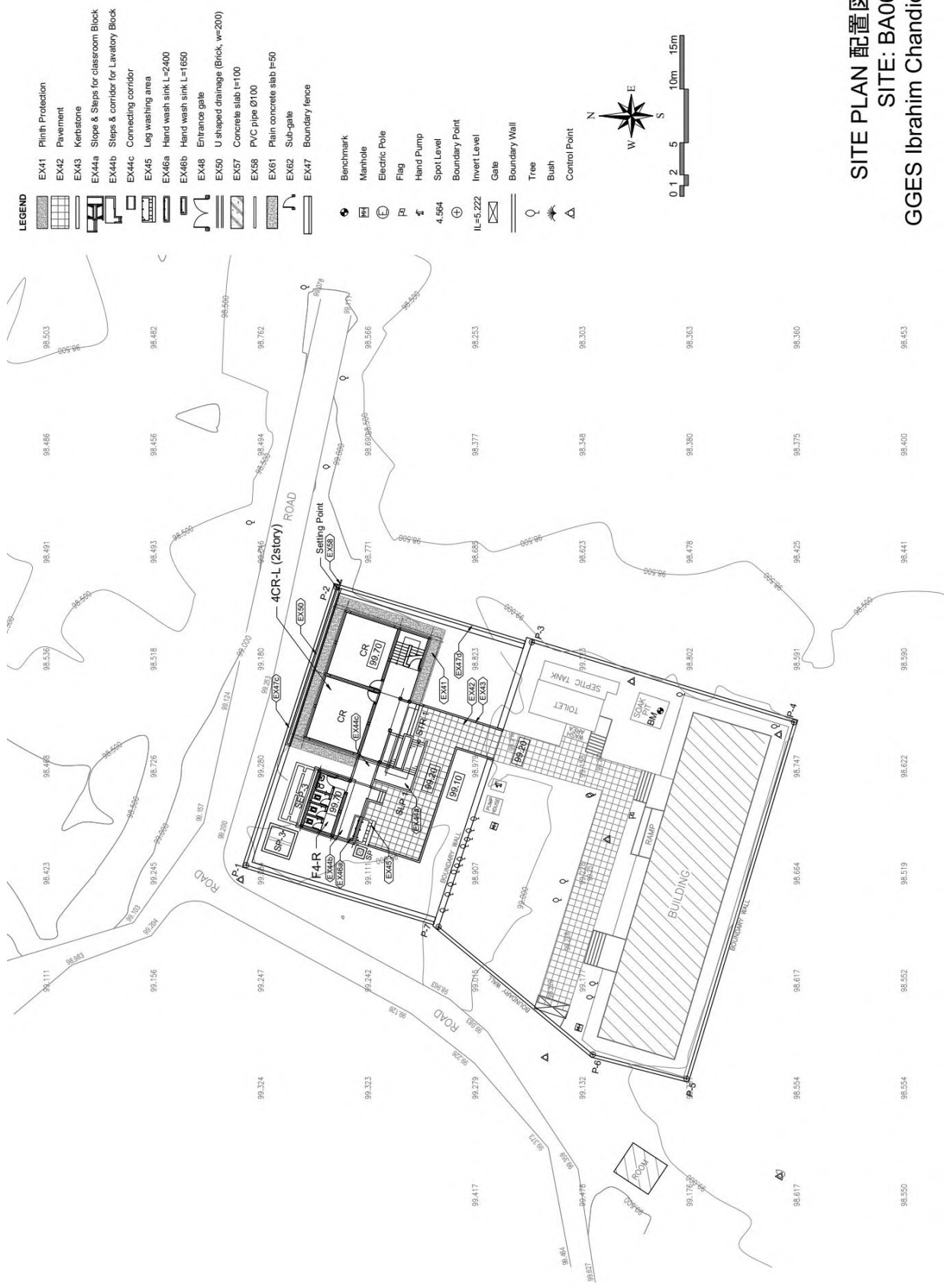


- LEGEND**
- EX41 Plinth Protection
 - EX42 Pavement
 - EX43 Kerbstone
 - EX44a Slope & Steps for classroom Block
 - EX44b Steps & coridor for Lavatory Block
 - EX44c Connecting corridor
 - EX45 Leg washing area
 - EX46a Hand wash sink L=2400
 - EX46b Hand wash sink L=1650
 - EX48 Entrance gate
 - EX50 U shaped drainage (Brick, w=200)
 - EX57 Concrete slab t=100
 - EX58 PVC pipe Ø100
 - EX61 Plain concrete slab t=50
 - EX62 Sub-gate
 - EX47 Boundary fence

- Benchmark
- Manhole
- Electric Pole
- Flag
- Hand Pump
- Spot Level
- Boundary Point
- Invert Level
- Gate
- Boundary Wall
- Tree
- Bush
- Control Point



SITE PLAN 配置図
SITE: BA01
GGES Gullan Khaskhell



SITE PLAN 配置図
SITE: BA06
GGES Ibrahim Chandio

Fiscal Year 2015 Cabinet Approval Project (25 sites)

| Northern phase | Khanpur (Kh) 10 sites Sikhar (Sh) 3 sites Sikharpur (Sh) 10 sites Chakra (Ch) 3 sites Larkana (La) 10 sites Dadu (Da) 3 sites | 25 sites (Typical) | Floor Raiser (Foundation) | Other use | Facility by Japanese Grand Aid Project | | | | | | | | | | | | | | | | | Facility by Pakistan Side | | | | | | | | | | | | | | |
|----------------|--|-----------------------|---------------------------|-----------|---|--|--|---|---|-------------|---|--------|--------------------|-----------------------------|----------------------|-----------------------------|--|--|--|--|--|---|---------------|-------------|--------------------|--------|-----------|--|----------------|-----------------------------|--------------|--|--------------------|--|-----------|--|
| | | | | | Classroom Block | | Lavatory | | Water Supply | | Hand pump | | Lighting | | Electrical Equipment | | | MCB | | Gate | | Fence | | Landscape | | | Classroom | | Laboratory | | Water Supply | | Electric Supply | | Landscape | |
| | | | | | A-Defect of hardware B-Defect of roof C-Mortar crack D-Header/Beam/peeling E-Joint crack F-Defect of backboard/board | A-Defect of tank B-Defect of faucet C-Mortar crack D-Header/Beam/peeling E-Joint crack F-Defect of hardware | A-Defect of pump B-Crack/Paint peeling C-Defect of reservoir tank D-Defect of elevated tank | A-Defect of pump B-Crack/Paint peeling | A-Defect of switch B-Defect of equipment | Cabling fan | A-Defect of switch B-Defect of equipment | Socket | Solar power system | A-Rust B-Defect of block | Furniture | A-Rust B-Defect of hinge | A-Blister/Paint peeling B-Crack C= joint crack | A-Crack of pavement B-Substance C-Crack/Defect of PC cover | Evaluation | A-Defect of wall by rain B-Exposed mortar C-Crack/peel D-Structural crack | A-Defect of wall by rain B-Exposed mortar C-Crack/peel | A-Defect of pump B-Defect of hand pump C-Defect of reservoir tank | Lighting | Ceiling fan | Solar power system | Others | Furniture | A-Defect of gate B-Crack of fence, joint crack C-Mortar peeling of fence D-Defect of pavement | | | | | | | | |
| Kh01 | GGES Wagda Colony | 41503032 | 2F-3CR-HSM | - | ✓ | A, F | A, B, D, Defect of pit, Defect of water pipe | A, B | Drain clogging | A, B | - | Defect | - | - | Partial defect | - | B | - | Rust of flagpole | - | Repair | C, Termite damage | - | B | - | - | - | - | - | - | - | - | A, B, C, D | | | |
| Kh02 | GGES Hadi Bux Laghari | 41506027 | 2F-3CR-HSM | - | ✓ | A, C, F, Mold | F | B | Drain clogging | - | - | - | - | - | Partial defect | A | B | - | B, C | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | |
| Kh03 | GGES Ali Dad Jogi | 41506057 | 2F-3CR-HSM | - | ✓ | A, C, D, F Termite damage | D, Defect of water pipe, Defect of pit cover | B | - | B | B | - | - | - | - | - | - | - | A, B, Defect of approach, Rust of flagpole | - | Repair | B, C, Termite damage | Not used | C | - | - | - | - | - | - | - | - | C, Defect of fence | | | |
| Kh05 | GGES Bajaid Fakir | 41501057 | 1F-3CR-HSM | - | - | A, F | C, E, F, Defect of pump's switch, Defect of elevated tank | A, B | Defect of borehole | B | - | - | - | - | - | - | - | - | A, C | - | Reconstruction | A, C, Termite damage, Defect of door, Floor damage | - | - | - | - | - | - | - | Partial defect | A, B | | | | | |
| Kh06 | GGES Ameen Patho | 41501030 | 1F-3CR-HSM | - | ✓ | A, C, D | D, Defect of pit cover, Defect of pump's switch | A, B | Defect of borehole | B | - | - | - | - | - | - | - | - | C | - | Reconstruction | A, C, Defect of floor | Not used | - | - | - | - | - | - | - | - | - | | | | |
| Kh07 | GGES Wazirabad Rajper | 41501039 | 1F-3CR-HSM | - | ✓ | A, C, D, F, Termite damage | A, B, E | A, B | - | B | B | - | - | - | Partial defect | - | - | - | B | - | Repair | C | - | - | - | - | - | - | - | - | - | Peel of fence paint | | | | |
| Kh08 | GGES Gambal Shah | 41505251 | 2F-3CR-HSM | - | ✓ | A, Defect of pinboard | A, B, D, Defect of water pipe | - | - | - | A, B | - | - | - | Partial defect | A | B | - | - | - | Reconstruction | A, C, Termite damage | - | - | - | - | - | - | - | - | - | A, Defect of fence | | | | |
| Kh09 | GGES Jani Boro | 41505296 | 2F-3CR-HSM | - | - | A, C, D | A, F, Drain clogging | - | - | B | - | - | - | - | Partial defect | - | - | - | - | - | Reconstruction | A, C, Defect of floor, Termite damage | - | C | - | - | - | - | Partial defect | A, Defect of reservoir tank | | | | | | |
| Kh11 | GGES Karim Bux Bhanbhro | 41507028 | 2F-3CR-HSM | - | ✓ | A, C, D, E, F, Defect of floor | B, C, D, E, F, Leakage in catch basin | B, Mortar peel | - | B | - | - | - | - | Partial defect | B | C | - | B, C | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | |
| Su03 | GGES Sorho | 41801050 | 2F-3CR-M | - | - | A, C, E, Crack of door | A, D, Leakage in catch basin | B | Defect of borehole | - | - | - | - | - | A | - | - | - | A, C | - | Repair | A, C | - | - | - | - | - | - | - | - | - | C, Defect of fence, Defect of scowerment | | | | |
| Su04 | GGES Moto Mirbaha | 41801025 | 2F-3CR-HSM | - | - | D, E | A, B, F | - | Defect of borehole | B | - | - | - | - | Partial defect | - | - | - | - | - | Reconstruction | B, C | - | - | - | - | - | - | - | - | - | Defect of fence | | | | |
| Su05 | GGES Hakej Sharif | 41805003 | 2F-3CR-HSM | - | - | A, C, E, F | A, B, D, E | A, B | Drain clogging | B | - | - | - | - | Partial defect | - | - | - | Defect of fence | B | - | - | - | - | - | - | - | - | - | - | - | Defect of fence | | | | |
| Su06 | GGES Muhammad Sadiq Path | 41802062 | 2F-3CR-HSM | - | ✓ | A, D, E, F | Drain clogging | - | - | - | B | - | - | - | Partial defect | Partial defect | B | - | B | - | Reconstruction | A, B, C | - | - | - | - | - | - | - | - | - | - | | | | |
| Sh01 | GGES Khanpur - II | 41402014 | 2F-3CR-M | - | ✓ | A, Mortar peel | - | - | - | - | - | - | - | - | - | - | - | - | - | - | Repair | A, C, Defect of floor, Mortar peel | Partly defect | - | - | - | - | - | Partial defect | - | - | | | | | |
| Sh01 | GGES Officer Colony Ghokli | 41801051 | 2F-3CR-HSM | - | - | A, E, F | A, C, F, Defect of water pipe | A | - | B | - | - | - | - | Partial defect | - | - | - | A, B, Rust of flagpole | - | Reconstruction | A, B, C, Defect of floor | - | A, B | - | - | - | - | - | - | - | Defect of fence | | | | |
| Sh02 | GGES Kamoon Shaheed | 41803049 | 1F-3CR-HSM | - | - | A, C, D, E, Mortar peel, Defect of door | A, B, D, E, F | - | A | B | - | - | - | - | Partial defect | - | - | - | A, B, C | - | Repair | A, C, Defect of door, defect of floor | - | - | - | - | - | - | - | - | - | Defect of fence | | | | |
| Sh04 | GGES Belo Nish | 41802096 | 2F-3CR-HSM | - | - | A, D, E, Mortar peel | A, D, Defect of door | B | A | B | B | Defect | - | - | Partial defect | Partial defect | - | - | A, B | - | - | - | - | - | - | - | - | - | - | - | - | Defect of fence | | | | |
| Sh08 | GGES Shero Mahar | 41804030 | 2F-3CR-HSM | - | ✓ | E, F, Defect of door | B, D, F, Mortar peel, Defect of pit cover | B, Mortar peel | - | - | - | - | - | - | Partial defect | A, B | C | - | C | - | Reconstruction, Plan for expansion | A, B, C, Mortar peel | - | - | - | - | - | - | - | - | - | Defect | | | | |
| La01 | GGES Gund | 41301040 | 2F-3CR-HSM | - | ✓ | A, D, E, Tilting of eaves | A, D, F | A, Partial defect of step | - | - | - | - | - | - | Partial defect | A, B | - | - | C, Tilting of flagpole | - | Under construction | - | - | - | - | - | - | - | - | - | - | B | | | | |
| La02 | GGES Nai Gund | 41304045 | 2F-3CR-HSM 2F-3CR | - | ✓ | A, D, F, Defect of cinder concrete's roof | A, D, F | A | Defect of borehole | B | A | - | - | - | - | A | B | - | A, B, Partial defect of pavement | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | |
| La03 | GGES Model community Tharacha | 41304077 | 2F-3CR-HSM | - | - | A, D, E, F | A, D, E | B | A | - | - | - | - | - | - | A, B | A | - | B, Rust of flagpole | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | |
| La04 | GGES Rasool Bux Hulo | 41304250 | 1F-3CR-HSM | - | ✓ | A, C, D, F | C, D, F | B | A | B | - | - | - | - | Partial defect | A | - | - | B, Rust of flagpole | - | Reconstruction | - | - | - | - | - | - | - | - | - | - | - | | | | |
| Da01 | GGES Kamaluddin Village Karhar | 40201028 | 2F-3CR-M | ✓ | ✓ | A, D, E | D, E, F, Drain clogging, Defect of water pipe | A, B | Defect of borehole | A | - | - | - | - | Partial defect | - | - | - | A, B, Crack of approach, Rust of flagpole | - | Repair | C, Termite damage | - | - | - | - | - | - | Partial defect | A, Defect of fence | | | | | | |
| Da04 | GGES Gharib Abad Radhan | 40204051 | 2F-3CR-HSM | - | ✓ | A, D, E, F | B, D, E, Leakage in catch basin | - | - | B | A | - | - | - | Partial defect | - | - | - | Rust of flagpole | - | Repair | A, C, Settlement of floor | - | - | - | - | - | - | - | - | - | C, Peel of fence paint, Deterioration of gate, Defect of fence | | | | |
| Da05 | GGES Wali Muhammad Gorar | 40204043 | 2F-3CR-HSM | - | ✓ | D, E, Defect of vent, Block | A, B, D, Defect of pit cover | - | - | B | B | - | - | - | Partial defect | - | C | - | B, C, Rust of flagpole | - | Reconstruction | B, Defect of door | - | - | - | - | - | - | - | - | - | B, Defect of sub-gate, Defect of fence | | | | |

6-3 Table of survey results by Project and District (Situation of Disaster) [The Programme for Flood Response through Reconstruction of Education Facilities in Sindh]

Fiscal Year 2013 Cabinet Approval Project (29 sites)

| S.no | District | | School Name | SEMIS | Access | Future expansion | Past flooded record | Rainfall record (July-August, 2022) | Flooded level (G.L+ .m) | Flooded level (F.L+ .m) | No. of days flooded | Reason for inundation | No. of people shelter use | No. of days shelter use | |
|------|------------|------|---------------------------------------|-----------|--------|------------------------------|---------------------|-------------------------------------|-------------------------|-------------------------|---------------------|---------------------------|---------------------------|-------------------------|---------|
| 1 | Mirpurkhas | Mi01 | GGES - Ahmed Bux Narejo | 405050180 | ○ | | GL+600 | 436 mm | | | | | | | |
| 2 | Mirpurkhas | Mi02 | GGES - Jeto Singh Malhi | 405020091 | ○ | 4CR by SELD | 1feet | | | | | | | 70 people | 30 days |
| 3 | Mirpurkhas | Mi03 | GGES - Deh - 294 | 405020099 | ○ | | | | 0.20 m | | 30 days | By rain | | | |
| 4 | Mirpurkhas | Mi04 | GGES -Kachelo Farm | 405020096 | ○ | | | | | | 36 days | By rain | 80 people | 10 days | |
| 5 | Mirpurkhas | Mi06 | GGES - Chodhri Bhag Din | 405060062 | ○ | | 3feet | | | | | | | | |
| 6 | Mirpurkhas | Mi07 | GGES - Muhammad Hassan Lodho | 405060057 | ○ | | GL+600 | | | | | | | 50 people | 30 days |
| 7 | Mirpurkhas | Mi08 | GGES - Muhammad Hassan Mari | 405060015 | ○ | | | | | | 20 days | By rain | 200 people | 45 days | |
| 8 | Mirpurkhas | Mi09 | GGES - Mevo Khan Laghari | 405030156 | ○ | | | | 0.08 m | | | | By rain | 98 people | 30 days |
| 9 | Mirpurkhas | Mi11 | GGES - Sagheer Colony Jhuddo | 405040001 | ○ | | 2feet | | 0.08 m | | 40 days | By rain | 150 people | 30 days | |
| 10 | Mirpurkhas | Mi12 | GGES - Mir Fazal Muhammad | 405010369 | ○ | | 4feet | | 0.10 m | | 20 days | By rain | 15 people | 2 days | |
| 28 | TAY | Ta04 | GGES - Bachal Pitafi | 424030063 | ○ | | | | | | 15 days | By rain | | | |
| 29 | TAY | Ta06 | GGES - Shah Nawaz Muhajar | 424020035 | ○ | | GL+1500 | | 0.76 m | | 90 days | | | | |
| 22 | Badin | Ba01 | GGES - Gullan Khaskheli | 401040123 | ○ | | | 538 mm | | | | | 20 people | 3 days | |
| 23 | Badin | Ba02 | GGES - Sangi Pharaho | 401040712 | ○ | | | | 0.15 m | | 90 days | By rain | 150 people | 30 days | |
| 24 | Badin | Ba03 | GGES - Peeru Lashari | 401050296 | ○ | | | | | | | | By rain | | |
| 25 | Badin | Ba05 | GGES - Chak No. 5 | 401020561 | ○ | | | | 0.25 m | | 25 days | By rain | | | |
| 26 | Badin | Ba06 | GGES - Ibrahim Chandio | 401020124 | ○ | | | | 0.08 m | | 12 days | By rain | | | |
| 27 | Badin | Ba07 | GGES - Ali Mohammad Mehri | 401020119 | ○ | | | | | | | | | | |
| 11 | Hyderabad | Hy02 | GGES - Qaim Babar | 403010193 | ○ | By TCF (HM room etc) for G10 | FL+300 | | 1,059 mm | | | | By rain | | |
| 12 | Hyderabad | Hy03 | GGES - Arif Kaka | 403010055 | ○ | | GFL+500-600 | | | | | | | | |
| 13 | Jamshoro | Ja01 | GGES - Bhiria Village | 422010061 | ○ | | | 378 mm | | | | | | | |
| 14 | Jamshoro | Ja02 | GGES - Muslim Town | 422010073 | ○ | 4CR under construction | | | | | | | | 20 people | 28 days |
| 15 | Jamshoro | Ja03 | GGES - Model Community School AlIabad | 422010055 | ○ | By SELD | | | 0.61 m | | 2 days | By rain | | | |
| 16 | Jamshoro | Ja04 | GGES - Wali Dad Jokio | 422030014 | ○ | | | | | | 4 days | By rain | | | |
| 17 | Jamshoro | Ja05 | GGES - Sari | 422030207 | ○ | | | | | | | | By rain | | |
| 18 | Jamshoro | Ja07 | GGES - Pakka Channa | 422020065 | ○ | | | | 1.83 m | 1.22 m | 35 days | Flooding from nearby lake | | | |
| 19 | Nawabshah | Na01 | GGES - Quest | 417020074 | ○ | | GFL+300 | 690 mm | 0.51 m | | 60 days | By rain | 15 people | 30 days | |
| 20 | Nawabshah | Na02 | GGES - Deh Phuleli | 417010059 | ○ | | | | | | | | | | |
| 21 | Nawabshah | Na03 | GGES - Jalalani | 417030290 | ○ | | | | 0.41 m | | 7 days | By rain | 30 people | 45 days | |

