Nama Water Services

Wastewater Treatment Technology

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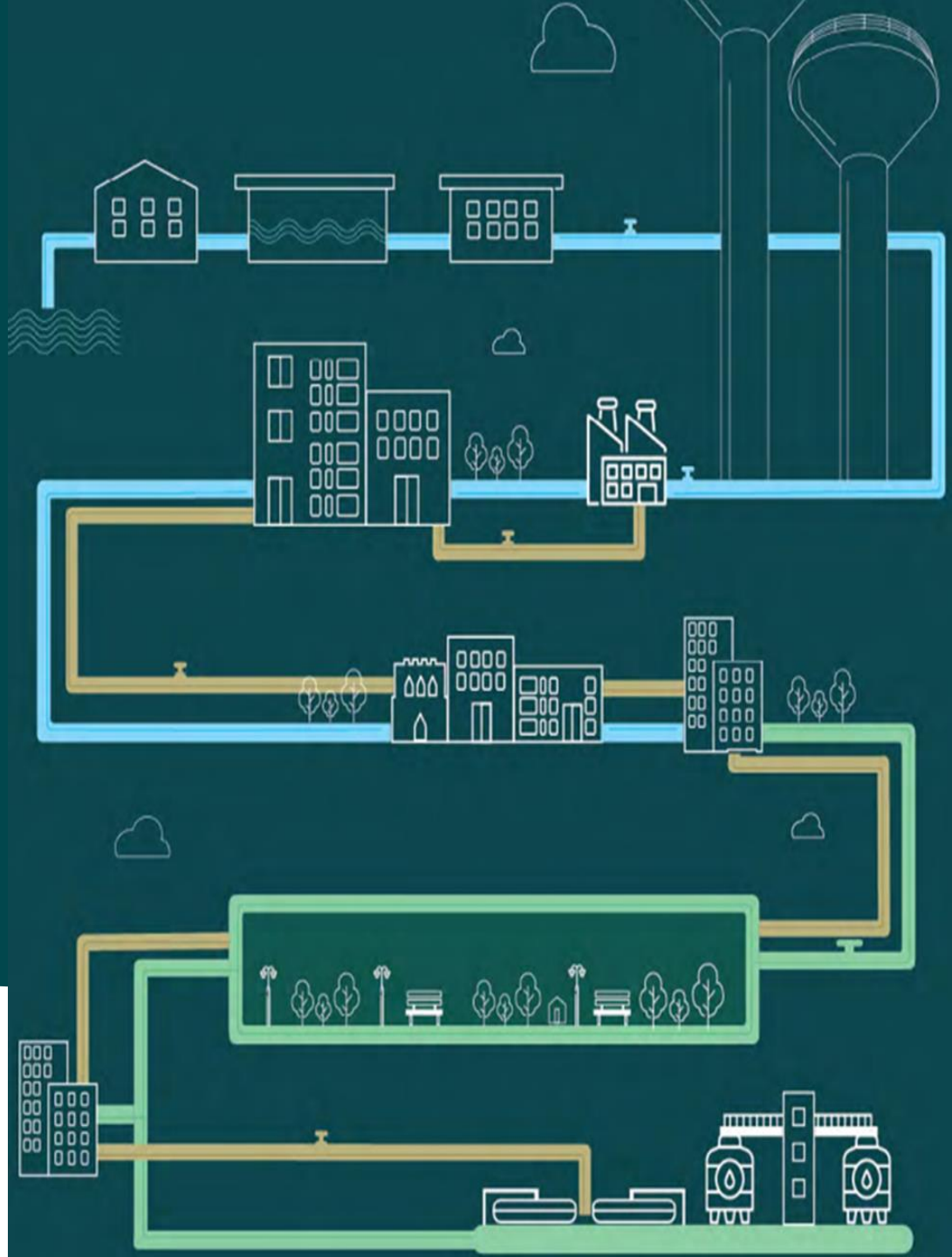

INTRODUCTION

Oman Water and Wastewater Services Company (NWS) was established based on the Royal Decree (2020/131) on 9 December 2020. The Royal Decree stated that Oman Water and Wastewater Services Company to provide Water and Wastewater services in all governorates in the Sultanate except Dhofar Governorate .

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TYPICAL RAW WASTEWATER CHARACTERISTICS

Origin of Wastewater

Wastewater may be defined as any material, solid, liquid or gas that is unwanted or unvalued, and discharged by its owner. NWS received flow by Networks and Yellow Tankers which is only domestic sewage.

NWS is designing the Sewage treatment plants according to the concession agreement standards of the of municipal and household sewage to comply with the national standards for the treatment of wastewater and sludge

Raw Wastewater Parameter	Unit	Minimum	Maximum
Biochemical Oxygen Demand (BOD_5)	mg/L	350	400
Chemical Oxygen Demand (COD)	mg/L	600	900
Total Suspended Solids (TSS)	mg/L	350	500
Total Kjeldahl Nitrogen (TKN