Fiscal Year 2015 Cabinet Approval (24 sites)

| S.no | District | | School Name | SEMIS | Access | Future expansion | Past flooded record | Rainfall record (July-August, 2022) | Flooded level (G.L+_m) | Flooded level (F.L+_m) | No. of days flooded | Reason for inundation | No. of people shelter use | No. of days shelter use | |
|------|-----------|------|--|-----------|--------|---------------------|---------------------|-------------------------------------|------------------------|------------------------|---------------------|----------------------------|---------------------------|-------------------------|---------|
| 30 | Khairpur | Kh01 | GGES - Wapda Colony | 415030332 | ○ | By SELD, ADP old PS | | 576 mm | 0.41 m | | | By rain | 20 people | 30 days | |
| 31 | Khairpur | Kh02 | GGES - Hadi Bux Laghari | 415060527 | ○ | | | | 0.41 m | | 4 days | By rain | 60 people | 7 days | |
| 32 | Khairpur | Kh03 | GGES - Ali Dad Jogi | 415060557 | ○ | | | | | | 70 days | By rain | 50 people | 60 days | |
| 33 | Khairpur | Kh05 | GGES - Bajeed Fakir | 415010517 | ○ | | | | | | 30 days | By rain | | | |
| 34 | Khairpur | Kh06 | GGES - Ameen Patho | 415010100 | ○ | | GL+1500 | | 0.25 m | | 30 days | By rain | 12 people | 45 days | |
| 35 | Khairpur | Kh07 | GGES - Wazirabad Rajper | 415010356 | ○ | | | | 0.48 m | | 80 days | By rain | 100 people | 30 days | |
| 36 | Khairpur | Kh08 | GGES - Gambal Shah | 415050251 | ○ | | | | 0.08 m | | 45 days | By rain | 150 people | 60 days | |
| 37 | Khairpur | Kh09 | GGES - Jani Buriro | 415050286 | ○ | | | | | | | By rain | | | |
| 38 | Khairpur | Kh11 | GGES - Karim Bux Bhambhro | 415070028 | ○ | | | | | | | | 25 people | 5 days | |
| 39 | Sukkur | Su03 | GGES - Sorho | 418010560 | ○ | | | | 689 mm | | | | | | |
| 40 | Sukkur | Su04 | GGES - Moto Mirbahar | 418010225 | ○ | | 2feet | | | | | | | | |
| 41 | Sukkur | Su05 | GGES - Haleji Sharif | 418050063 | ○ | | | | | | | | | | |
| 42 | Sukkur | Su06 | GGES - Muhammad Sadiq Palh | 418020162 | ○ | | | 0.30 m | | | 30 days | By rain | 80 people | 20 days | |
| 47 | Shikarpur | Sh01 | GGES- Khanpur-II | 414020104 | ○ | | GFL+700 | 457 mm | | | | | 140 people | 45 days | |
| 46 | Ghotki | Gh01 | GGES – Officer Colony Ghotki | 419010151 | ○ | | | | | | | | | | |
| 43 | Ghotki | Gh03 | GGES – Kamoon Shaheed | 419030149 | ○ | | | | | | | | | | |
| 44 | Ghotki | Gh04 | GGES - Belo Nich | 419020096 | ○ | | | | | | | | | | |
| 45 | Ghotki | Gh06 | GGES - Shero Mahar | 419040100 | ○ | Repair by SMC | | | | | | | By rain | 25 people | 7 days |
| 49 | Larkana | La01 | GGES - Gund | 413010040 | ○ | SELD? | | 893 mm | | | 30 days | By rain | 70 people | 45 days | |
| 50 | Larkana | La02 | GGES - Nai Gudd | 413040145 | ○ | | | | | | | | | 156 people | 25 days |
| 51 | Larkana | La03 | GGES – Model Community Thaercha | 413040177 | ○ | | | | | | | | | | |
| 48 | Larkana | La04 | GGES - Rasool Bux Hulio | 413040250 | ○ | | | 516 mm | | | | Flooding from nearby river | 30 people | 12 days | |
| 52 | Dadu | Da01 | GGES – Kamaluddin Bhutto Village Kanhari | 402010282 | ○ | | | | 1.45 m | 0.71 m | 23 days | Flooding from nearby lake | 20 people | 15 days | |
| 54 | Dadu | Da04 | GGES - Garib Abad Radhan | 402040151 | ○ | | | | | | | | | 147 people | 60 days |
| 53 | Dadu | Da05 | GGES – Wali Muhammad Gorar | 402040143 | ○ | | | | | | | | By rain | 45 people | 60 days |

Fiscal Year 2015 Cabinet Approval Project (24 sites)

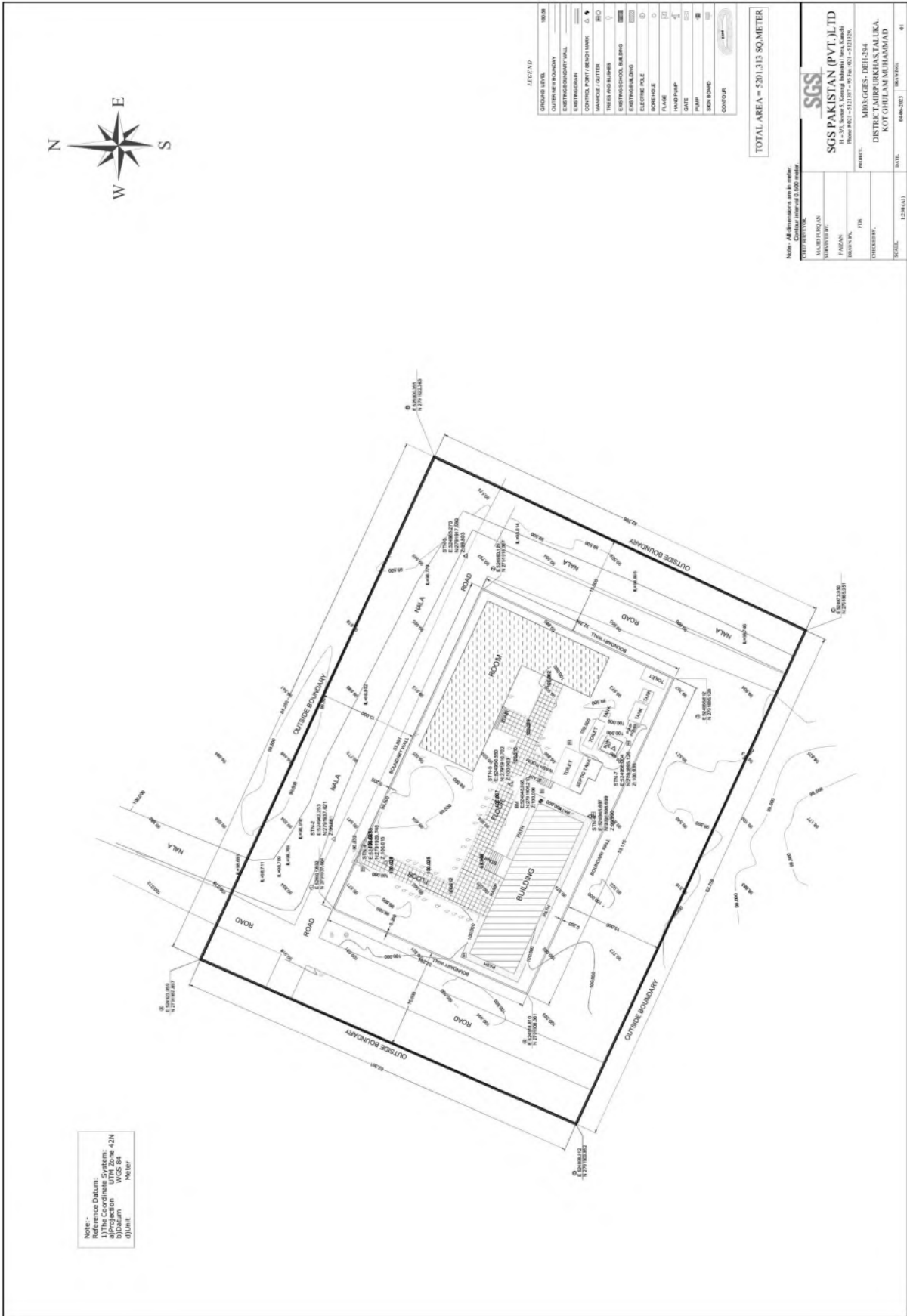
| S.no | District | School Name | SEMIS | Kati | G1 | G2 | G3 | G4 | G5 | Total G1-G5 | Ave. G1-5 | G6 | G7 | G8 | Total G6-G8 | Ave. G6-8 | G9 | G10 | ECT teacher | PST teacher | JEST teacher | HST/SSST teacher | Others | Total | Evaluation of primary school condition | Security/Safety Concern | Evaluation of enrollment (G1-5) | | | | | | | | | | | | | |
|------|-----------|---|-----------|------|----|-----|----|----|----|-------------|-----------|----|----|----|-------------|-----------|-----|-----|-------------|-------------|--------------|------------------|--------|-------|--|-------------------------|---------------------------------|----|----|---|----|----------------|------------------------------------|----------------|----------------|----------------|---|----------------|--|----------------------|
| 30 | Khairpur | Kh01 GGES - Wapda Colony | 415030332 | 15 | 10 | 14 | 18 | 4 | 11 | 13 | 8 | 8 | 12 | 8 | 4 | 47 | 53 | 9 | 20 | 10 | 9 | 3 | | | | | 10 | 2 | | | 2 | 12 | 2 | Repair | | | | | | |
| 31 | Khairpur | Kh02 GGES - Hadi Bux Laghari | 415060527 | 30 | | 20 | | 20 | | 26 | 18 | | 17 | | 101 | 0 | 20 | 20 | 14 | 9 | 11 | | | | | | 6 | | 3 | | 9 | 0 | - | | | | | | | |
| 32 | Khairpur | Kh03 GGES - Ali Dad Jogi | 415060557 | 40 | 10 | 7 | 3 | 11 | 1 | 10 | 1 | 8 | 2 | 6 | 42 | 7 | 8 | 9 | 18 | 18 | 2 | | | | | | 5 | 4 | | 2 | 9 | 2 | Repair | | | | | | | |
| 33 | Khairpur | Kh05 GGES - Bajeed Fakir | 415010517 | 100 | 40 | 28 | 7 | 20 | 6 | 16 | 9 | 27 | 13 | 23 | 20 | 114 | 55 | 22 | 33 | 23 | 21 | 18 | | | | | 2 | 1 | | 2 | 5 | 0 | Reconstruction | | A- | | | | | |
| 34 | Khairpur | Kh06 GGES - Ameen Patho | 415010100 | 100 | | 15 | | 18 | | 8 | | 12 | | 10 | 63 | 0 | 12 | 12 | | | | | | | | 2 | 1 | | 1 | 3 | 1 | Reconstruction | | low enrollment | | | | | | |
| 35 | Khairpur | Kh07 GGES - Wazirabad Rajper | 415010356 | 50 | 50 | 16 | 14 | 15 | 15 | 15 | 12 | 10 | 10 | 16 | 68 | 72 | 119 | 14 | 38 | 20 | 20 | 20 | | | | | 4 | 1 | | 2 | 7 | 0 | Repair | | | | | | | |
| 36 | Khairpur | Kh08 GGES - Gambal Shah | 415050251 | 21 | 41 | 2 | | 4 | 1 | 2 | 6 | 3 | 4 | | 11 | 11 | 2 | 4 | 6 | | | | | | | 3 | 4 | | 1 | 7 | 1 | Reconstruction | | low enrollment | | | | | | |
| 37 | Khairpur | Kh09 GGES - Jani Buriro | 415050286 | 75 | | 24 | | 21 | | 18 | | 14 | | 24 | 101 | 0 | 20 | 20 | 17 | 15 | 8 | | | | | 3 | 2 | 1 | | 6 | 0 | Reconstruction | | B | | | | | | |
| 38 | Khairpur | Kh11 GGES - Karim Bux Bhambro | 415070028 | 20 | 40 | 5 | 5 | 1 | 9 | | 6 | | 8 | 3 | 8 | 9 | 36 | 1 | 9 | | | | | | | | 1 | 1 | | 1 | 1 | 1 | - | | | | | | | |
| 39 | Sukkur | Su03 GGES - Sorho | 418010580 | 38 | | 11 | | 15 | | 14 | | 16 | | 10 | 66 | 0 | 13 | 13 | 26 | 8 | 21 | | | | | | 3 | 1 | 1 | 1 | 5 | 1 | Repair | | | | | | | |
| 40 | Sukkur | Su04 GGES - Moto Mirbahar | 418010225 | 53 | | 10 | | 30 | | 21 | | 20 | | 19 | 100 | 0 | 20 | 20 | 21 | 19 | 20 | | | | | | 3 | | | 1 | 3 | 1 | Reconstruction | | B | | | | | |
| 41 | Sukkur | Su05 GGES - Haleji Sharif | 418050063 | 20 | | 15 | | 9 | | 12 | | 12 | | 15 | 63 | 0 | 12 | 12 | 16 | 7 | 4 | | | | | | 4 | 3 | | | 7 | 0 | - | | | | | | | |
| 42 | Sukkur | Su06 GGES - Muhammad Sadiq Path | 418020162 | 10 | 23 | 8 | 25 | 6 | 11 | 5 | 15 | 1 | 6 | 3 | 7 | 23 | 64 | 4 | 17 | 4 | 6 | 4 | 5 | 4 | 6 | 12 | 17 | 4 | 10 | | | 3 | | 1 | 2 | 5 | 4 | Reconstruction | | low girls enrollment |
| 47 | Shikarpur | Sh01 GGES - Khanpur-II | 414020104 | 38 | 10 | 72 | 10 | 51 | 6 | 53 | 7 | 39 | 6 | 43 | 3 | 258 | 32 | 51 | 58 | 34 | 15 | | | | | | 14 | 1 | | 1 | 2 | 15 | 3 | Repair | | | | | | |
| 46 | Ghotki | Gh01 GGES - Officer Colony Ghotki | 419010151 | 25 | 24 | 21 | 12 | 43 | 3 | 19 | 8 | 32 | 8 | 13 | 13 | 128 | 44 | 25 | 34 | 25 | 5 | 1 | | | | | 12 | 2 | 1 | | 2 | 15 | 2 | Reconstruction | Δ | A | | | | |
| 43 | Ghotki | Gh03 GGES - Kamoon Shaheed | 419030149 | 27 | | 27 | | 21 | | 19 | | 23 | | 22 | 112 | 0 | 22 | 22 | 50 | 35 | 53 | | | | | | 9 | 1 | | 1 | 1 | 11 | 1 | Repair | | | | | | |
| 44 | Ghotki | Gh04 GGES - Belo Nich | 419020096 | 23 | | 12 | | 16 | | 7 | | 13 | | 4 | 52 | 0 | 10 | 10 | 15 | 4 | 7 | | | | | | 8 | 3 | | | 1 | 11 | 1 | - | | | | | | |
| 45 | Ghotki | Gh06 GGES - Shero Mahar | 419040100 | 61 | | 6 | | 12 | | 17 | | 10 | | 6 | 51 | 0 | 10 | 10 | 9 | | | | | | | | 3 | | | 1 | 3 | 1 | Reconstruction, Plan for expansion | | low enrollment | | | | | |
| 49 | Larkana | La01 GGES - Gund | 413010040 | 100 | | 40 | | 29 | | 35 | | 48 | | 20 | 172 | 0 | 34 | 34 | 23 | 30 | 30 | | | | | | 9 | 3 | | 3 | 12 | 3 | Under construction | | | | | | | |
| 50 | Larkana | La02 GGES - Nai Gudd | 413040145 | 21 | 32 | | | 27 | 21 | 48 | 39 | 24 | 25 | 23 | 22 | 122 | 107 | 24 | 45 | 7 | 13 | | | | | | 4 | | | 3 | 4 | 3 | - | | | | | | | |
| 51 | Larkana | La03 GGES - Model Community Thaercha | 413040177 | 40 | | 13 | | 12 | | 13 | | 13 | | 10 | 61 | 0 | 12 | 12 | 6 | 10 | | | | | | | 2 | 1 | | | 3 | 0 | - | | | | | | | |
| 48 | Larkana | La04 GGES - Rasool Bux Hulio | 413040250 | 14 | 24 | 2 | 3 | 3 | 3 | 2 | 3 | 6 | 3 | 5 | 2 | 18 | 14 | 3 | 6 | 2 | 1 | | | | | | | 4 | 1 | | 1 | 0 | 6 | Reconstruction | | low enrollment | | | | |
| 52 | Dadu | Da01 GGES - Kamaluddin Bhutto Village Kanhari | 402010282 | 40 | | 23 | | 11 | | 11 | | 11 | | 14 | 70 | 0 | 14 | 14 | 23 | 23 | 14 | | | | | | 4 | 3 | | | 7 | 0 | Repair | Δ | | | | | | |
| 54 | Dadu | Da04 GGES - Garib Abad Radhan | 402040151 | 79 | | 132 | | 50 | | 37 | | 29 | | 35 | 283 | 0 | 56 | 56 | 52 | 25 | 35 | | | | | | 1 | 13 | | 1 | 2 | 15 | 2 | Repair | | | | | | |
| 53 | Dadu | Da05 GGES - Wali Muhammad Gorar | 402040143 | 30 | | 30 | | 13 | | 14 | | 15 | | 6 | 78 | 0 | 15 | 15 | 18 | 4 | | | | | | | 3 | 1 | | | 4 | 0 | Reconstruction | | B | | | | | |

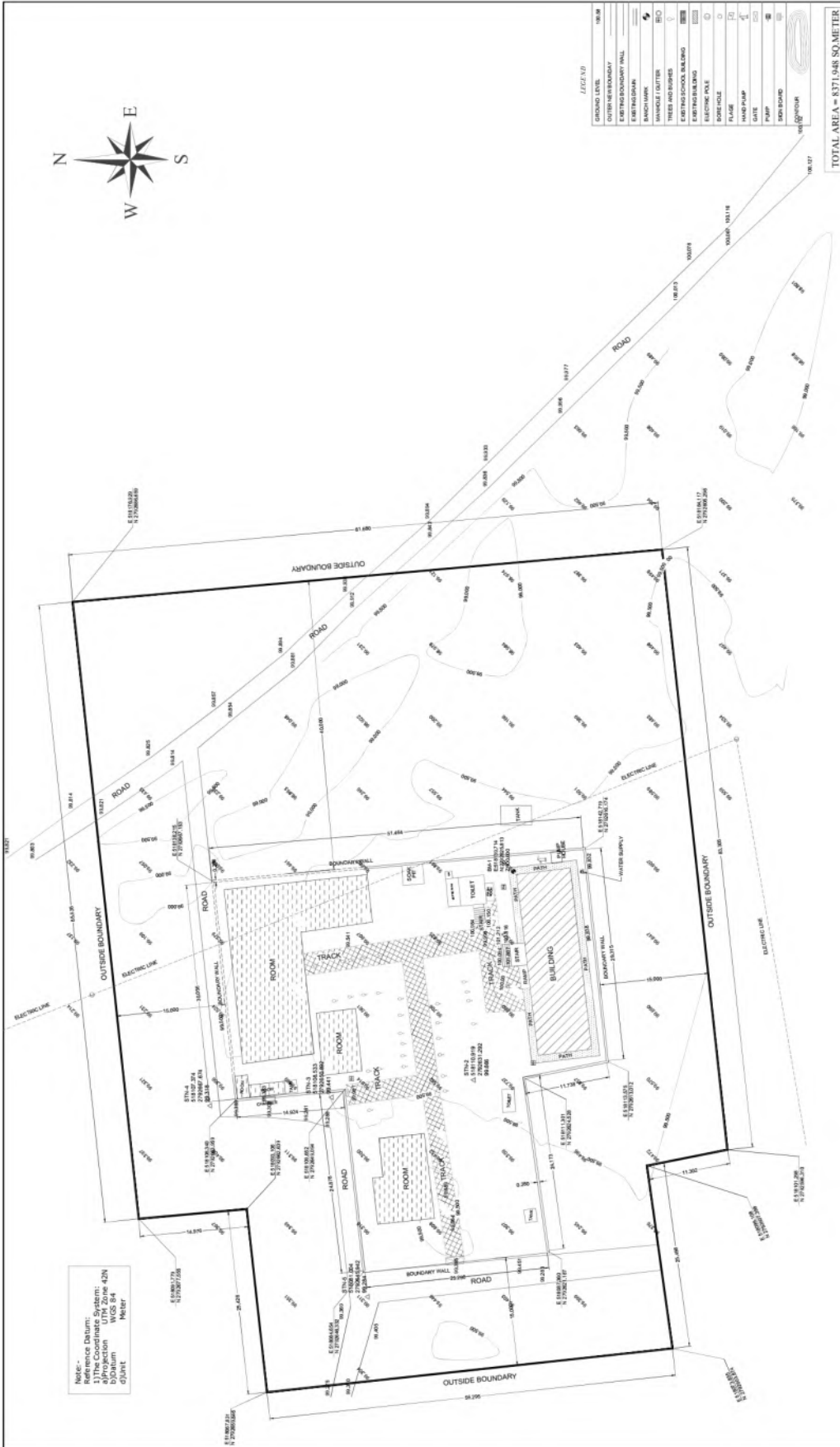
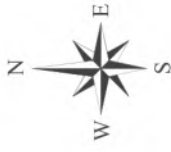
12<P<30
30 ≥ P

ECT : Early Childhood Teacher
PST : Primary School Teacher
JEST : Junior Elem. School Teacher
HST/SSST : High School Teacher/ Sec. School Teacher

Priority A: Average enrollment in grades G1-G5 of at least 30 students. Number of primary school teachers (PSTs): at least 6 PSTs
Priority A-: Average enrollment in grades G1-G5 of at least 30 students. Number of primary school teachers (PSTs): at least 6 PSTs
Priority B: Average enrollment in grades G1-G5 of from 12 to 29 students. Number of primary school teachers (PSTs): at least 3 PSTs
Priority B-: Average enrollment in grades G1-G5 of from 12 to 29 students. Number of primary school teachers (PSTs): 2 or less PSTs

6-5 Topographic Survey Map of the Project Site



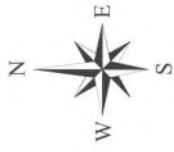


Note: -
 1) The Projection is UTM
 2) The Zone is 42N
 3) The Datum is GDA97
 4) The Spheroid is Everest
 5) The Datum Shift is 500 m

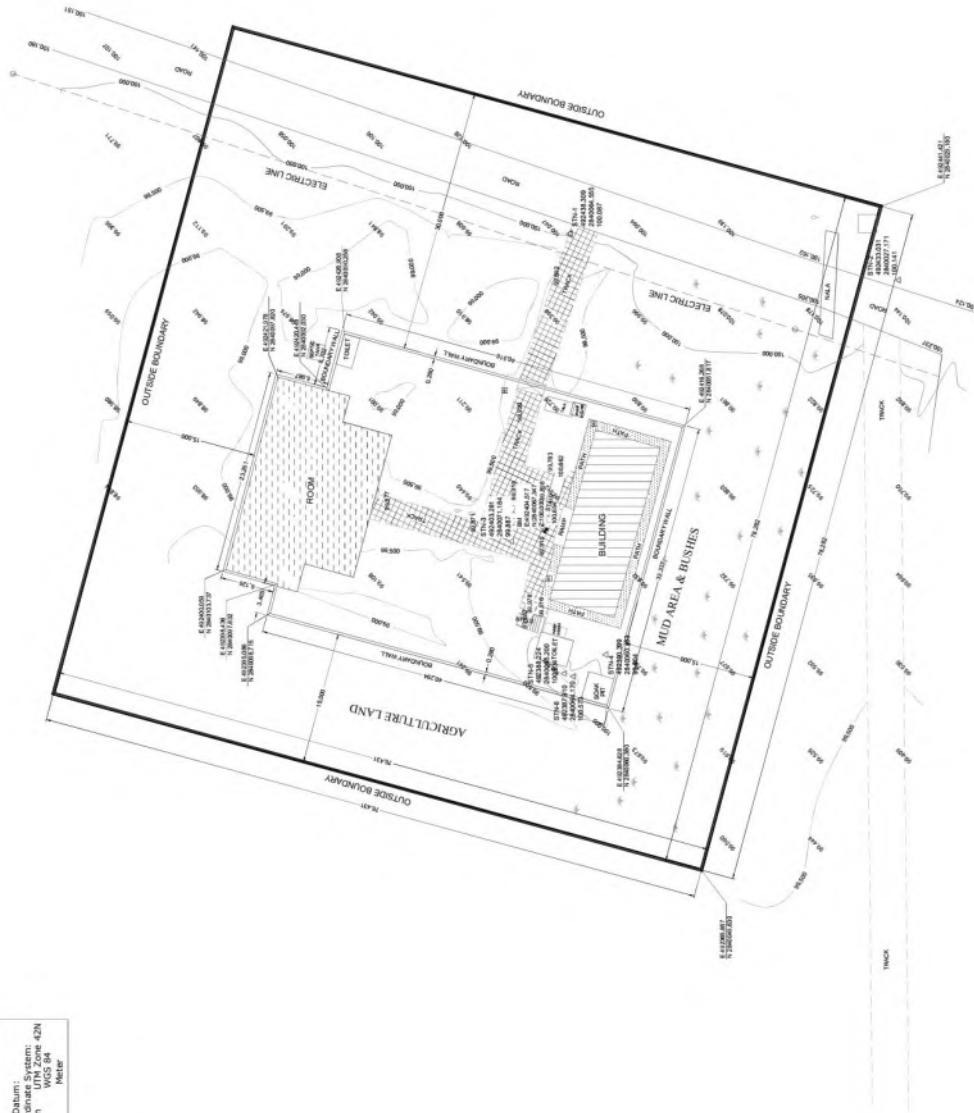
SGS
SGS PAKISTAN (PVT.) LTD
 Plot No. 10, Phase 1, F-7/3, Islamabad
 Phone: +92-312-377-9100, Fax: +92-312-377-9101
 Website: www.sgs-pakistan.com

PROJECT: M/S. G. G. KACHELO FARM
 DISTRICT: BARUCHAS
 TOWN: TALKAN, DISTRICT: RAJSHAB
 SCALE: 1:25000
 DATE: 27/06/2023
 SHEET NO: 01

Note: - All dimensions are in meter.
 Contour interval is 0.50 meter.



Note:-
 1) The Coordinate System:
 a) Projection: UTM Zone 42N
 b) Unit: Meter



| LEGEND | | 100:80 |
|--------------------------|--|--------|
| GROUND LEVEL | | |
| OUTER PERIMETER WALL | | |
| ELECTRICITY CABLE | | |
| ROAD | | |
| RANCH HOUSE | | |
| HAND PUMP | | |
| TOILET | | |
| WELL | | |
| WOODEN WALKWAY | | |
| ROUNDRY WALL | | |
| ROADWAY WALL | | |
| MUD AREA & BUSHES | | |
| EXISTING BUILDING | | |
| EXISTING SCHOOL BUILDING | | |
| ELECTRIC POLE | | |
| BORE HOLE | | |
| FLARE | | |
| HAND PUMP | | |
| GATE | | |
| PUMP | | |
| SEWERAGE | | |
| CONTOUR | | |

TOTAL AREA = 5995.972 SQ.METER

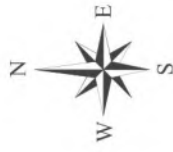
Note: All dimensions are in meter
 Contour interval 0.500 meter

SGS
SGS PAKISTAN (PVT.) LTD
 11-C, Sector 5, Ganga Sahay Park, Ganga
 Road, Faisalabad-38000
 Phone: 372-333337 - 37233338 Fax: 372-333338
 PAKISTAN
 MR. MOHAMMAD HASSAN MARI
 DISTRICT: MURPURKHA
 TALUKA: HUSSAIN BOX MARI

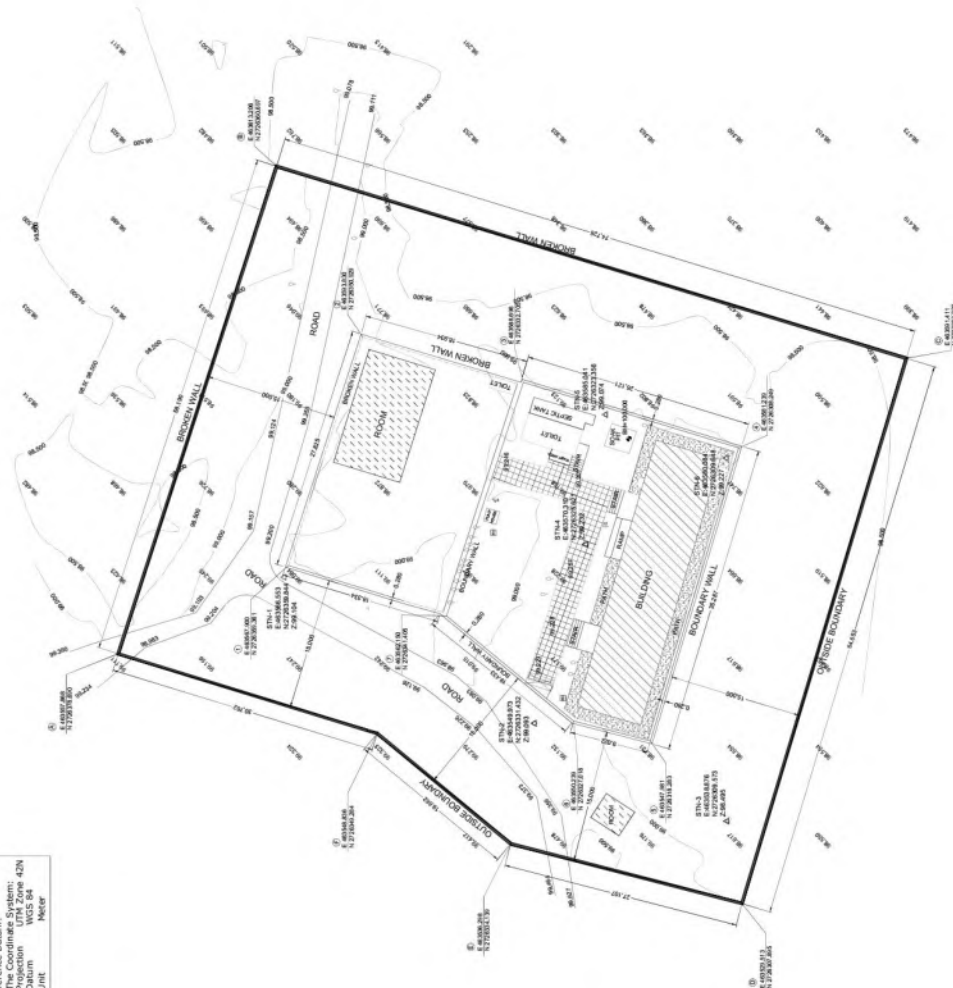
| | |
|-------|------------|
| TOTAL | 1201441 |
| SCALE | 1:40000 |
| DRAWN | 27/06/2011 |



Note:-
 Reference Datum:
 1) The Coordinate System:
 a) Projection UTM Zone 42N
 b) Datum WGS 84
 c) Unit Meter



Notes:
 Reference Datum:
 1) The Coordinate System:
 Projection: UTM
 Datum: WGS 84
 Unit: Meter

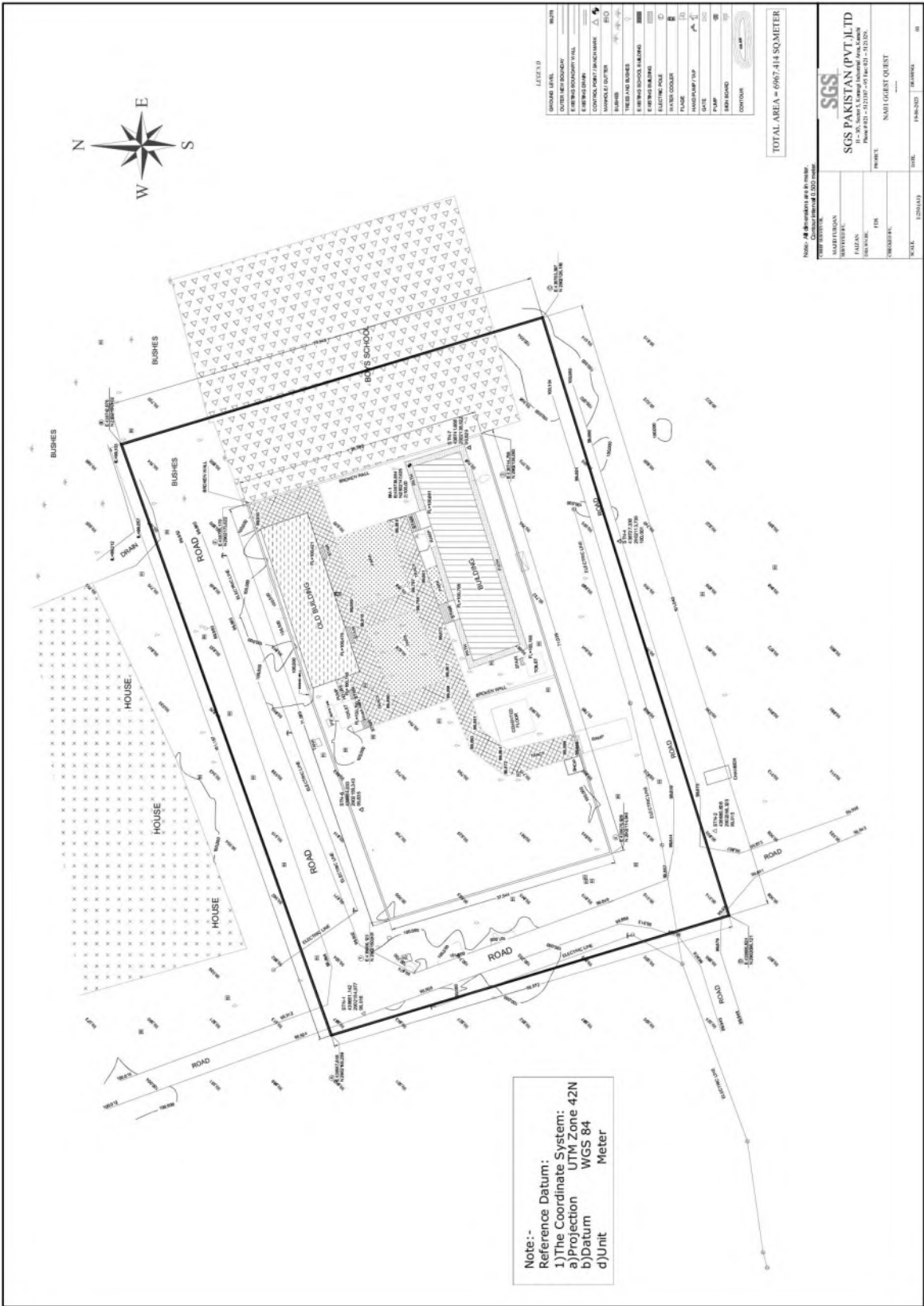


| LEGEND | |
|--------------------------------|---------|
| GROUND LEVEL | 100.00 |
| OUTSIDE BOUNDARY | --- |
| INSIDE BOUNDARY | --- |
| ROCKY AREA | ---/--- |
| CONCRETE PAVEMENT / BRICK MARK | ---/--- |
| MANHOLE / CUTTING | ○ |
| TRUSS AND ROOF | ---/--- |
| EMPTY POND / SCHOOL BUILDING | ---/--- |
| EMPTY POND BUILDING | ---/--- |
| ELECTRIC POLE | ○ |
| STONE HOLE | ○ |
| PLAGE | ---/--- |
| HAND PUMP | ○ |
| GATE | ---/--- |
| PUMP | ○ |
| RAIN ISLAND | ---/--- |
| CONTOUR | ---/--- |

TOTAL AREA = 4645.992 SQ.METER

Note: All dimensions are in meter.
 Contour Interval 0.50 meter

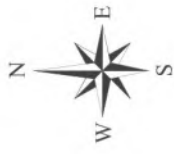
| | |
|---------------|---|
| PROJECT: | TEMPERATURE |
| MAJOR DESIGN: | SGS PAKISTAN (PVT) LTD |
| DESIGNER: | 11-35, Sector 5, Ganga International Area, Lahore |
| SCALE: | 1:1000 |
| DATE: | 14/06/2023 |
| DRAWN BY: | BAHR-GE-SHRAHIM CHADRO |
| CHECKED BY: | DISTRICT BAHR TALUKA |
| DATE: | 14/06/2023 |
| SCALE: | 1:2500 (AS) |
| DATE: | 14/06/2023 |
| SCALE: | 1:1000 (AS) |



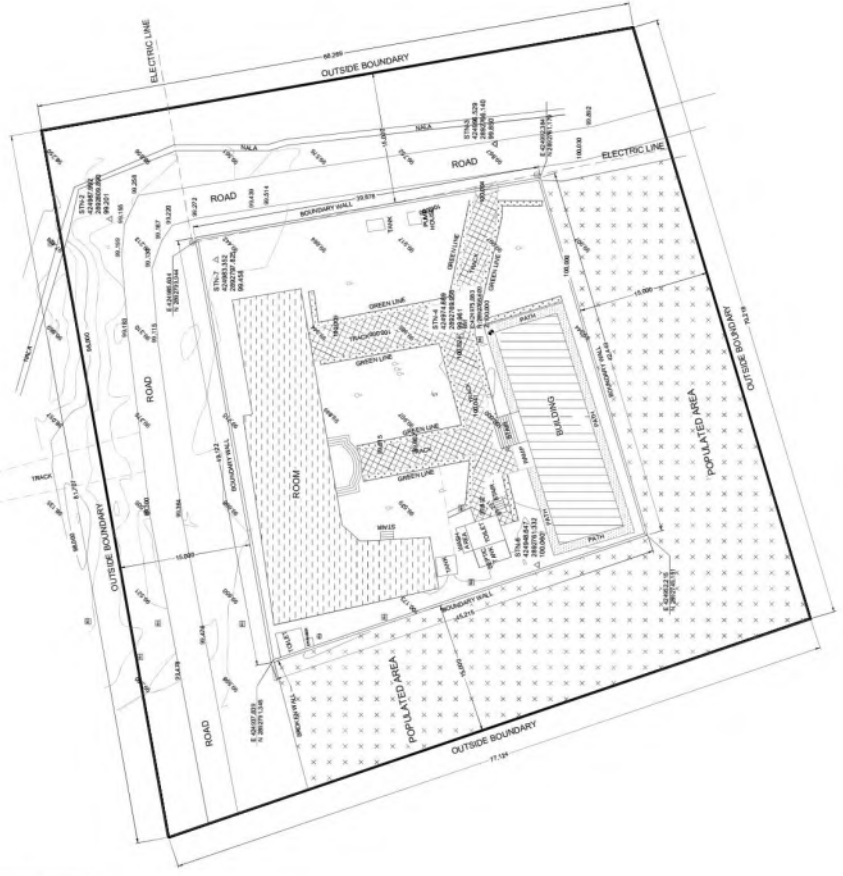
Note:-
 Reference Datum:
 1) The Coordinate System:
 a) Projection UTM Zone 42N
 b) Datum WGS 84
 c) Unit Meter

TOTAL AREA = 6965.414 SQMETER

| | |
|---|---|
| Note:- All dimensions are in meters Contour Interval is 1.00 Meter | |
| SGS SGS PAKISTAN (PVT.) LTD 10-35, Sector 5, Commercial Area, Islamabad | PROJECT: NAUIGUEST QUEST |
| MAP SHEET NO: SHEET NO: DATE: DRAWN BY: CHECKED BY: | SCALE: 1:2000 DATE: 14/06/2013 DRAWN BY: CHECKED BY: |



Note:-
 Reference Datum:
 1) The Coordinate System:
 a) Projection UTM Zone 42N
 b) Datum WGS 84
 c) Unit Meter



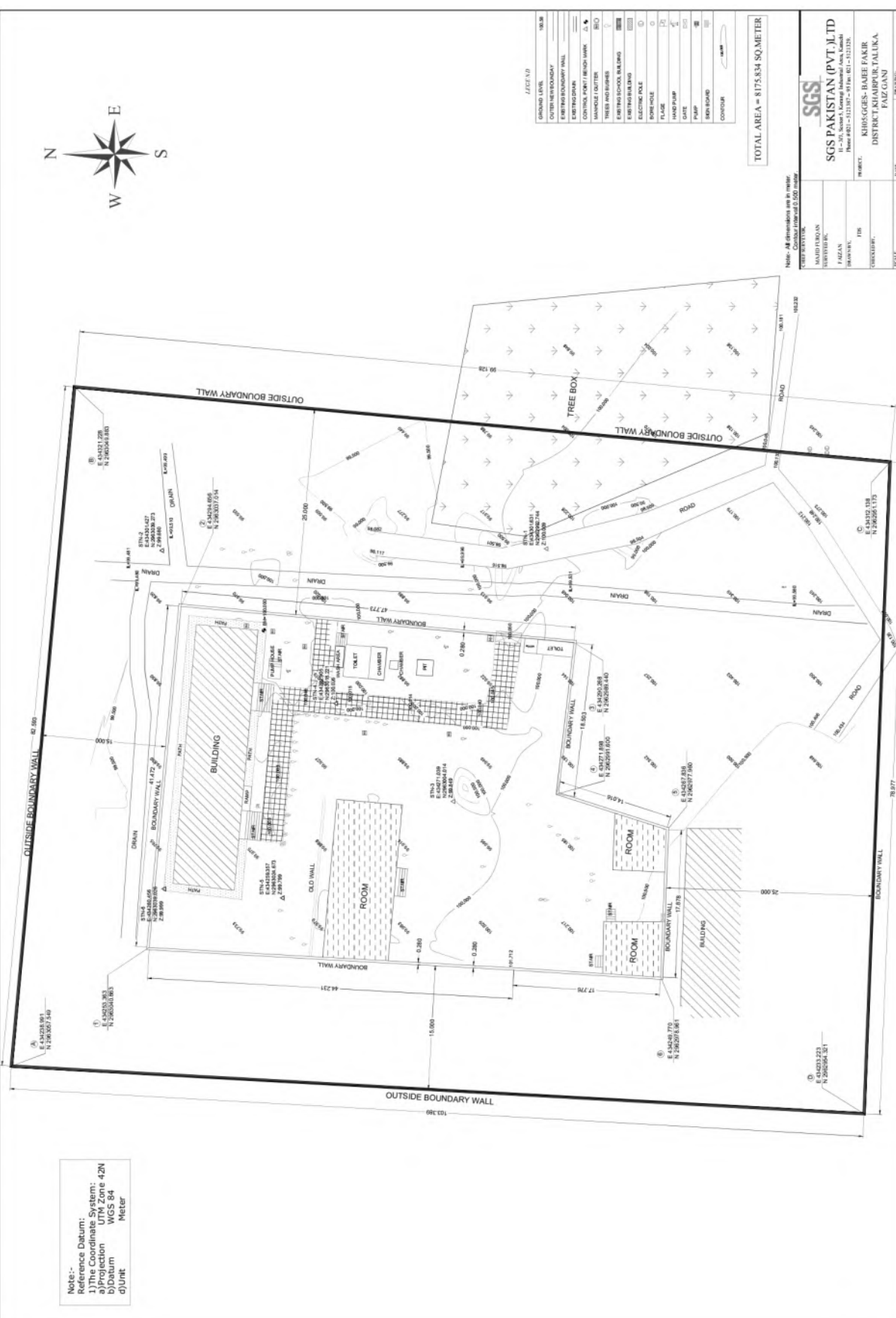
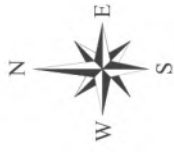
| | |
|------|--------------------------|
| 9479 | GRINDING LEVEL |
| 9478 | OUTER PERIMETRY WALL |
| 9477 | EARTH RETENTION WALL |
| 9476 | WATER TOWER |
| 9475 | MANHOLE / CATCHER |
| 9474 | WELL |
| 9473 | TRASH AND DEBRIS |
| 9472 | EXISTING SCHOOL BUILDING |
| 9471 | EXISTING BUILDING |
| 9470 | ELECTRIC POLE |
| 9469 | WIRE MESH |
| 9468 | PLAGE |
| 9467 | HAND PUMP / TAP |
| 9466 | DATE |
| 9465 | PUMP |
| 9464 | EXISTING ROAD |
| 9463 | CONTOUR |

TOTAL AREA = 5494.808 SQ.METER

Note: All dimensions are in meter
 Contour Interval: 0.500 meter

| | |
|-----------------|------------------------|
| CITY/DISTRICT: | MAJLIS PAKISTAN |
| IDENTIFICATION: | ISLAMABAD |
| REGION: | ISLAMABAD |
| DISTRICT: | ISLAMABAD |
| PROJECT: | NA-03, GGES - JALALANI |
| OWNER/CLIENT: | DISTRICT, SAHAWASHAH |
| SCALE: | 1:2000 |
| TITLE: | 1440-2403 |
| DATE: | 18 |

SGS
SGS PAKISTAN (PVT.) LTD
 11-375, Sector 5, Avenue Industrial Area, G-7/3,
 Phase VIII - II, Islamabad - 44000
 TEL: 37321117 - 37321118 - 37321119



Note:-
 Reference Datum:
 1) The Coordinate System: UTM, Zone 42N
 a) Projection: WGS 84
 b) Datum: Meter
 c) Unit: Meter

| LEGEND | 1:500 |
|-----------------------|--------|
| GROUND LEVEL | 150.38 |
| OUTSIDE BOUNDARY WALL | --- |
| BOUNDARY WALL | --- |
| CONCRETE PAVEMENT | --- |
| ASPHALT PAVEMENT | --- |
| GRAVEL PAVEMENT | --- |
| DIRT ROAD | --- |
| ROAD | --- |
| TOILET | --- |
| CHAMBER | --- |
| WATER TANK | --- |
| ELECTRIC POLE | --- |
| WIRE | --- |
| PLANT | --- |
| WELL | --- |
| DRAIN | --- |
| ROAD | --- |
| CONTOUR | --- |

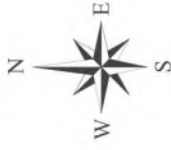
TOTAL AREA = 8175.834 SQ.METER

Note: All dimensions are in meter
 Contour interval 0.500 meter

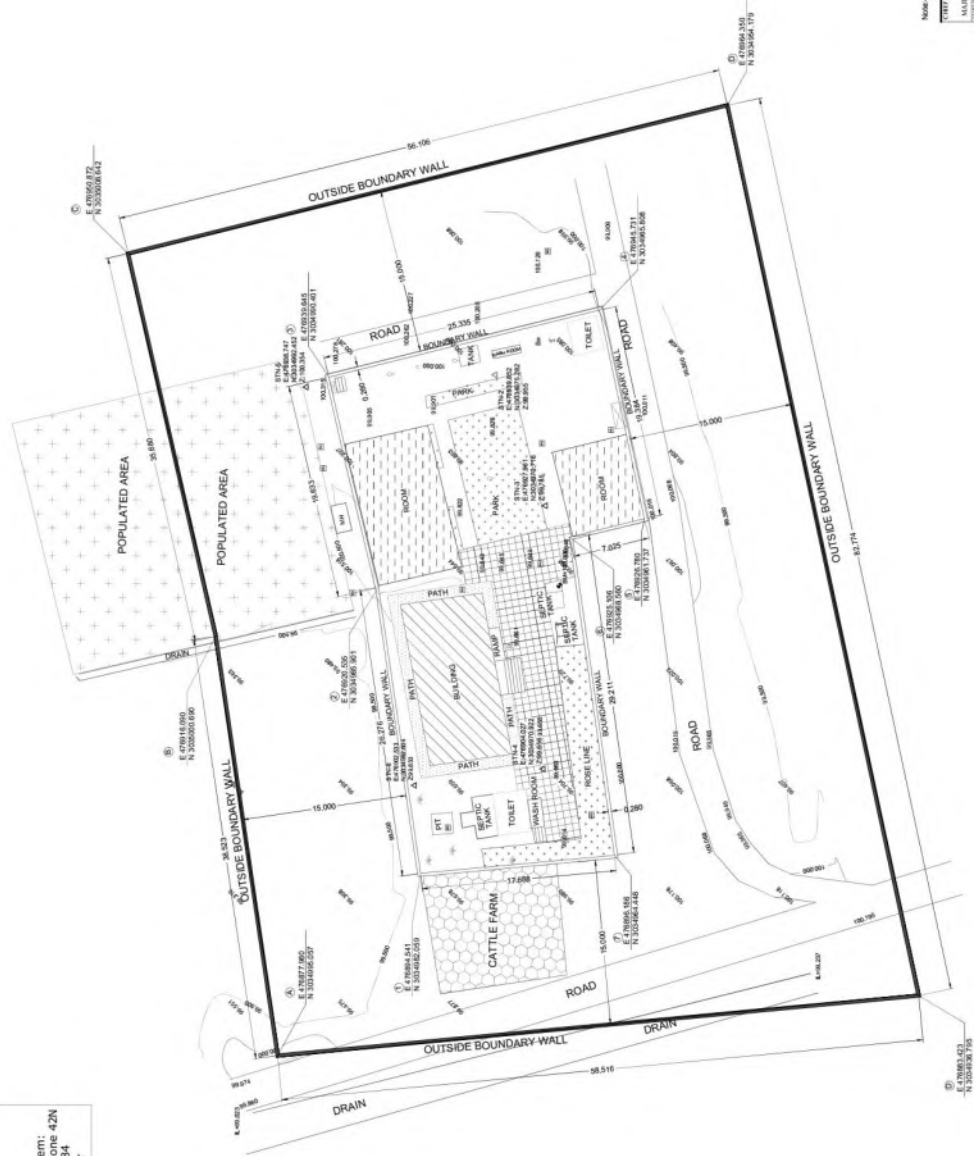
SGS
SGS PAKISTAN (PVT.) LTD
 H-37, Sector 5, Avenue Industrial Area, Faisalabad
 Phone: 041-2512101-2-97111; 041-2512125

PROJECT: KHUSROO-BAHE FAKIR
 DISTRICT: KHUSHAB TALUKA
 TOWN: FAIZ COLONY

SCALE: 1:2000
 DATE: 14/06/2018
 SHEET NO: 01



Note:-
 Reference Datum:
 1) The Coordinate System: 42N
 2) Datum: WGS 84
 d) Unit: Meter



| | |
|------------------|--------|
| GRADING LEVEL | 100.00 |
| OUTER BOUNDARY | --- |
| INNER BOUNDARY | --- |
| BOUNDARY WALL | --- |
| ROAD | --- |
| ROAD MARK | --- |
| ROAD CENTER LINE | --- |
| ROAD WIDTH | --- |
| ROAD LENGTH | --- |
| ROAD AREA | --- |
| ROAD VOLUME | --- |
| ROAD COST | --- |
| ROAD MATERIAL | --- |
| ROAD TYPE | --- |
| ROAD GRADE | --- |
| ROAD SURFACE | --- |
| ROAD DRAIN | --- |
| ROAD PAVEMENT | --- |
| ROAD WIDTH MARK | --- |
| ROAD CENTER MARK | --- |
| ROAD END MARK | --- |
| ROAD START MARK | --- |
| ROAD FINISH MARK | --- |
| ROAD BEGIN MARK | --- |
| ROAD END MARK | --- |
| ROAD START MARK | --- |
| ROAD FINISH MARK | --- |
| ROAD BEGIN MARK | --- |
| ROAD END MARK | --- |
| ROAD START MARK | --- |
| ROAD FINISH MARK | --- |
| ROAD BEGIN MARK | --- |
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| ROAD START MARK | --- |
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| ROAD BEGIN MARK | --- |
| ROAD END MARK | --- |
| ROAD START MARK | --- |
| ROAD FINISH MARK | --- |
| ROAD BEGIN MARK | --- |
| ROAD END MARK | --- |

TOTAL AREA = 4427.759 SQ.METER

Note: All dimensions are in meter
 Contour interval 0.500 meter

PROJECT:

MAJOR PROJECT:

REGION:

SECTION:

DATE:

SGS

SGS PAKISTAN (PVT.) LTD

11-551, Sector-1, Gurgaon, Haryana, India

Phone: 91-122-241351-2 Fax: 91-122-241352

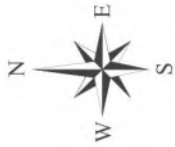
PROJECT: KHINDIGES-JANI BORO

DISTRICT: JAIDPUR, TALUKA

NO. OF SHEETS: 41

SCALE: 1:2000 (AS)

DRAWN BY: A-65



Note:-
 Reference Datum:
 1) The Coordinate System: UTM Zone 42N
 a) Projection: WGS 84
 b) Datum: Meter
 d) Unit: Meter



| | |
|----------------------------|-------|
| GROUND LEVEL | 84.78 |
| OUTER PERIMETRY WALL | |
| INNER PERIMETRY WALL | |
| ELECTRIFICATION | |
| CONTROL POINT / BOUND MARK | |
| MANHOLE / DITCHES | |
| WATER | |
| SEWER | |
| ELECTRICAL WIRE / CABLE | |
| ELECTRIC POLE | |
| WATER PUMP | |
| PLANT | |
| DATE | |
| BY | |
| FOR | |

TOTAL AREA = 2825.546 SQ. METER

Note:- All dimensions are in meters. Contour interval is 0.200 meter.

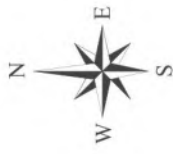
SGS
SGS PAKISTAN (PVT.) LTD
 14-A, Sector 4, Industrial Area, Lahore
 Phone: 401-1121397-95 Fax: 401-1121326

PROJECT: SU 004, GRES - Metro Mirpur
 DISTRICT: SUKKUR
 TALUQA: PANDI AKIL

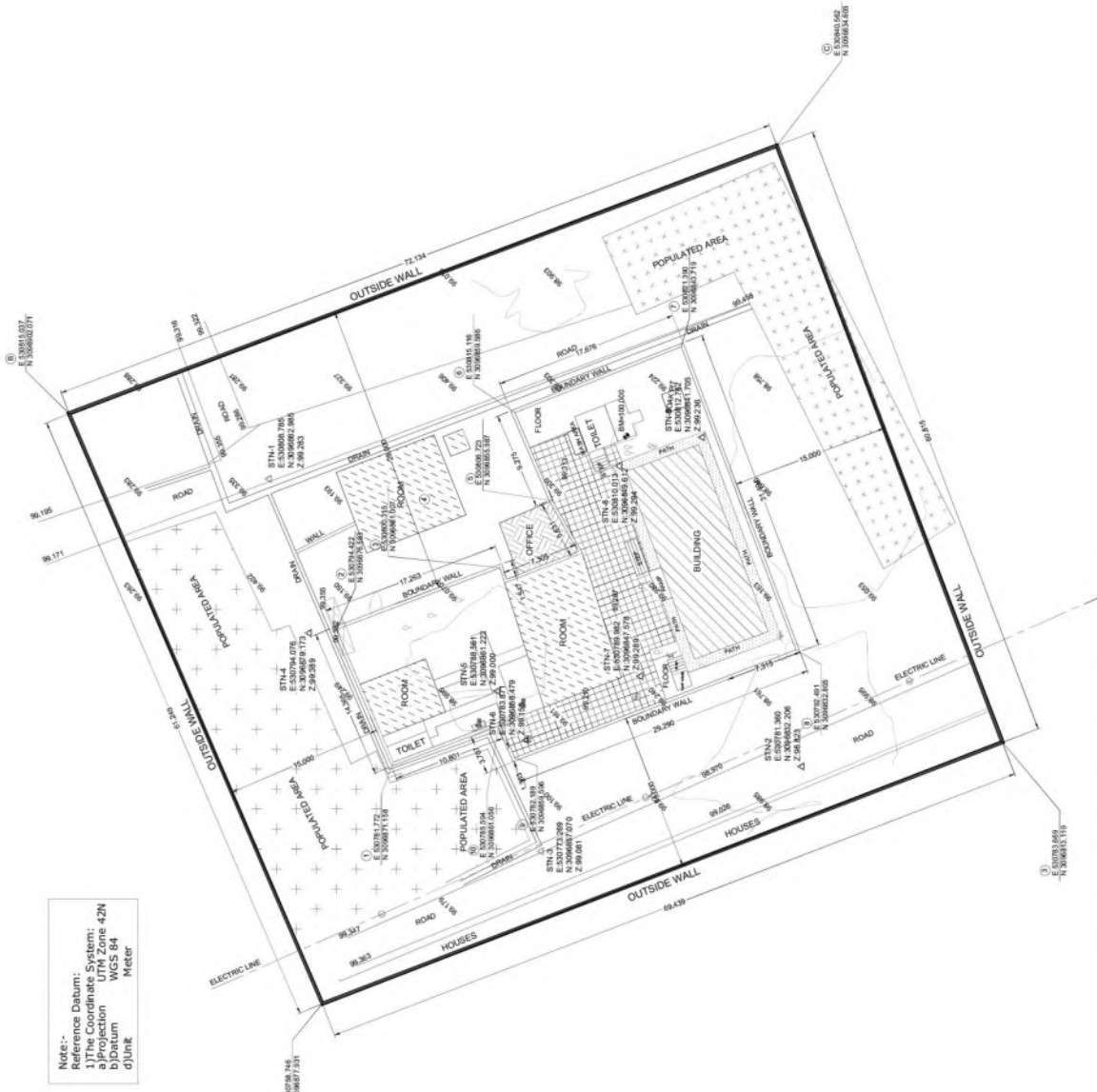
SCALE: 1:2000 (1:1)

DATE: 14-06-2021
 REVISED: 11

HAJIB I SHAJAN
 FAZAN
 DAWOOD
 TIR
 CHECKED BY:
 SCALE: 1:2000 (1:1)



Note:-
 Reference Datum:
 1) The Coordinate System:
 a) Projection: UTM Zone 42N
 b) Datum: WGS 84
 c) Unit: Meter

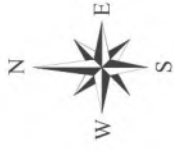


| LEGEND | |
|----------------------------|------|
| GROUND LEVEL | INLM |
| OUTER PERIMETRY WALL | --- |
| INNER PERIMETRY WALL | --- |
| ELECTRIC CABLE | --- |
| CONTROL POINT / BOUND MARK | △ |
| MANHOLE / DRAIN | ○ |
| FIELD AND PLOTS | --- |
| ROAD | --- |
| BOUNDARY WALL | --- |
| ELECTRIC POLE | ○ |
| STONE COLUMN | ○ |
| PLAKE | ○ |
| WATER PUMP | ○ |
| GATE | --- |
| PUMP | --- |
| SEWER BOARD | --- |
| CONTOUR | --- |

TOTAL AREA = 4318.394 SQ.METER

Name of the person/s who has prepared the plan: _____
 ORGANIZATION: _____
 MAJORITY: _____
 REGION: _____
 DISTRICT: _____
 SUB-DISTRICT: _____
 TOWN: _____
 VILLAGE: _____
 DATE: 12/01/11
 SCALE: 1:2000
 SHEET NO: 01

SGS
SGS PAKISTAN (PVT.) LTD
 11-15, Sector 5, Gurgaon, Bahawal Area, Karachi
 Phone: 021-111317-10, Fax: 021-111318
 PROJECT: GH01-GGS-OFFICER COLONY
 DISTRICT: GHOTKI



Note:-
 Reference Datum:
 1) The Coordinate System: UTM Zone 42N
 2) Projection: WGS 84
 3) Datum: Meter



LEGEND

| | |
|--------------------------|--------|
| GROUND LEVEL | 100.00 |
| OUTSIDE BOUNDARY | --- |
| ELECTRIC BOUNDARY WALL | --- |
| CONTOUR | --- |
| WATER | --- |
| WALL | --- |
| WINDMILL / WINDMILL | --- |
| TREES AND SHRUBS | --- |
| EXISTING SCHOOL BUILDING | --- |
| EXISTING BUILDING | --- |
| ELECTRIC POLE | --- |
| WATER HOLE | --- |
| PLAZA | --- |
| HANDPUMP | --- |
| GATE | --- |
| PUMP | --- |
| ROAD BOUNDARY | --- |
| CONTOUR | --- |

TOTAL AREA = 3488.885 SQ.METER

Note: All dimensions are in meter
 Contour interval 0.500 meter

| | |
|----------------|--|
| CLIENT/PROJECT | SGS |
| MAJOR PERSON | SGS PAKISTAN (PVT.) LTD |
| INTERIOR | 11-175, Street 5, Khasmaji Bahawal Area, Bahawal |
| PROJECT | Phase 02D - 11/1317 - 5/17m, 101 - 11/1317 |
| DATE | |
| DRAWING | PHASE 02D WALI MUHAMMAD GORAR |
| | DISTRICT DADU ALIKA MEHAR |
| SCALE | 1:200 (AS) |
| SHEET | 2140C-023 |
| | 10/03/2010 |
| | 91 |

6-6 Report of the Geotechnical investigation on the Site

SOIL TESTING SERVICES



Geotechnical Engineers and Testing Laboratory

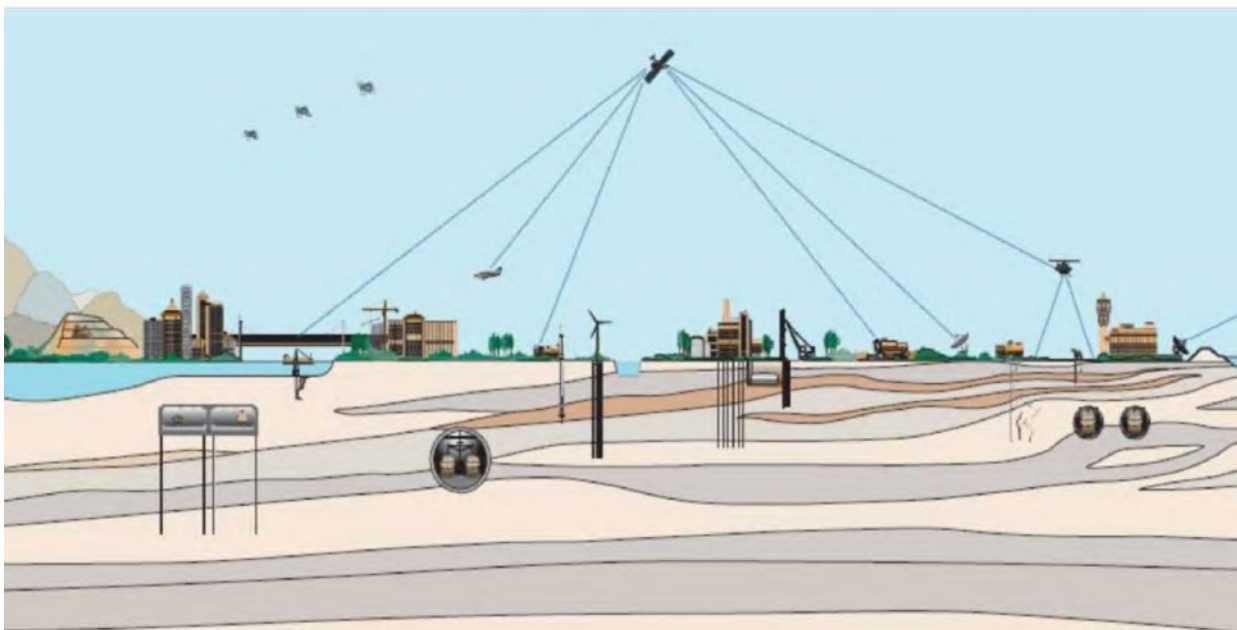
Report No. S-23-1080

**GEOTECHNICAL INVESTIGATION REPORT FOR THE
RECONSTRUCTION OF EDUCATION FACILITIES IN FLOOD
AFFECTED AREAS OF SINDH AT MI-03 DEH-294 TALUKA KOT
GHULAM MUHAMAD, MIRPURKHAS, SINDH**

(REV. 0.0, DATED: JULY 18, 2023)



株式会社 マツダコンサルタンツ
Matsuda Consultants International co.,Ltd.





SOIL TESTING SERVICES

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| | | | | |
|---|--|--|-----------------|-------------------|
| SOIL TESTING SERVICES  | Geotechnical Investigation Report | | Revision | |
| | | | # | Date |
| | Report No.: Vol I | | 00 | 19/07/2023 |

PROJECT: Geotechnical Investigation for the Reconstruction of Education Facilities in Flood Affected Areas of Sindh at Mi-03 DEH-294 Taluka Kot Ghulam Muhamad, Mirpurkhas, Sindh

| | NAME | SIGNATURE | DATE |
|---|---------------|------------------|-------------|
| <i>PREPARED BY:</i> (Project Engineer) | Safi Ul Hasan | | |
| <i>REVIEWED BY:</i> (Project Manager) | Zainab Abbasi | | |
| <i>APPROVED BY:</i> (General Manager) | Naveed Anwer | | |

ISSUE/REVISION INDEX

| Issue Code | Revision | | | | | Revision Details |
|-------------------|-----------------|-----------|---------------|-------------|-------------|-------------------------|
| | No. | By | Rev'd. | App. | Date | |
| RD | 00 | SUH | ZA | NA | 19/07/2023 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Issue Codes: RC = Released for Construction, RD = Released for Design, RF = Released for Fabrication, RI = Released for Information, RP = Released for Purchase, RPA = Released for Permit Application, RQ = Released for Quotation, RR = Released for Review and Comments.

SOIL TESTING SERVICES

EXECUTIVE SUMMARY

Geotechnical Investigation for the Reconstruction of Education Facilities in Flood Affected Areas of Sindh at Mi-03 DEH-294 Taluka Kot Ghulam Muhamad, Mirpurkhas, Sindh was carried out in order to determine geotechnical parameters of subsurface deposits. Scope of field work included drilling of three (03) boreholes up to the depth of 20.0 meters below existing ground level. Soil and ground water samples were collected during field investigation. Laboratory testing of these samples has been carried out in the Soil Testing Services laboratory, Karachi.

The deposition of the area mainly consists of '*medium stiff to hard, silty, clay*' and '*medium stiff to stiff, clayey silt*'. Groundwater table was encountered at the depth range of 1.76 – 1.83 meters below the existing ground level in the boreholes drilled at site, at the time of this investigation.

Keeping these conditions under consideration:

- Allowable net bearing pressure have been given for shallow foundations at the depth range of 1.0 – 3.0 meters below the existing ground level.
- Earth pressure parameters have been provided for earth retaining structures.
- Liquefaction potential of the subsurface deposits at the project site are assessed and results are discussed in the report.
- Seismic soil profile has been taken as ' S_D ' for the foundations in accordance with PBC-21.

The exposure of underground concrete to aggressive chemicals is found to be '*moderate*' for sulphates and chlorides which have influenced the selection of cement for underground concreting and it is recommended to use *Ordinary Portland Cement (OPC) with slag* for all underground concrete works.

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1. INTRODUCTION

Planning for the Reconstruction of Education Facilities in Flood Affected Areas of Sindh at Mi-03 DEH-294 Taluka Kot Ghulam Muhamad, Mirpurkhas, Sindh is underway. In order to determine the geotechnical parameters of the subsurface deposits, *M/s. Soil Testing Services (STS)* were entrusted by *M/s. Matsuda Consultants International Co., Ltd* to perform the geotechnical investigation at the project site.

Scope of field work included drilling of three (03) boreholes up to the depth of 20.0 meters below existing ground level. Elevation of the drilling platform at each borehole location was noted with respect to the adjacent road level and is mentioned in borehole logs attached in Appendix B. Standard penetration tests were carried out at regular intervals in the boreholes along with the collection of soil samples via split spoon sampler. Groundwater samples were also collected from the boreholes drilled at the site. The samples retrieved from the field work were tested in the laboratory and this report is prepared from the information obtained from the field and laboratory tests.

The report consists of five chapters with *Chapter 2* describing the site's existing condition, *Chapter 3* discusses the subsurface deposits in detail, *Chapter 4* includes the recommendations for foundation design, and *Chapter 5* contains a summary of conclusions regarding the ground conditions, with respect to geotechnical engineering for this project.

2. THE SITE

The project site is located in Taluka Kot Ghulam Muhamad, Mirpurkhas, Sindh. Nearby landmark includes Masjid e Hanfi.

The topography of the plot is plain with no major changes in elevation observed across the site. Figure 2.1 shows the google image of the site.



Fig 2.1: Google image of the the Neighbourhood area (Courtesy: Google Earth)

3. GROUND CONDITIONS

The subsurface deposits up to the explored depth consist of the following units:

- Silt
- Clay

Following sub-sections describe the strength characteristics of the geological unit and the groundwater conditions.

3.1 SILT

Deposits of *clayey silt* were encountered in all the boreholes drilled at site. State of compactness according to SPT 'N' counts has been determined to be '*medium stiff to stiff*'. The grain size analysis has been carried out of samples collected from these deposits. Unified Classification System (UCS) classifies these deposits as '*ML*'. Table 3.1 summarizes the details of these deposits.

Table 3.1 Deposits of Silt

| Borehole No. | Depth (meters) |
|--------------|-------------------|
| BH-01 | 0.0 – 3.4 |
| | 5.5 – 7.5 |
| BH-02 | 0.0 – 2.6 |
| | 5.5 – 7.5 |
| BH-03 | 0.0 – 2.6 |
| | 5.7 – 6.6 |

3.2 CLAY

Deposits of *silty clay* were encountered in all the boreholes drilled at site. State of compactness according to SPT 'N' counts has been determined to be '*medium stiff to hard*'. The grain size analysis has been carried out of samples collected from these deposits. Unified Classification System (UCS) classifies these deposits as '*CL*' & '*CL-ML*'. Table 3.2 summarizes the details of these deposits.

Table 3.2 Deposits of Clay

| Borehole No. | Depth (meters) |
|---------------------|---------------------------|
| BH-01 | 3.4 – 5.5 |
| | 7.5 – 20.0 |
| BH-02 | 2.6 – 5.5 |
| | 7.5 – 20.0 |
| BH-03 | 2.6 – 5.7 |
| | 6.6 – 20.0 |

3.3 GROUNDWATER CONDITIONS

Groundwater was encountered at the depth range of 1.76 – 1.83 meters below existing ground level in the boreholes drilled at the site at the time of this geotechnical investigation. However, this may fluctuate due to seasonal and other environmental variations.

4. ENGINEERING DESIGN CONSIDERATIONS

Foundation type for a structure depends on the expected loads taken by the foundation and the type of soil underlying it. The characteristics of the subsurface soil deposits have been discussed in the previous section. Keeping in view the subsoil conditions prevailing at the site and the loads expected to be transferred to the foundations, recommendations for shallow raft foundations are provided. Following sections discuss recommendations for shallow foundations in detail.

4.1 DESIGN PARAMETERS

The design soil parameters are based on grain size, material type, SPT N-values, field and laboratory testing data and design water table. Our recommended design parameters used in our analysis are presented below.

Table 4.1: Engineering Design Parameters

| Layer Depth below EGL (m) | | Layer Thickness (m) | Design SPT-N | Material Type | Cohesion, C, (KPa) | Angle of Internal friction (Φ), (degree) | Unit Weight co-related with SPT N (kN/m^3) | Modulus of Elasticity, E (kN/m^2) |
|---------------------------|--------|---------------------|--------------|---------------|--------------------|---|---|--|
| Top | Bottom | | | | | | | |
| 0.0 | 1.8 | 1.8 | 9 | Silt (P) | 55 | - | 17.0 | 4,500 |
| 1.8 | 2.5 | 0.7 | 7 | Silt (NP) | - | 22 | 17.0 | 3,900 |
| 2.5 | 5.5 | 3.0 | 12 | Clay | 75 | - | 17.5 | 5,400 |
| 5.5 | 7.5 | 2.0 | 16 | Silt (P) | 85 | - | 17.5 | 6,600 |
| 7.5 | 17.0 | 9.5 | 13 | Clay | 80 | - | 17.5 | 5,700 |
| 17.0 | 20.0 | 3.0 | 25 | Clay | 150 | - | 18.0 | 9,300 |

NOTES:

- The values of internal angle of friction (Φ) and cohesion (c) for cohesive soil are taken from triaxial test results. However, for cohesionless soil, values are taken from Principles and Practices of Soil Mechanics and Foundation Engineering V.N.S Murthy.
- The values of Elastic Modulus are calculated as presented in Chapter 5 Page 316 Table 5-6 of Book Foundation Analysis And Design by Joseph E. Bowles (5th edition).
- Unit weight values are taken from density test results.

4.2 ALLOWABLE BEARING PRESSURES

The allowable bearing pressure has been calculated following shear strength determination through in-situ field tests and settlement analysis. Table 4.2 gives the net allowable bearing pressures for shallow foundations at the depth range of 1.0 – 3.0 meters from the existing ground level.

Table 4.2: Net Allowable Bearing Pressures

| Minimum Embedment Below EGL (meter) | Raft Foundation (kPa / tsf) |
|--|--------------------------------|
| 1.0 | 50.0 / 0.50 |
| 1.5 | 60.0 / 0.60 |
| 2.0 | 60.0 / 0.60 |
| 2.5 | 70.0 / 0.70 |
| 3.0 | 70.0 / 0.70 |

Proper drainage shall be provided to avoid infiltration of water into the foundation soil. It should be ensured that the foundation is not placed on the fill material. The settlement of isolated/ strip and raft foundation due to net allowable pressure has been estimated to be within the allowable limit of 25 mm (1-inch) and 50 mm (2-inches), respectively.

4.3 MODULUS OF SUBGRADE REACTION

Designing of floor slab system requires the modulus of subgrade reaction at the depth at which it is to be placed. Table 4.3 shows the values of modulus of subgrade reaction for given pressure.

Table 4.3 Modulus of subgrade reaction based on allowable bearing pressure

| Minimum Embedment below EGL (meter) | k_s for Shallow Foundation (MN/m ³ / tcf) |
|--|---|
| 1.0 | 3.0 / 9.0 |
| 1.5 | 7.2 / 21.6 |
| 2.0 | 7.2 / 21.6 |

| | |
|-----|------------|
| 2.5 | 8.4 / 25.2 |
| 3.0 | 8.4 / 25.2 |

4.4 DEWATERING

Groundwater level lies at the depth range of 1.76 – 1.83 meters below the existing ground level. However, this may fluctuate due to seasonal, tidal and environmental variations. In case the groundwater is encountered at the level of foundations, some positive measures of effectively controlling groundwater level should be provided to enable the construction to be completed in the dry. For the construction of foundation below ground water table, proper dewatering system may be required. However, the design of dewatering system is not in the scope of this report.

4.5 EARTH RETAINING STRUCTURE

All measures shall be taken to provide safety to adjacent structures. Properly designed earth retaining structure must be constructed prior to deep excavation.

Earth pressure parameters required for the design of structure to retain the excavation are given in *Table 4.4*.

Table 4.4 Earth pressure parameters

| Strata | Φ' (Undisturbed) | k_a (Coefficient of active earth pressure) | k_p (Coefficient of passive earth pressure) |
|--------|-----------------------|---|--|
| Silt | 22° | 0.455 | 2.198 |

4.6 LIQUEFACTION POTENTIAL OF SOIL

The potential for liquefaction at this project site was evaluated using Peysanj software. This program is based on the most recent publications of the NCEER Workshop (1996) and Ambraseys (1988). The method evaluates liquefaction potential based on soil type and density, groundwater conditions, peak surface acceleration (2475 Years - 2% PE in 50 Yrs = 0.2320g), and magnitude of the design earthquake.

The method is used to compare the cyclic shear stresses indicated during the design earthquake, with those that would be required to cause liquefaction to determine whether any zone exists within the soil where liquefaction may be expected.

A peak ground acceleration of 0.2320g was evaluated based on BCP Seismic provision 2021 for design, and has been adopted for the current study. We based our liquefaction analyses for an earthquake magnitude of $M = 5.5$.

Using the design parameters and procedures discussed above, the factors of safety against liquefaction is calculated. The factor of safety against liquefaction is observed as greater than 1.0 for earthquakes of magnitude 5.5. Hence, the subsurface deposits at project site are not susceptible to liquefaction.

4.7 PERCOLATION TEST

The percolation test is performed in accordance with BS – 6297: 2007. The test was performed in three (03) holes excavated at each pit location. The observation sheets of test are attached in appendix F of the report. The test procedure involved is summarized below:

- Excavation of three holes 300mm square to a depth 300mm below existing ground level at each pit location.
- Each hole was filled with water to a depth of at least 300mm and it was allowed to seep completely.
- As per the standard, the first stage of test was checked to determine the suitability of ground for performing test.
- The ground was determined as suitable for test performance and hence, each hole was re-filled to a depth of at least 300mm.
- Time was observed for the water to seep away from 75% full (225mm depth) to 25% full (75mm depth), the time taken for water to drop 150mm.
- This was repeated 3 times in each hole.
- In order to calculate V_p (percolation value), each time in second was divided by 150(mm).
- The percolation values for different time intervals was averaged to calculate the average percolation value of each hole.

- The test was repeated three times in each hole and the results averaged as shown in the table 4.5 below:

Table 4.5 Percolation test Summary

| Pit No. | Hole No. | Hole No. | Time for water to drop 150mm (sec) | Percolation value V_p (s/mm) | Average V_p |
|---------|----------|----------|------------------------------------|--------------------------------|---------------|
| A | A1 | 1 | 2160 | 14.4 | 15.4 |
| | | 2 | 2460 | 16.4 | |
| | A2 | 1 | 2640 | 17.6 | 18.2 |
| | | 2 | 2820 | 18.8 | |
| | A3 | 1 | 2940 | 19.6 | 19.4 |
| | | 2 | 2880 | 19.2 | |
| B | B1 | 1 | 2100 | 14.0 | 15.6 |
| | | 2 | 2580 | 17.2 | |
| | B2 | 1 | 2100 | 14.0 | 16.4 |
| | | 2 | 2820 | 18.8 | |
| | B3 | 1 | 2160 | 14.4 | 16.0 |
| | | 2 | 2640 | 17.6 | |
| C | C1 | 1 | 4740 | 31.6 | 21.0 |
| | | 2 | 1560 | 10.4 | |
| | C2 | 1 | 1740 | 11.6 | 24.2 |
| | | 2 | 5520 | 36.8 | |
| | C3 | 1 | 2040 | 13.6 | 17.6 |
| | | 2 | 3240 | 21.6 | |

The percolation values (V_p) for all test locations are between the range of 15 – 100 which meets the criteria mentioned in BS6297:2007.

4.8 SEISMIC GROUND MOTION PARAMETERS (BCP – 2021)

4.8.1 SITE CLASS

Chapter 16 of BCP – 2021 defines the site class definition in accordance with Chapter 20 ASCE-7 to be used for determining site coefficients. Based on the field data obtained from sub-soil exploration, the soil class will be taken as “**S_D**”.

4.8.2 SHORT PERIOD SPECTRAL RESPONSE ACCELERATION (S_s)

Chapter 16 of BCP – 2021, Section 1613.2.1 deals with the mapped values for 0.2-seconds spectral acceleration corresponding to Maximum Considered Earthquake (MCE) defined as the ground motion level with 2% probability of exceedance in 50 years (2745 years return period). The S_s for project site will be taken as 0.4837.

4.8.3 LONG PERIOD SPECTRAL RESPONSE ACCELERATION (S_1)

Chapter 16 of BCP – 2021, Section 1613.2.1 deals with the mapped values for 1-second spectral acceleration corresponding to Maximum Considered Earthquake (MCE) defined as the ground motion level with 2% probability of exceedance in 50 years (2745 years return period). The S_1 for project site will be taken as 0.1300.

4.9 TYPE OF CEMENT

Tests on groundwater samples obtained from the boreholes indicate ‘*moderate*’ exposure to sulphate and chloride. Under these conditions it is recommended to use *Ordinary Portland Cement (OPC) with slag* for all underground concrete works.

5. CONCLUSIONS

Geotechnical Investigation for the Reconstruction of Education Facilities in Flood Affected Areas of Sindh at Mi-03 DEH-294 Taluka Kot Ghulam Muhamad, Mirpurkhas, Sindh was carried out in order to determine geotechnical parameters of subsurface deposits. Scope of field work included drilling of three (03) boreholes up to the depth of 20.0 meters below existing ground level. Soil and groundwater samples were collected during the field investigation. Laboratory testing on these samples has been carried out in the lab and includes determination of index properties through grain size analysis, Atterberg limits, specific gravity, density, moisture content, triaxial compression test etc.

Chemical characteristics of soil and water samples have also been assessed through determination of total dissolved solids, sulphate content, chloride content and pH.

Keeping in view, the results from field and laboratory tests and the expected loads being transferred to the founding stratum, allowable bearing pressures for shallow foundations at depth range of 1.5 – 3.0 meters are given. Exposure to chloride and sulphate salts is 'moderate' for water samples, therefore, *Ordinary Portland Cement (OPC) with slag* may be used for all underground concreting works.

Boreholes Location Plan

GEOTECHNICAL SURVEY

| | |
|---|--|
| School Name : | |
| MI03: GGES - Deh - 294 | |
| District : | |
| Mirpurkhas | |
| Taluka : | |
| Kot Ghulam Muhammad | |
| Union Council : | |
| Contact/Focal Person : | |
| Other information : | |
| The Site Plan on the right is only for reference. | |
| [Please ask details to contact person.] | |

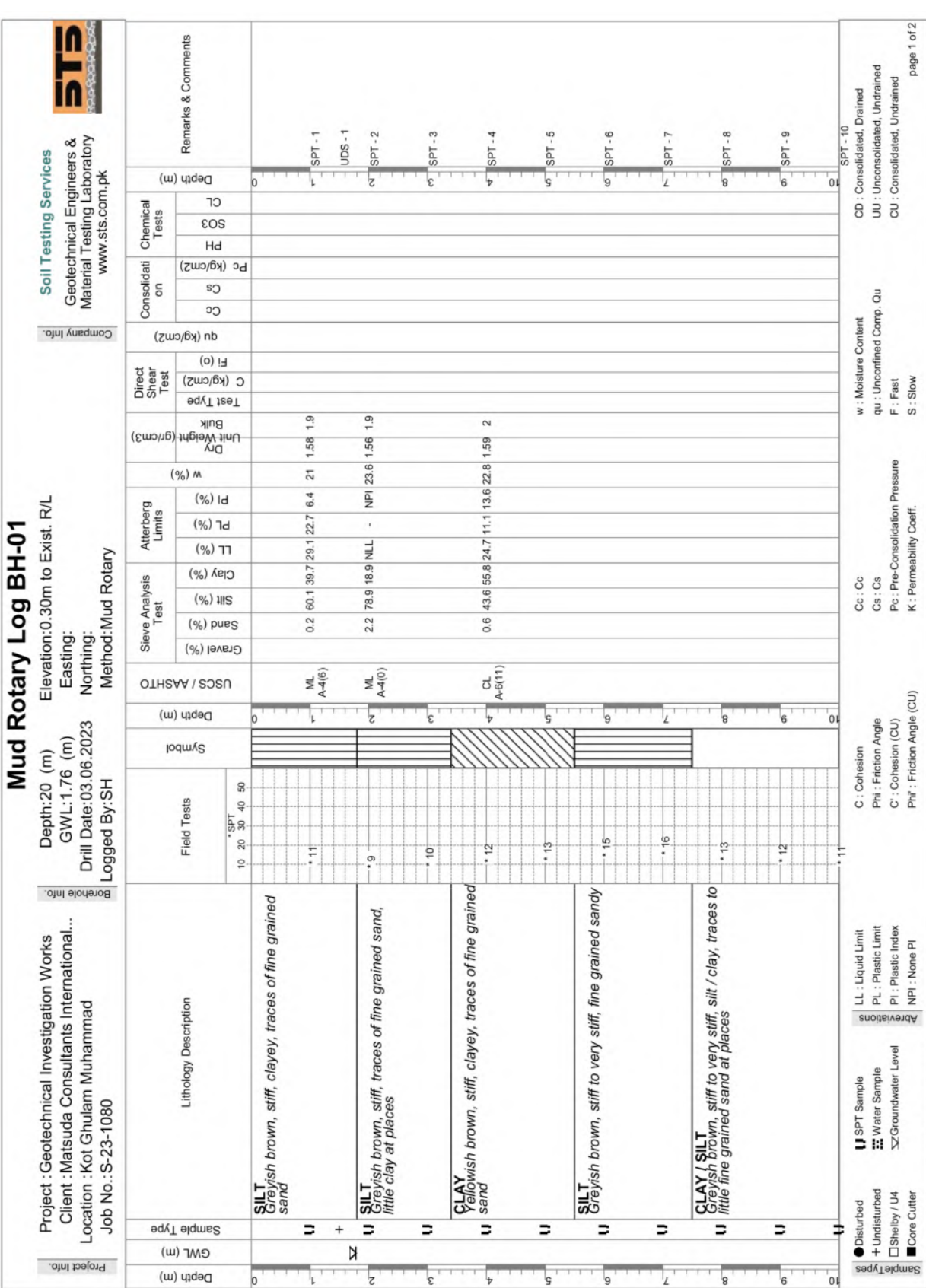
- SPT Test Point / Soil Sampling
- Percolation Test Point



- LEGEND**
- Ground Floor Level
 - Boundary Reference and lines
 - Existing Boundary Wall
 - Existing Drain
 - Boundary Pillar
 - Traverse Point
 - Trees and Bushes
 - Manhole / Gutter
 - Water Point
 - Existing School Building
 - Existing Building
 - Electric Pole

Appendix B

Borehole Logs



Mud Rotary Log BH-01

Project : Geotechnical Investigation Works
Client : Matsuda Consultants International...
Location : Kot Ghulam Muhammad
Job No.: S-23-1080

Depth: 20 (m)
Elevation: 0.30m to Exist. R/L
Easting:
Northing:
Method: Mud Rotary

Drill Date: 03.06.2023
Logged By: SH

Soil Testing Services
Geotechnical Engineers & Material Testing Laboratory
www.sts.com.pk



| Depth (m) | Sample Type | Lithology Description | Field Tests | USCS / AASHTO | Sieve Analysis Test | Alterberg Limits | w (%) | Dry Weight Bulk | Direct Shear Test | Consolidation | Chemical Tests | Depth (m) | Remarks & Comments |
|-----------|-------------|--|---------------------------------|---------------|--|----------------------------|-------|-----------------------------------|--|--------------------------------------|-----------------------------|-----------|--------------------|
| | | | * SPT 10 20 30 40 50 • 11 | | Gravel (%) Sand (%) Silt (%) Clay (%) | LL (%) PL (%) PI (%) | | Unit Weight (gr/cm ³) | Test Type C (kg/cm ²) FI (o) | Cc Cs Pc (kg/cm ²) | CL SO ₃ PH | | |
| 10 | U | CLAY / SILT Greyish brown, stiff to very stiff silt / clay, traces to little fine grained sand at places | • 11 | | | | | | | | | 10 | SPT - 10 |
| 11 | U | | • 14 | | | | | | | | | 11 | SPT - 11 |
| 12 | U | | • 16 | | | | | | | | | 12 | SPT - 12 |
| 13 | U | | • 13 | | | | | | | | | 13 | SPT - 13 |
| 14 | U | | • 15 | | | | | | | | | 14 | SPT - 14 |
| 15 | U | | • 10 | | | | | | | | | 15 | SPT - 15 |
| 16 | U | | • 11 | | | | | | | | | 16 | SPT - 16 |
| 17 | U | | • 12 | | | | | | | | | 17 | SPT - 17 |
| 18 | U | | • 17 | | | | | | | | | 18 | SPT - 18 |
| 19 | U | | • 25 | | | | | | | | | 19 | SPT - 19 |
| 20 | U | | • 19 | | | | | | | | | 20 | SPT - 20 |

End of Log @ 20 (m)
 U SPT Sample
 + Undisturbed
 □ Shelby / U4
 ■ Core Cutter
 LL : Liquid Limit
 PL : Plastic Limit
 PI : Plastic Index
 NPI : None PI
 C : Cohesion
 Phi : Friction Angle
 C' : Cohesion (CU)
 Phi' : Friction Angle (CU)

Cc : Cc
 Cs : Cs
 Pc : Pre-Consolidation Pressure
 K : Permeability Coeff.

w : Moisture Content
 qu : Unconfined Comp. Qu
 F : Fast
 S : Slow

CD : Consolidated, Drained
 UU : Unconsolidated, Undrained
 CU : Consolidated, Undrained

Mud Rotary Log BH-02



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Company Info.

Project : Geotechnical Investigation Works
Client : Matsuda Consultants International...
Location : Kot Ghulam Muhammad
Job No. : S-23-1080

Depth: 20 (m)
Elevation: 0.30m to Exist. R/L
Easting: 1.83 (m)
Northing: 02.06.2023
Method: Mud Rotary

Borehole Info.

Project Info.

| Depth (m) | Sample Type | Lithology Description | Field Tests | Symbol | Depth (m) | USCS / AASHTO | Sieve Analysis Test | | | | | w (%) | Dry Weight (gr/cm ³) | Direct Shear Test | Consolidation | Chemical Tests | Depth (m) | Remarks & Comments | |
|-----------|-------------|--|-------------|--------|-----------|---------------|---------------------|----------|----------|----------|--------|-------|----------------------------------|-------------------|---------------|----------------|-----------|--------------------|--------|
| | | | | | | | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | LL (%) | | | | | | | | PL (%) |
| 0.5 | U | SILT Greyish brown, stiff, clayey, traces of fine grained sand | • 10 | | 0.5 | ML A-4(8) | 0.4 | 57 | 42.6 | 34.4 | 26.8 | 7.6 | 20.4 | 1.57 | 1.9 | | | SPT - 1 | |
| 1.5 | U | SILT Greyish brown, medium stiff, traces of fine grained sand, little clay at places | • 7 | | 1.5 | ML A-4(0) | 3.2 | 79.5 | 17.3 | NULL | - | NPI | 25.3 | 1.56 | 2 | | | SPT - 2 | |
| 3.5 | U | CLAY Yellowish brown, stiff to very stiff, silty, traces of fine grained sand | • 13 | | 3.5 | CL A-6(13) | 0.8 | 48.1 | 51.1 | 34.8 | 22.6 | 12.2 | 24.2 | 1.59 | 2 | | | SPT - 3 | |
| 4.5 | U | SILT Greyish brown, very stiff, fine grained sandy | • 15 | | 4.5 | | | | | | | | | | | | | SPT - 4 | |
| 5.5 | + | | • 21 | | 5.5 | | | | | | | | | | | | | UDS - 1 | |
| 6.5 | U | | • 21 | | 6.5 | | | | | | | | | | | | | SPT - 5 | |
| 7.5 | U | | • 22 | | 7.5 | | | | | | | | | | | | | SPT - 6 | |
| 8.5 | U | CLAY / SILT Greyish brown, stiff to very stiff, silt / clay, traces to little fine grained sand at places | • 13 | | 8.5 | | | | | | | | | | | | | SPT - 7 | |
| 9.5 | U | | • 12 | | 9.5 | | | | | | | | | | | | | SPT - 8 | |
| 10.5 | U | | • 15 | | 10.5 | | | | | | | | | | | | | SPT - 9 | |
| 11.5 | U | | | | 11.5 | | | | | | | | | | | | | SPT - 10 | |

| | | | | | | |
|-------------------------|---------------|-------------------|--------------------|----------------------------|--------------------------|--------------------------------|
| Sample Types | Disturbed | SPT Sample | LL : Liquid Limit | C : Cohesion | w : Moisture Content | CD : Consolidated, Drained |
| | + Undisturbed | Water Sample | PL : Plastic Limit | Phi : Friction Angle | qu : Unconfined Comp. Qu | UU : Unconsolidated, Undrained |
| | Shelby / U4 | Groundwater Level | PI : Plastic Index | C' : Cohesion (CU) | F : Fast | CU : Consolidated, Undrained |
| | Core Cutter | | NPI : None PI | Phi' : Friction Angle (CU) | S : Slow | |
| K : Permeability Coeff. | | | | | | |
| page 1 of 2 | | | | | | |

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Mud Rotary Log BH-02

Project : Geotechnical Investigation Works
 Client : Matsuda Consultants International...
 Location : Kot Ghulam Muhammad
 Job No. : S-23-1080

Borehole Info.

Depth: 20 (m) Elevation: 0.30m to Exist. R/L
 GWL: 1.83 (m) Easting:
 Drill Date: 02.06.2023 Northing:
 Logged By: SH Method: Mud Rotary

Company Info.
 Soil Testing Services
 Geotechnical Engineers &
 Material Testing Laboratory
 www.sts.com.pk



| Depth (m) | GWL (m) | Sample Type | Lithology Description | Field Tests | | Symbol | Depth (m) | USCS / AASHTO | Sieve Analysis Test | | | Atterberg Limits | | | w (%) | Dry Unit Weight (gr/cm ³) | Direct Shear Test | | Consolidation | Chemical Tests | | | Depth (m) | Remarks & Comments | | |
|-----------|---------|-------------|--|-------------|----------|--------|-----------|---------------|---------------------|----------|--------|------------------|--------|-----------|-------|---------------------------------------|-------------------------|--------------------|---------------|----------------|----|----|-----------|--------------------|----------|-----------------|
| | | | | Gravel (%) | Sand (%) | | | | Silt (%) | Clay (%) | LL (%) | PL (%) | PI (%) | Test Type | | | C (kg/cm ²) | F ₁ (°) | | Cc | Cs | Pc | | | PH | SO ₃ |
| 10 | | U | CLAY / SILT Greyish brown, stiff to very stiff, silt / clay, traces to little fine grained sand at places | 10 | 15 | | 10 | | | | | | | | | | | | | | | | 10 | SPT - 10 | | |
| 11 | | U | | 15 | 16 | | 11 | | | | | | | | | | | | | | | | | 11 | SPT - 11 | |
| 12 | | U | | 16 | 14 | | 12 | | | | | | | | | | | | | | | | | 12 | SPT - 12 | |
| 13 | | U | | 14 | 13 | | 13 | | | | | | | | | | | | | | | | | 13 | SPT - 13 | |
| 14 | | U | | 13 | 12 | | 14 | | | | | | | | | | | | | | | | | 14 | SPT - 14 | |
| 15 | | U | | 12 | 13 | | 15 | | | | | | | | | | | | | | | | | 15 | SPT - 15 | |
| 16 | | U | | 13 | 16 | | 16 | | | | | | | | | | | | | | | | | 16 | SPT - 16 | |
| 17 | | U | | 16 | 28 | | 17 | | | | | | | | | | | | | | | | | 17 | SPT - 17 | |
| 18 | | U | | 28 | 28 | | 18 | | | | | | | | | | | | | | | | | 18 | SPT - 18 | |
| 19 | | U | | 28 | 28 | | 19 | | | | | | | | | | | | | | | | | 19 | SPT - 19 | |
| 20 | | U | | 28 | 28 | | 20 | | | | | | | | | | | | | | | | | 20 | SPT - 20 | |

End of Log @ 20 (m)

SPT Sample Liquid Limit
 Water Sample Plastic Limit
 Shelby / U4 Plastic Index
 Groundwater Level None PI
 Core Cutter None PI

C : Cohesion Cc : Cc
 Phi : Friction Angle Cs : Cs
 C' : Cohesion (CU) Pc : Pre-Consolidation Pressure
 Phi' : Friction Angle (CU) K : Permeability Coeff.

w : Moisture Content CD : Consolidated, Drained
 qu : Unconfined Comp. Qu UU : Unconsolidated, Undrained
 F : Fast CU : Consolidated, Undrained
 S : Slow

page 2 of 2

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Mud Rotary Log BH-03

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 Material Testing Laboratory
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Company Info.

Project : Geotechnical Investigation Works
 Client : Matsuda Consultants International...
 Location : Kot Ghulam Muhammad
 Job No.: S-23-1080

Depth: 20 (m) Elevation: 0.30m to Exist. R/L
 Easting: 1.8 (m)
 Northing: 01.06.2023
 Method: Mud Rotary
 Logged By: SH

Borehole Info.

Project Info.



| Depth (m) | GWL (m) | Sample Type | Lithology Description | Field Tests | | Symbol | Depth (m) | USCS / AASHTO | Sieve Analysis Test | | | | Atterberg Limits | | | w (%) | Dry Unit Weight (gr/cm ³) | Direct Shear Test | | Consolidation | Chemical Tests | Depth (m) | Remarks & Comments | | | |
|-----------|---------|-------------|---|-------------|---|--------|-----------|---------------|---------------------|----------|----------|----------|------------------|--------|--------|-------|---------------------------------------|-------------------|-------------------------|---------------|----------------|-----------|--------------------|--------------------|---------|----------|
| | | | | *SPT | C | | | | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | LL (%) | PL (%) | PI (%) | | | Test Type | C (kg/cm ²) | | | | | F _i (o) | Cc | Cs |
| 0 | | | | | | | 0 | | | | | | | | | | | | | | | | | | | |
| 1 | | U | SILT Greyish brown, medium stiff, clayey, traces of fine grained sand | • 8 | | | 1 | ML A-4(7) | 0.2 | 55.8 | 44 | 30.6 | 24.1 | 6.5 | 19.8 | 1.58 | | | | | | | | | SPT - 1 | |
| 2 | | U | SILT Greyish brown, medium stiff, traces of fine grained sand, little clay at places | • 6 | | | 2 | ML A-4(0) | 1.8 | 79.2 | 19 | NULL | - | NPI | 23.3 | 1.56 | | | | | | | | | SPT - 2 | |
| 3 | | U | CLAY Yellowish brown, stiff to very stiff, silty, traces of fine grained sand | • 10 | | | 3 | | | | | | | | | | | | | | | | | | SPT - 3 | |
| 4 | | U | | • 16 | | | 4 | CL A-4(8) | 0.4 | 46.7 | 52.9 | 31.5 | 21.9 | 9.6 | 22.1 | 1.59 | | | | | | | | | UDS - 1 | |
| 5 | | U | | • 9 | | | 5 | | | | | | | | | | | | | | | | | | SPT - 4 | |
| 6 | | U | SILT Greyish brown, stiff to very stiff, fine grained sandy | • 14 | | | 6 | | | | | | | | | | | | | | | | | | | SPT - 5 |
| 7 | | U | | • 20 | | | 7 | | | | | | | | | | | | | | | | | | SPT - 6 | |
| 8 | | U | CLAY / SILT Greyish brown, stiff to hard, silt / clay, traces to little fine grained sand at places | • 12 | | | 8 | | | | | | | | | | | | | | | | | | | SPT - 7 |
| 9 | | U | | • 11 | | | 9 | | | | | | | | | | | | | | | | | | | SPT - 8 |
| 10 | | U | | • 15 | | | 10 | | | | | | | | | | | | | | | | | | | SPT - 9 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | SPT - 10 |

Sample Types
 ● Disturbed
 + Undisturbed
 □ Shelby / U4
 ■ Core Cutter

Abbreviations
 U : SPT Sample
 W : Water Sample
 G : Groundwater Level

LL : Liquid Limit
PL : Plastic Limit
PI : Plastic Index
NPI : None PI

C : Cohesion
Phi : Friction Angle
C' : Cohesion (CU)
Phi' : Friction Angle (CU)

Cc : Cc
Cs : Cs
Pc : Pre-Consolidation Pressure
K : Permeability Coeff.

w : Moisture Content
qu : Unconfined Comp. Qu
F : Fast
S : Slow

CD : Consolidated, Drained
UU : Unconsolidated, Undrained
CU : Consolidated, Undrained

page 1 of 2

Mud Rotary Log BH-03

Project : Geotechnical Investigation Works
Client : Matsuda Consultants International...
Location : Kot Ghulam Muhammad
Job No.: S-23-1080
Depth: 20 (m) **Elevation:** 0.30m to Exist. R/L
GWL: 1.8 (m) **Easting:**
Drill Date: 01.06.2023 **Northing:**
Logged By: SH **Method:** Mud Rotary

Soil Testing Services
Geotechnical Engineers & Material Testing Laboratory
www.sts.com.pk

Company Info.

Borehole Info.

Project Info.

| Depth (m) | GWL (m) | Sample Type | Lithology Description | Field Tests | | Symbol | Depth (m) | USCS / AASHTO | Sieve Analysis Test | | | | Atterberg Limits | | | w (%) | Dry Unit Weight (gr/cm ³) | Direct Shear Test | | Consolidation | Chemical Tests | | | Depth (m) | Remarks & Comments | |
|-----------|---------|-------------|--|-------------|----|--------|-----------|---------------|---------------------|----------|----------|----------|------------------|--------|--------|-------|---------------------------------------|-------------------|-------------------------|---------------|----------------|--------------------------|----|-----------|--------------------|----|
| | | | | SPT | 15 | | | | Gravel (%) | Sand (%) | Silt (%) | Clay (%) | LL (%) | PL (%) | PI (%) | | | Test Type | C (kg/cm ²) | | FI (o) | qu (kg/cm ²) | Cc | | | Cs |
| 10 | | U | CLAY / SILT Greyish brown, stiff to hard, silt / clay, traces to little fine grained sand at places | 10 | 15 | | 10 | | | | | | | | | | | | | | | | | SPT - 10 | | |
| 11 | | U | | 12 | | | 11 | | | | | | | | | | | | | | | | | | SPT - 11 | |
| 12 | | U | | 13 | | | 12 | | | | | | | | | | | | | | | | | | SPT - 12 | |
| 13 | | U | | 14 | | | 13 | | | | | | | | | | | | | | | | | | SPT - 13 | |
| 14 | | U | | 17 | | | 14 | | | | | | | | | | | | | | | | | | SPT - 14 | |
| 15 | | U | | 20 | | | 15 | | | | | | | | | | | | | | | | | | SPT - 15 | |
| 16 | | U | | 19 | | | 16 | | | | | | | | | | | | | | | | | | SPT - 16 | |
| 17 | | U | | 19 | | | 17 | | | | | | | | | | | | | | | | | | SPT - 17 | |
| 18 | | U | | 22 | | | 18 | | | | | | | | | | | | | | | | | | SPT - 18 | |
| 19 | | U | | 29 | | | 19 | | | | | | | | | | | | | | | | | | SPT - 19 | |
| 20 | | U | | 38 | | | 20 | | | | | | | | | | | | | | | | | | SPT - 20 | |

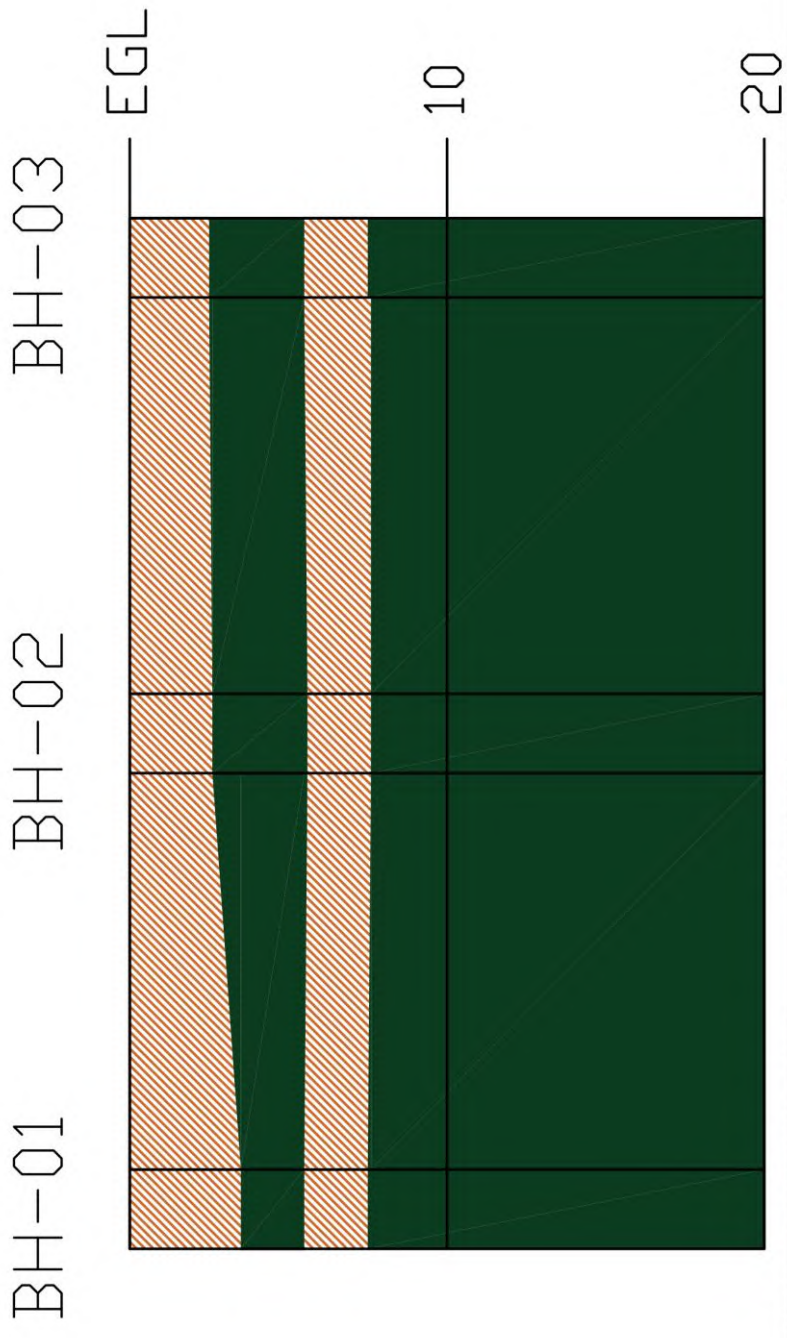
End of Log @ 20 (m)
Legend:
 U : SPT Sample
 + : Undisturbed
 □ : Shelby / U4
 ■ : Core Cutter
 LL : Liquid Limit
 PL : Plastic Limit
 PI : Plastic Index
 NPI : None PI
 C : Cohesion
 Phi : Friction Angle
 C' : Cohesion (CU)
 Phi' : Friction Angle (CU)

Soil Properties:
 w : Moisture Content
 qu : Unconfined Comp. Qu
 F : Fast
 S : Slow
 Cc : Cc
 Cs : Cs
 Pc : Pre-Consolidation Pressure
 K : Permeability Coeff.

Consolidation State:
 CD : Consolidated, Drained
 UU : Unconsolidated, Undrained
 CU : Consolidated, Undrained

Soil Profiles

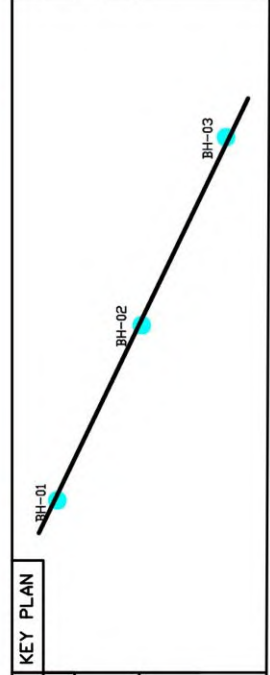
PROFILE A1



LEGEND:
 Clay
 Silt

| | | | | | |
|----|------------|------------------|-------|----|------|
| DO | 18/07/2023 | REVISION DETAILS | SR | ZA | MA |
| Rv | Date | REVISION DETAILS | Drawn | Rv | Appr |

Notes:
 -All measurements are in meters



Drawing title: GEOTECHNICAL CROSS-SECTION
Project ID: S-23-1080 **Date:** 18/07/2023
Project Name: Geotechnical Investigation at Deh-294
 Taluka Kot Ghulam Muhammad

Client:
 株式会社 マツダコンサルタンツ
 Mitsuda Consultants International Co. Ltd.

Geotechnical Contractor:


Laboratory Test Results

Summary of Lab. Tests

Project : Geotechnical Investigation Works
 Client : Matsuda Consultants International...
 Job No.: S-23-1080
 Location : Kot Ghulam Muhammad

Soil Testing Services



Sieve Analysis Test

| Borehole | Sample Depth (m) | Soil Class | D10 mm | D30 mm | D60 mm | Clay (%) | Silt (%) | Sand (%) | Gravel (%) | Cobble (%) | LL | PL |
|----------|------------------|---------------|--------|--------|--------|----------|----------|----------|------------|------------|------|------|
| BH-01 | 1 | ML A-4(6) | | | | 39.7 | 60.1 | 0.2 | | | 29.1 | 22.7 |
| BH-01 | 2 | ML A-4(0) | | | | 18.9 | 78.9 | 2.2 | | | - | - |
| BH-01 | 4 | CL A-6(11) | | | | 55.8 | 43.6 | 0.6 | | | 24.7 | 11.1 |
| BH-02 | 1 | ML A-4(8) | | | | 42.6 | 57 | 0.4 | | | 34.4 | 26.8 |
| BH-02 | 2 | ML A-4(0) | | | | 17.3 | 79.5 | 3.2 | | | - | - |
| BH-02 | 4 | CL A-6(13) | | | | 51.1 | 48.1 | 0.8 | | | 34.8 | 22.6 |
| BH-03 | 1 | ML A-4(7) | | | | 44 | 55.8 | 0.2 | | | 30.6 | 24.1 |
| BH-03 | 2 | ML A-4(0) | | | | 19 | 79.2 | 1.8 | | | - | - |
| BH-03 | 4 | CL A-4(8) | | | | 52.9 | 46.7 | 0.4 | | | 31.5 | 21.9 |

ATTERBERG LIMITS TEST

| Borehole | Sample Depth (m) | Soil Class | Liquid Limit (LL) | Plastic Limit (PL) |
|----------|------------------|---------------|-------------------|--------------------|
| BH-01 | 1 | ML A-4(6) | 29.1 | 22.7 |
| BH-01 | 4 | CL A-6(11) | 24.7 | 11.1 |
| BH-02 | 1 | ML A-4(8) | 34.4 | 26.8 |
| BH-02 | 4 | CL A-6(13) | 34.8 | 22.6 |
| BH-03 | 1 | ML A-4(7) | 30.6 | 24.1 |
| BH-03 | 4 | CL A-4(8) | 31.5 | 21.9 |

Density & Moisture Test

| Borehole | Sample Depth (m) | Soil Class | Moisture Content (%) | Dry Density (gr/cm3) |
|----------|------------------|---------------|----------------------|----------------------|
| BH-01 | 1 | ML A-4(6) | 21.03 | 1.58 |
| BH-01 | 2 | ML A-4(0) | 23.61 | 1.56 |
| BH-01 | 4 | CL A-6(11) | 22.78 | 1.59 |
| BH-02 | 1 | ML A-4(8) | 20.43 | 1.57 |
| BH-02 | 2 | ML A-4(0) | 25.32 | 1.56 |
| BH-02 | 4 | CL A-6(13) | 24.18 | 1.59 |
| BH-03 | 1 | ML A-4(7) | 19.77 | 1.58 |
| BH-03 | 2 | ML A-4(0) | 23.27 | 1.56 |
| BH-03 | 4 | CL A-4(8) | 22.08 | 1.59 |

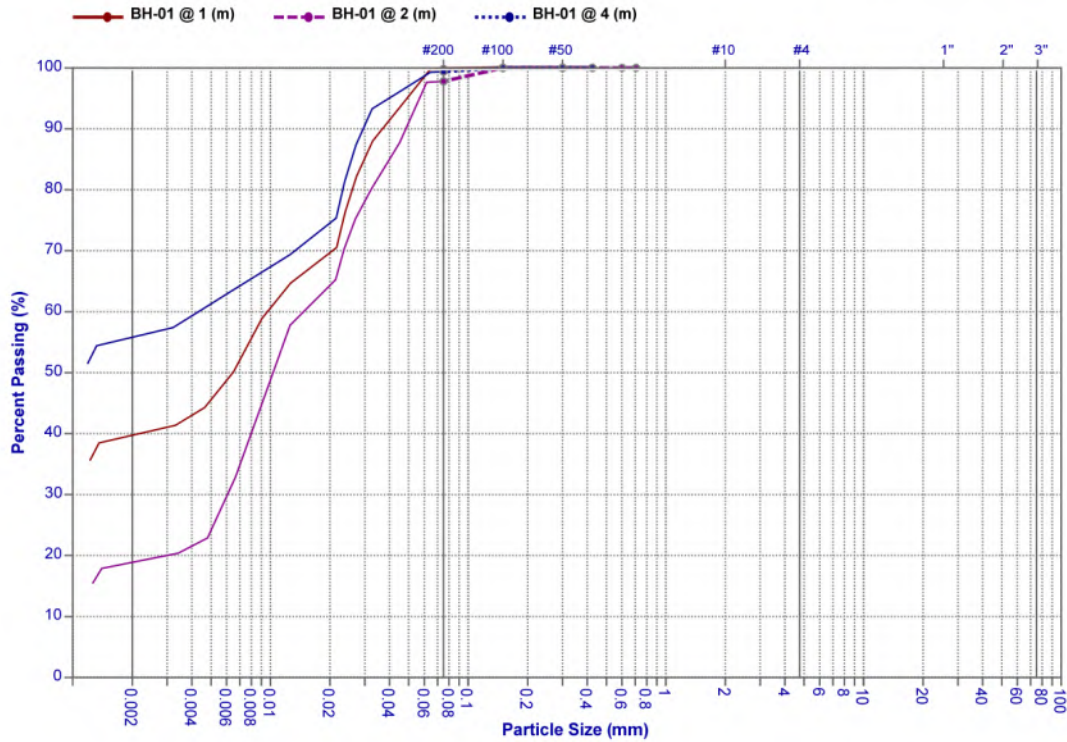
Sieve Analysis Test

Project : Geotechnical Investigation Works
 Client : Matsuda Consultants International...
 Job No.: S-23-1080
 Location : Kot Ghulam Muhammad

Soil Testing Services



ASTM C136



Particle Distribution (%)

| Clay | Silt | Sand | Gravel | Cobble |
|------|------|------|--------|--------|
| 39.7 | 60.1 | 0.2 | - | - |
| 18.9 | 78.9 | 2.2 | - | - |
| 55.8 | 43.6 | 0.6 | - | - |

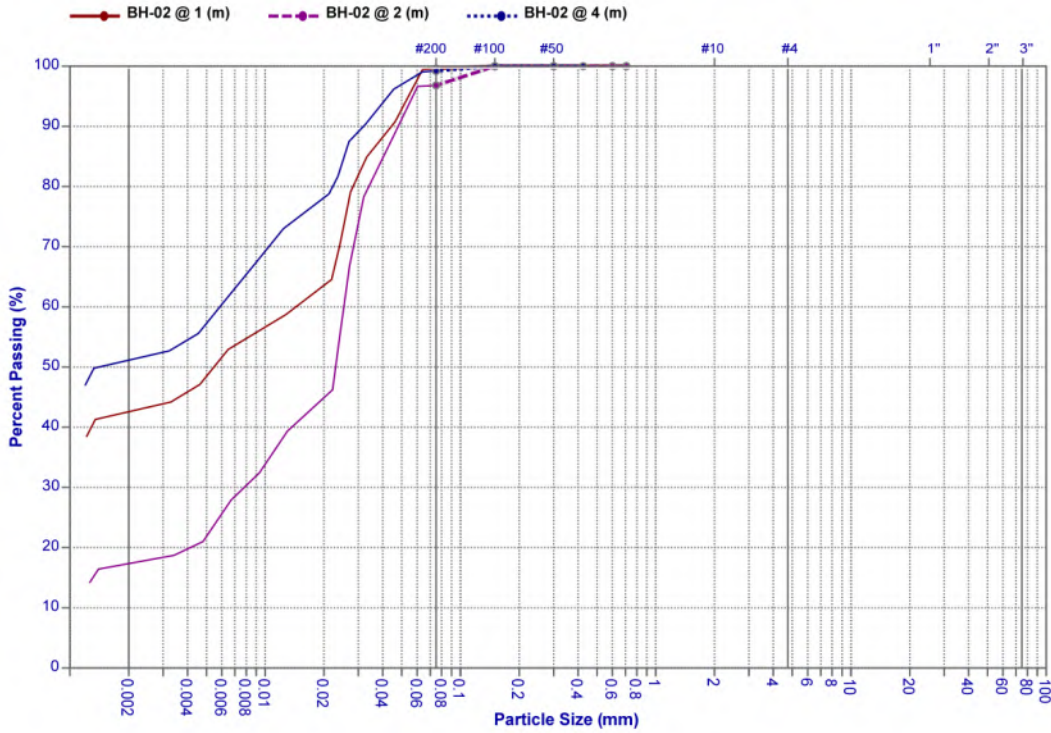
Classification

| Borehole | Sample Depth (m) | D10 (mm) | D30 (mm) | D50 (mm) | D60 (mm) | Cc | Cu | LL (%) | PI (%) | Disp. (%) | USCS | AASHTO |
|----------|------------------|----------|----------|----------|----------|------|----|--------|--------|-----------|------|---------|
| BH-01 | 1 | 0.001 | 0.001 | 0.006 | 0.01 | 0.1 | 10 | 29.1 | 6.4 | N/A | ML | A-4(6) |
| BH-01 | 2 | 0.001 | 0.006 | 0.01 | 0.015 | 2.4 | 15 | - | - | N/A | ML | A-4(0) |
| BH-01 | 4 | 0.001 | 0.001 | 0.001 | 0.004 | 0.25 | 4 | 24.7 | 13.6 | N/A | CL | A-6(11) |

Sieve Analysis Test

Project : Geotechnical Investigation Works
 Client : Matsuda Consultants International...
 Job No.: S-23-1080
 Location : Kot Ghulam Muhammad

Soil Testing Services



Particle Distribution (%)

| Clay | Silt | Sand | Gravel | Cobble |
|------|------|------|--------|--------|
| 42.6 | 57 | 0.4 | - | - |
| 17.3 | 79.5 | 3.2 | - | - |
| 51.1 | 48.1 | 0.8 | - | - |

Classification

| Borehole | Sample Depth (m) | D10 (mm) | D30 (mm) | D50 (mm) | D60 (mm) | Cc | Cu | LL (%) | PI (%) | Disp. (%) | USCS | AASHTO |
|----------|------------------|----------|----------|----------|----------|-------|----|--------|--------|-----------|------|---------|
| BH-02 | 1 | 0.001 | 0.001 | 0.005 | 0.014 | 0.071 | 14 | 34.4 | 7.6 | N/A | ML | A-4(8) |
| BH-02 | 2 | 0.001 | 0.008 | 0.023 | 0.025 | 2.56 | 25 | - | - | N/A | ML | A-4(0) |
| BH-02 | 4 | 0.001 | 0.001 | 0.001 | 0.006 | 0.167 | 6 | 34.8 | 12.2 | N/A | CL | A-6(13) |

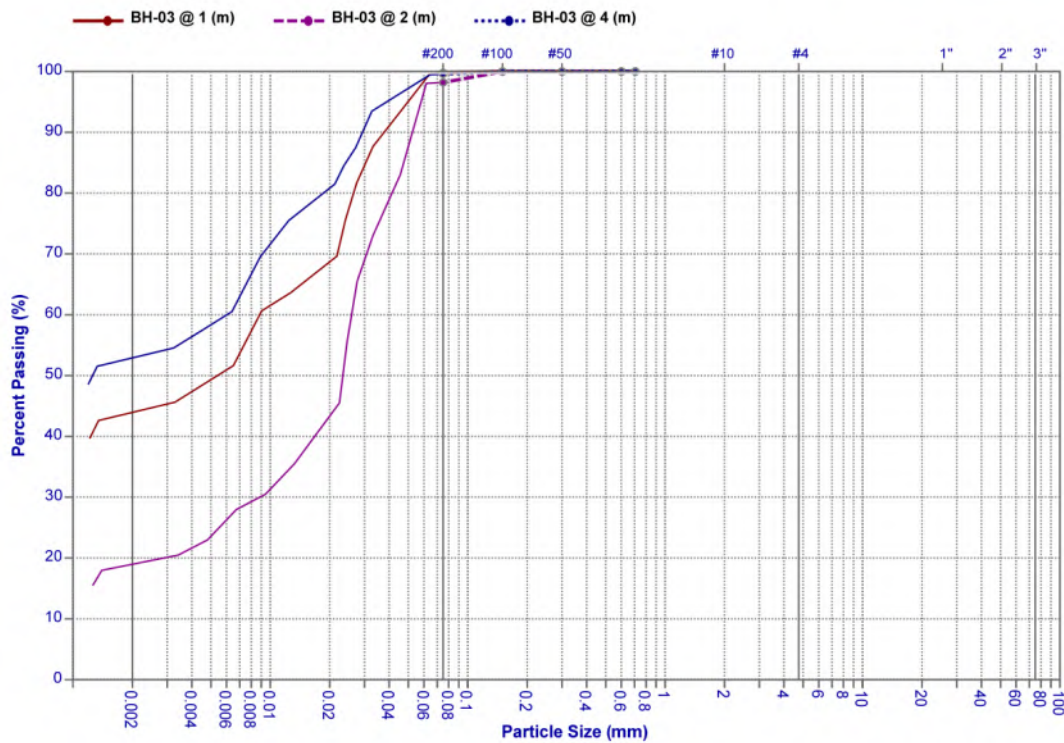
Sieve Analysis Test

Project : Geotechnical Investigation Works
 Client : Matsuda Consultants International...
 Job No.: S-23-1080
 Location : Kot Ghulam Muhammad

Soil Testing Services



ASTM C136



Particle Distribution (%)

| Clay | Silt | Sand | Gravel | Cobble |
|------|------|------|--------|--------|
| 44 | 55.8 | 0.2 | - | - |
| 19 | 79.2 | 1.8 | - | - |
| 52.9 | 46.7 | 0.4 | - | - |

Classification

| Borehole | Sample Depth (m) | D10 (mm) | D30 (mm) | D50 (mm) | D60 (mm) | Cc | Cu | LL (%) | PI (%) | Disp. (%) | USCS | AASHTO |
|----------|------------------|----------|----------|----------|----------|-------|----|--------|--------|-----------|------|--------|
| BH-03 | 1 | 0.001 | 0.001 | 0.005 | 0.009 | 0.111 | 9 | 30.6 | 6.5 | N/A | ML | A-4(7) |
| BH-03 | 2 | 0.001 | 0.009 | 0.023 | 0.026 | 3.115 | 26 | - | - | N/A | ML | A-4(0) |
| BH-03 | 4 | 0.001 | 0.001 | 0.001 | 0.006 | 0.167 | 6 | 31.5 | 9.6 | N/A | CL | A-4(8) |

ATTERBERG LIMITS TEST

Project : Geotechnical Investigation Works

Borehole : BH-01

Soil Testing Services

Client : Matsuda Consultants International...

Sample Depth : 1 (m)



Job No.: S-23-1080

Classification : ML | A-4(6)

Location : Kot Ghulam Muhammad

Sample Type : SPT Split Spoon

ASTM D2216-90, D654

Liquid Limit

| Cont. W (gr) | Cont. + Wet Soil W (gr) | Cont. + Dry Soil W (gr) | # of Blows | Moisture Content (%) |
|--------------|-------------------------|-------------------------|------------|----------------------|
| 14.36 | 30.55 | 26.78 | 16 | 30.4 |
| 20.39 | 43.4 | 38.3 | 31 | 28.5 |
| | | | | - |

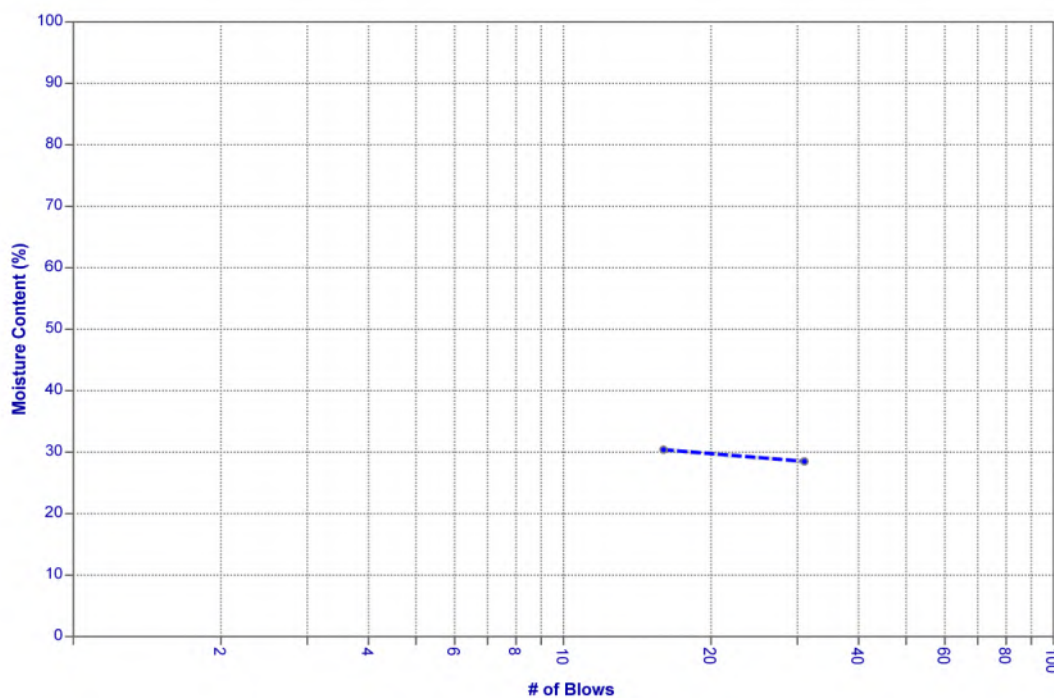
Plastic Limit

| Cont. W (gr) | Cont. + Wet Soil W (gr) | Cont. + Dry Soil W (gr) | Moisture Content (%) |
|--------------|-------------------------|-------------------------|----------------------|
| 31.97 | 39.37 | 38 | 22.7 |

LL = 29.1 %

PL = 22.7 %

PI=6.4



USCS Soil Description : Low Plasticity Silt With Sand
 AASHTO Soil Description : A-4, Silty soils (6)

Tested By :

ATTERBERG LIMITS TEST

Project : Geotechnical Investigation Works

Borehole : BH-01

Soil Testing Services

Client : Matsuda Consultants International...

Sample Depth : 4 (m)



Job No.: S-23-1080

Classification : CL | A-6(11)

Location : Kot Ghulam Muhammad

Sample Type : SPT Split Spoon

ASTM D2216-90, D854

Liquid Limit

| Cont. W (gr) | Cont. + Wet Soil W (gr) | Cont. + Dry Soil W (gr) | # of Blows | Moisture Content (%) |
|--------------|-------------------------|-------------------------|------------|----------------------|
| 13.19 | 38.22 | 33.16 | 18 | 25.3 |
| 14.6 | 36.71 | 32.41 | 36 | 24.1 |
| | | | | - |

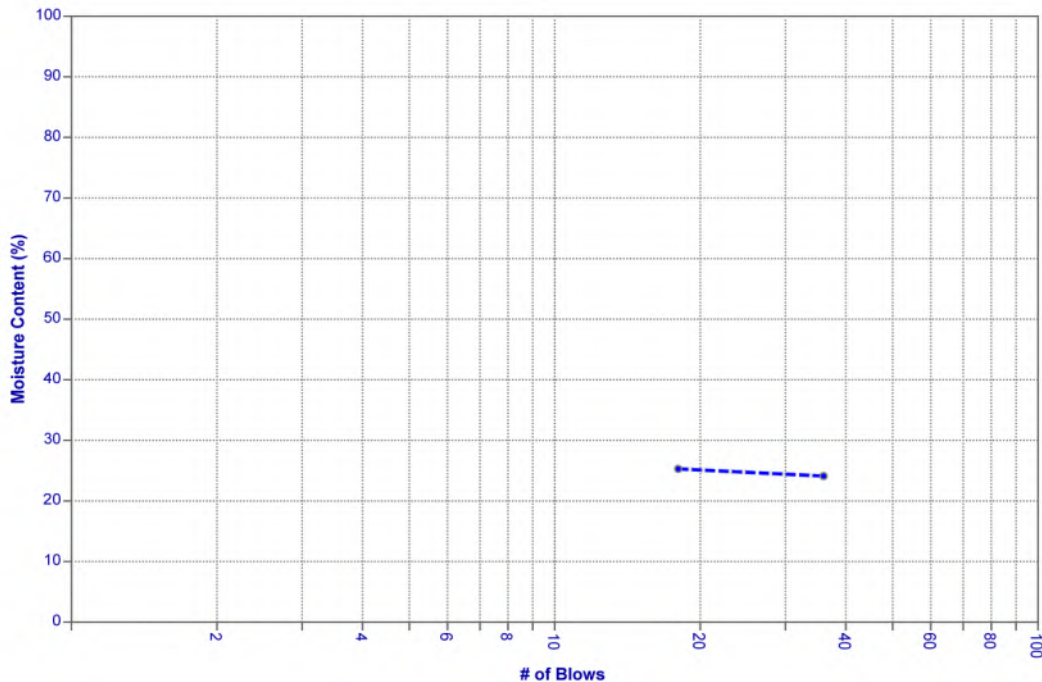
Plastic Limit

| Cont. W (gr) | Cont. + Wet Soil W (gr) | Cont. + Dry Soil W (gr) | Moisture Content (%) |
|--------------|-------------------------|-------------------------|----------------------|
| 31.95 | 43.14 | 42.02 | 11.1 |

LL = 24.7 %

PL = 11.1 %

PI=13.6



USCS Soil Description : Low Plasticity Clay With Sand
AASHTO Soil Description : Clayey soils (11)

Tested By :

ATTERBERG LIMITS TEST

Project : Geotechnical Investigation Works Borehole : BH-02
 Client : Matsuda Consultants International... Sample Depth : 1 (m)
 Job No.: S-23-1080 Classification : ML | A-4(8)
 Location : Kot Ghulam Muhammad Sample Type : SPT Split Spoon

Soil Testing Services



ASTM D2216-90, D854

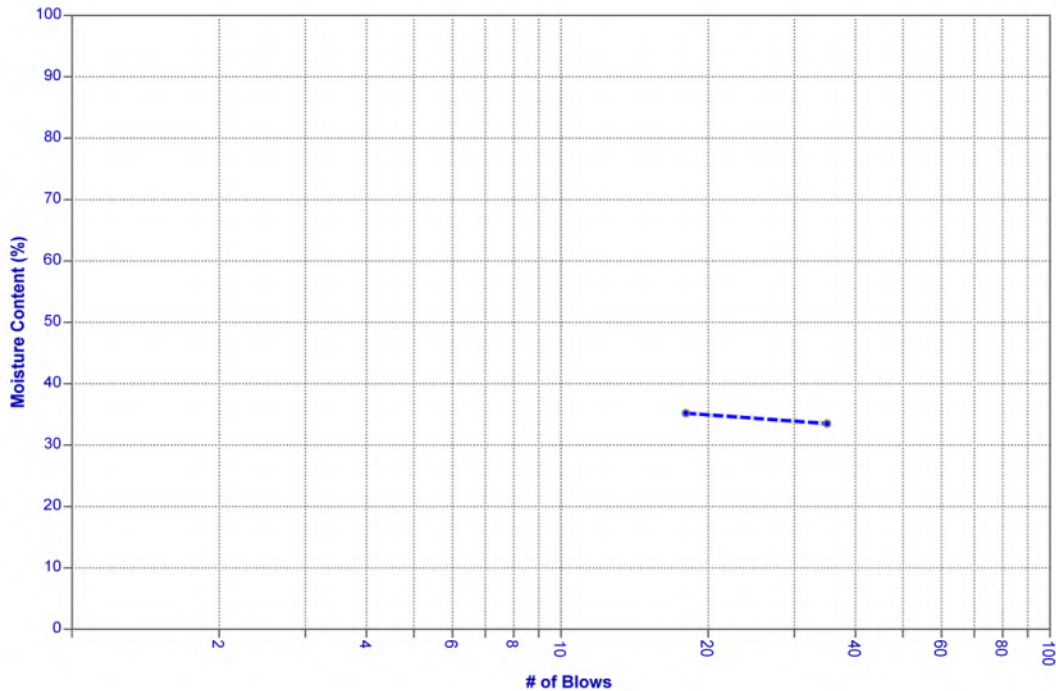
Liquid Limit

| Cont. W (gr) | Cont. + Wet Soil W (gr) | Cont. + Dry Soil W (gr) | # of Blows | Moisture Content (%) |
|--------------|-------------------------|-------------------------|------------|----------------------|
| 20.62 | 32.68 | 29.54 | 18 | 35.2 |
| 14.67 | 27.97 | 24.63 | 35 | 33.5 |

Plastic Limit

| Cont. W (gr) | Cont. + Wet Soil W (gr) | Cont. + Dry Soil W (gr) | Moisture Content (%) |
|--------------|-------------------------|-------------------------|----------------------|
| 33.71 | 44.35 | 42.1 | 26.8 |

LL = 34.4 % PL = 26.8 % PI=7.6



USCS Soil Description : Low Plasticity Silt With Sand
 AASHTO Soil Description : A-4, Silty soils (8)

Tested By :

ATTERBERG LIMITS TEST

Project : Geotechnical Investigation Works Borehole : BH-02
 Client : Matsuda Consultants International... Sample Depth : 4 (m)
 Job No.: S-23-1080 Classification : CL | A-6(13)
 Location : Kot Ghulam Muhammad Sample Type : SPT Split Spoon

Soil Testing Services



ASTM D2216-90, D854

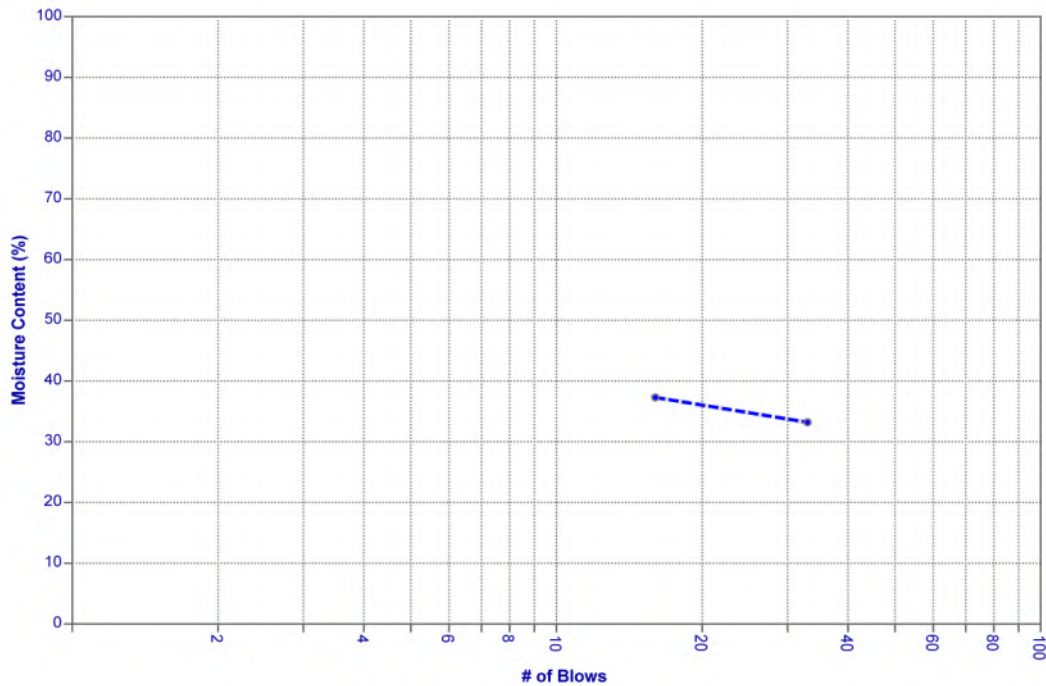
Liquid Limit

| Cont. W (gr) | Cont. + Wet Soil W (gr) | Cont. + Dry Soil W (gr) | # of Blows | Moisture Content (%) |
|--------------|-------------------------|-------------------------|------------|----------------------|
| 11.5 | 30.89 | 25.62 | 16 | 37.3 |
| 20.62 | 33.77 | 30.49 | 33 | 33.2 |
| | | | | - |

Plastic Limit

| Cont. W (gr) | Cont. + Wet Soil W (gr) | Cont. + Dry Soil W (gr) | Moisture Content (%) |
|--------------|-------------------------|-------------------------|----------------------|
| 25.75 | 33.07 | 31.82 | 20.6 |

LL = 34.8 % PL = 20.6 % PI=14.2



USCS Soil Description : Low Plasticity Clay With Sand
 AASHTO Soil Description : Clayey soils (13)

Tested By :

ATTERBERG LIMITS TEST

Project : Geotechnical Investigation Works
 Client : Matsuda Consultants International...
 Job No.: S-23-1080
 Location : Kot Ghulam Muhammad

Borehole : BH-03
 Sample Depth : 1 (m)
 Classification : ML | A-4(7)
 Sample Type : SPT Split Spoon

Soil Testing Services



ASTM D2216-90, D854

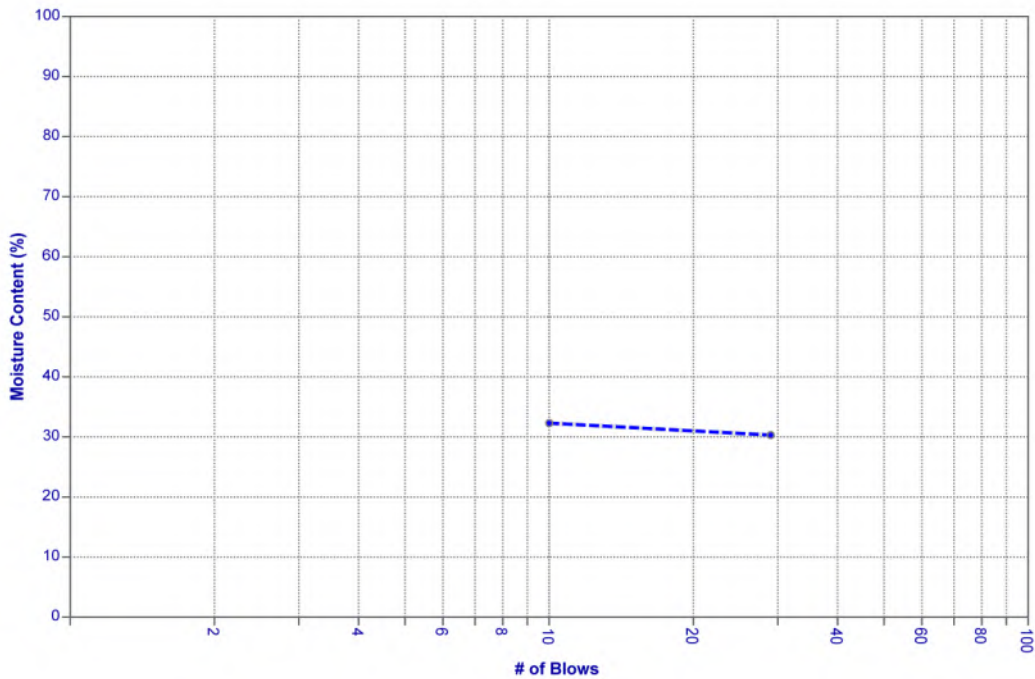
Liquid Limit

| Cont. W (gr) | Cont. + Wet Soil W (gr) | Cont. + Dry Soil W (gr) | # of Blows | Moisture Content (%) |
|--------------|-------------------------|-------------------------|------------|----------------------|
| 11.24 | 28.41 | 24.22 | 10 | 32.3 |
| 14.55 | 34.18 | 29.61 | 29 | 30.3 |
| | | | | - |

Plastic Limit

| Cont. W (gr) | Cont. + Wet Soil W (gr) | Cont. + Dry Soil W (gr) | Moisture Content (%) |
|--------------|-------------------------|-------------------------|----------------------|
| 76.97 | 91.17 | 88.41 | 24.1 |

LL = 30.6 % PL = 24.1 % PI=6.5



USCS Soil Description : Low Plasticity Silt With Sand
 AASHTO Soil Description : A-4, Silty soils (7)

Tested By :

ATTERBERG LIMITS TEST

Project : Geotechnical Investigation Works

Borehole : BH-03

Soil Testing Services

Client : Matsuda Consultants International...

Sample Depth : 4 (m)



Job No.: S-23-1080

Classification : CL | A-4(8)

Location : Kot Ghulam Muhammad

Sample Type : SPT Split Spoon

ASTM D2216-90, D854

Liquid Limit

| Cont. W (gr) | Cont. + Wet Soil W (gr) | Cont. + Dry Soil W (gr) | # of Blows | Moisture Content (%) |
|--------------|-------------------------|-------------------------|------------|----------------------|
| 20.5 | 33.84 | 30.53 | 10 | 33 |
| 11.05 | 22.03 | 19.42 | 30 | 31.2 |
| | | | | - |

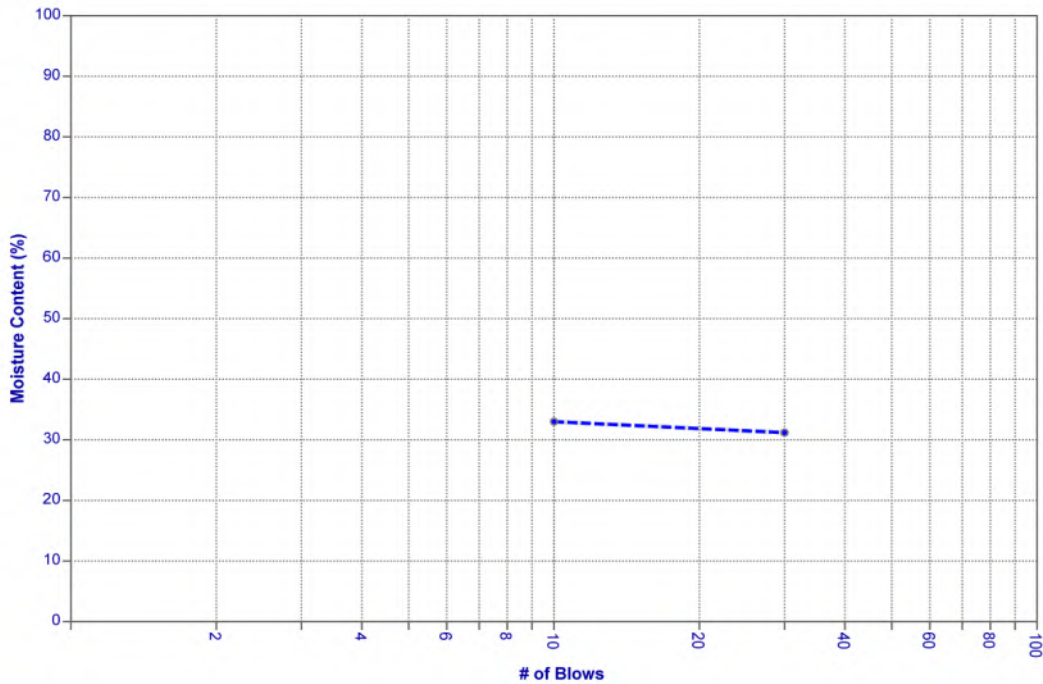
Plastic Limit

| Cont. W (gr) | Cont. + Wet Soil W (gr) | Cont. + Dry Soil W (gr) | Moisture Content (%) |
|--------------|-------------------------|-------------------------|----------------------|
| 31.83 | 39.72 | 38.3 | 21.9 |

LL = 31.5 %

PL = 21.9 %

PI=9.6



USCS Soil Description : Low Plasticity Clay With Sand
 AASHTO Soil Description : A-4, Silty soils (8)

Tested By :

Density & Moisture Test

Project : Geotechnical Investigation Works
Client : Matsuda Consultants International...
Job No.: S-23-1080
Location : Kot Ghulam Muhammad

Soil Testing Services



ASTM D4643, D2216

| Borehole | Sample Depth (m) | Moisture Content (%) | Dry Density (gr/cm3) | Wet Density (gr/cm3) |
|----------|------------------|----------------------|----------------------|----------------------|
| BH-01 | 1 | 21.03 | 1.58 | 1.91 |
| BH-01 | 2 | 23.61 | 1.56 | 1.93 |
| BH-01 | 4 | 22.78 | 1.59 | 1.95 |
| BH-02 | 1 | 20.43 | 1.57 | 1.89 |
| BH-02 | 2 | 25.32 | 1.56 | 1.95 |
| BH-02 | 4 | 24.18 | 1.59 | 1.97 |
| BH-03 | 1 | 19.77 | 1.58 | 1.89 |
| BH-03 | 2 | 23.27 | 1.56 | 1.92 |
| BH-03 | 4 | 22.08 | 1.59 | 1.94 |

CU Triaxial Test

Project : Geotechnical Investigation Works
Client : Matsuda Consultants International...
Job No.: S-23-1080
Location : Kot Ghulam Muhammad

Soil Testing Services



ASTM D4767

| Borehole No. | Sample ID | Sample Depth (m) | Effective Cohesion 'c' (kPa) | Effective Friction Angle (ϕ) |
|--------------|-----------|------------------|------------------------------|-------------------------------------|
| BH-01 | UDS-01 | 1.50 | 55 | 10 |
| BH-02 | UDS-01 | 4.50 | 75 | 0 |
| BH-03 | UDS-01 | 3.50 | 65 | 0 |

S-23-1080

Project: Geotechnical Investigation Works

Client: Matsuda Consultants International Co., Ltd

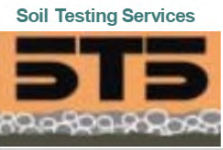
Location: Kot Ghulam Muhammad

RESULTS OF SPECIFIC GRAVITY TESTS

| S.NO. | BH NO. | SAMPLE | DEPTH (m) | SPECIFIC GRAVITY |
|--------------|---------------|---------------|------------------|-------------------------|
| 1 | BH - 1 | SPT - 1 | 1.00 | 2.629 |
| 2 | BH - 1 | SPT - 2 | 2.00 | 2.614 |
| 3 | BH - 1 | SPT - 4 | 4.00 | 2.667 |
| 4 | BH - 2 | SPT - 1 | 1.00 | 2.633 |
| 5 | BH - 2 | SPT - 2 | 2.00 | 2.627 |
| 6 | BH - 2 | SPT - 4 | 4.00 | 2.656 |
| 7 | BH - 3 | SPT - 1 | 1.00 | 2.602 |
| 8 | BH - 3 | SPT - 2 | 2.00 | 2.621 |
| 9 | BH - 3 | SPT - 4 | 4.00 | 2.648 |

Water Chemical Test Results

Project : Geotechnical Investigation Works
Client : Matsuda Consultants International...
Job No.: S-23-1080
Location : Kot Ghulam Muhammad



| Borehole | Sample | Sample Depth (m) | Total Salt Content (ppm) | Chloride Content (ppm) | Sulphate (ppm) | pH Values |
|----------|--------|------------------|--------------------------|------------------------|----------------|-----------|
| BH-01 | WS-1 | 1.76 | 9120 | 4302 | 337 | 6.67 |

General Information on Testing Procedures

A. DRILLING, FIELD TESTING & SAMPLING

The field testing program consisted of drilling works, and in-situ testing including Standard Penetration Tests (SPT), collection of soil samples and collection of ground water samples. The following sections describe these activities in further detail.

A.1. DRILLING METHOD

Both the boreholes were drilled by using rotary/wash boring method; in this method soil or rock is cut by the constant rotation of various types of bits. Drilling fluid, which is either water or bentonite slurry, is circulated through drilling rods. The returning fluid lifts loosened material.

Details of the boreholes are given in Table A.1.

Table A.1 Detail of Boreholes

| Borehole No. | Borehole Depth (meters) | Water table Depth (meters) |
|--------------|----------------------------|-------------------------------|
| BH-01 | 20.0 | 1.76 |
| BH-02 | 20.0 | 1.83 |
| BH-03 | 20.0 | 1.80 |



Figure A-1: Drilling works in progress

A.2. FIELD TESTING

Field testing carried out at the site includes Standard Penetration Test (SPT). Soil samples were extracted from the boreholes with the help of "SPT sampler for all types of soils".

Following sections indicate the processes carried out in each of the field tests.

A.2.1. STANDARD PENETRATION TESTS

The standard penetration tests (SPT) were carried out at interval of 1.0 - 1.5 meter in the overburden above the bedrock. The standard penetration test was carried out by "Safety" type sliding hammer. Split-spoon sampler was used in cohesive and fine granular soils to conduct SPT.

The standard penetration test was carried out by an assembly of the following parts:

- Drive-weight assembly, consisting of a drive head and a 63.5kg impact hammer, a hammer fall guide and the drop system. The drop mechanism will ensure a constant free fall of 760mm.
- Drive rods connect the drive-weight assembly to the sampler.
- The split spoon sampler was used to carry out the test, along with retrieving disturbed samples.

The base of the borehole was made clean and reasonably undisturbed at the test elevation. Following precautions were taken during the testing sequence:

- The level of water or bentonite slurry was maintained at a sufficient level above the groundwater level, to ensure any entry of water through the bottom of the borehole.
- The casing was not driven below the level at which the test will start.

The test was executed in the following steps:

- The sampler and the drive rods were lowered in the borehole and the hammer assembly added to it.
- The sampler is penetrated over seating drive of 150mm and the numbers of blows are recorded.
- In the same way the sampler is driven over a test drive of 300mm in two increments of 150mm.

- The numbers of blows are recorded during each of the last two increments.
 - The test was deemed finished when total number of blows equal to 50 was reached.
- The standard penetration test was carried out in accordance with the procedure given in ASTM D1586-11/ BS 1377-9:1990.



Figure A.2: Performance of Standard Penetration test in progress

A.2.2. PERCOLATION TEST

This test method is used to determine the area of infiltration required to disperse the effluent. Soil porosity can vary across a site and the percolation test should be carried out at the intended location of the proposed drainage field. This test should be avoided in extreme weather conditions, such as drought, frost or heavy rain. The test is carried out as per BS6297: 2007. This code of practice gives recommendations and guidance on the design and installation of drainage fields and infiltration systems for use in wastewater treatment. It is applicable to systems for handling discharges from domestic and commercial sources from single households upwards. These sources are typically septic tanks and package treatment plants. The test procedure is discussed in section 4.7 of the report.



Figure A-3: Percolation test in progress

A.3. SAMPLING

Sampling forms an essential part of the geotechnical investigation process and good sampling is essential for proper laboratory testing of samples for determining strength and compressibility characteristics of soil.

A.3.1. SPT SAMPLES

Samples were recovered from standard penetration testing. The samples were recovered in split-spoon sampler and then stored in plastic bags. The storage of split-spoon samples in bags ensured retention of natural moisture of the samples which were later tested for gradation, consistency and chemical characteristics.



Figure A.4: Sampling via split spoon sampler

A.3.2. WATER SAMPLES

In order to determine the chemical characteristic of groundwater, water samples were collected from the boreholes. The samples were preserved in airtight bottle & later transported to the testing laboratory. Chemical characteristics of water samples have also been assessed through determination of sulphate content, chloride content, TDS and pH.

B. LABORATORY TESTING

Laboratory testing was carried out on retrieved samples. The following section enlists and gives details of relevant tests carried out on selected samples as required for determining the subsurface conditions and correlating with the information obtained from field testing and sampling.

B.1. GRAIN SIZE ANALYSIS

The purpose of grain size analysis is to determine the sizes of the assemblage of particles that make up the soil. The grain size analysis is conducted in two parts: for particles above the “# 200 US sieve”, sieve analysis is carried out by passing the selected soil sample from various sieves. For particles finer than the “# 200 US sieve”, hydrometer analysis is carried out. The combined process of determination of the size of particles is termed as the grain size analysis.

The results are appended with the report in Appendix C. Grain size analysis of nine (09) soil samples was carried out as per *ASTM D422-63(2007)*.

B.2. LIQUID AND PLASTIC LIMITS

The liquid and plastic limits of soil are parameters that define the state of the soil at different water content levels. The liquid limit is the water content above which the soil goes from solid phase to liquid phase and the plastic limit indicates the water content below which the soil mass makes the transition from a plastic, remouldable solid to a brittle mass which cannot be remoulded any more. The difference in the water contents at Liquid and Plastic limits is termed as the plasticity index and it is a measure of the plasticity of the soil under consideration. The samples used for determining the limits are finer than the “#40 US sieve”. The limits were determined in accordance with the *ASTM D-4318*.

Liquid and plastic limits of three (03) samples extracted from boreholes were carried out in accordance with the given procedure.

B.3. NATURAL MOISTURE CONTENT

Natural moisture content is the quantity of water contained in a soil or rock sample. It is the ratio of the weight of water to the weight of solids in a given volume of soil or rock

sample. Natural moisture content of nine (09) samples was determined in accordance with *ASTM 2216-10*.

B.4. DENSITY

The weight per unit volume of the solid portion of soil is called particle (dry) density. Whereas, the oven dry weight of a unit volume of soil inclusive of pore spaces is called bulk (wet) density. The bulk density of a soil is always smaller than its particle density. Density of nine (09) samples was determined in accordance with the procedure described in *ASTM D 7263-09*.

B.5. SPECIFIC GRAVITY

Specific gravity (Gs) is defined as mass of material in air divided by mass of water displaced by material. This quantity is used for calculation of void ratio, in hydrometer test, etc. Specific gravity of nine (09) samples was determined in accordance with the procedure described in *ASTM D854-10*.

B.6. TRIAXIAL COMPRESSION TEST

This test method covers the determination of strength and stress-strain relationships of a cylindrical specimen of either an intact, reconstituted, or remolded saturated cohesive soil. Specimens are isotropically consolidated and sheared in compression without drainage at a constant rate of axial deformation (strain controlled). The *ASTM D4767-04* was followed for the performance of consolidated undrained triaxial compression test.

B.7. CHEMICAL TESTS

Sulphate in groundwater or soil can attack concrete placed in the ground or on surface. A reaction takes place between the sulphate and the aluminate compounds present in the cement, causing crystallisation of complex compounds. The expansion, which accompanies crystallisation, induces stresses in the concrete, which results in mechanical disintegration. In moist conditions, such as exposure to seawater, the presence of chloride ion, Cl⁻, presents a serious possibility of the corrosion of the reinforcement. The presence of Ca(OH)₂ provides a strong alkaline environment in which a thin film of iron oxide is formed on the metal surface which protects it against corrosion. However, if the concrete is permeable to the extent that the soluble chlorides can reach up to the reinforcing steel, then in the presence of water and oxygen, the

corrosion of the reinforcement will take place. Rust occupies more volume than the original steel, and hence the ensuing expansion of concrete, results in cracking and spalling.

Due to adverse effect of sulphates and chlorides on the quality of concrete it is essential to conduct chemical tests on soil and groundwater. This helps in quantifying the expected exposure of concrete to these chemicals and in devising precautionary measures to ensure integrity of concrete. The following chemical tests were carried out on groundwater samples:

- Total dissolved solids
- Chloride content
- Sulphate content
- pH

Chemical tests were carried out in accordance with *ASTM C 1580-09, and D 4972-01*. The selection of cement for underground concreting and is discussed in *Chapter 4*.

Table B.1 ACI standards for concrete for sulphate exposure

| Sulphate Exposure | Water Soluble Sulphates in Soil (%) | Sulphate in Water (mg/L) | Cement Type |
|--------------------------|--|---------------------------------|-------------------------|
| Negligible | 0.00-0.10 | 0- 150 | OPC |
| Moderate | 0.10-0.20 | 150- 1500 | Type II |
| Severe | 0.20-2.00 | 1500-10000 | Type V |
| Very Severe | Over 2.00 | Over 10000 | Type V plus pozzolan |

Percolation Test Sheet

| | | | |
|-------------|---|--|--|
| Project | Reconstruction of Education Facilities in Flood Affected Areas in Sindh, Islamic Republic of Pakistan | | |
| Location: | Mi-03 DEH-294 Taluka Kot Ghulam Muhamad, Mirpurkhas | | |
| Project ID: | S-23-1080 | | |
| Test Date: | 03/06/2023 | | |



SOIL TESTING SERVICES

PERCOLATION TEST (Calculation of Vp)

| Pit | Hole No. | Test No. | Start Time (24-hour) | | Finish Time (24-hour) | | Time Elapsed | | Vp (s/mm) | Average Vp (hole) |
|-----|----------|----------|----------------------|---------|-----------------------|---------|--------------|---------|-----------|-------------------|
| | | | Hours | Minutes | Hours | Minutes | Minutes | Seconds | | |
| A | A1 | 1 | 12 | 46 | 13 | 22 | 36 | 2160 | 14.4 | 15.4 |
| | | 2 | 13 | 23 | 14 | 4 | 41 | 2460 | 16.4 | |
| | A2 | 1 | 14 | 34 | 15 | 18 | 44 | 2640 | 17.6 | 18.2 |
| | | 2 | 15 | 19 | 16 | 6 | 47 | 2820 | 18.8 | |
| B | A3 | 1 | 16 | 38 | 17 | 27 | 49 | 2940 | 19.6 | 19.4 |
| | | 2 | 17 | 28 | 18 | 16 | 48 | 2880 | 19.2 | |
| | B1 | 1 | 12 | 45 | 13 | 20 | 35 | 2100 | 14 | 15.6 |
| | | 2 | 13 | 21 | 14 | 4 | 43 | 2580 | 17.2 | |
| C | B2 | 1 | 14 | 36 | 15 | 11 | 35 | 2100 | 14 | 16.4 |
| | | 2 | 15 | 12 | 15 | 59 | 47 | 2820 | 18.8 | |
| | B3 | 1 | 16 | 29 | 17 | 5 | 36 | 2160 | 14.4 | 16 |
| | | 2 | 17 | 6 | 17 | 50 | 44 | 2640 | 17.6 | |
| C | C1 | 1 | 12 | 41 | 14 | 0 | 79 | 4740 | 31.6 | 21 |
| | | 2 | 14 | 1 | 14 | 27 | 26 | 1560 | 10.4 | |
| | C2 | 1 | 14 | 35 | 15 | 4 | 29 | 1740 | 11.6 | 24.2 |
| | | 2 | 15 | 5 | 16 | 37 | 92 | 5520 | 36.8 | |
| C3 | 1 | 16 | 51 | 17 | 25 | 34 | 2040 | 13.6 | 17.6 | |
| | 2 | 17 | 26 | 18 | 20 | 54 | 3240 | 21.6 | | |



SOIL TESTING SERVICES

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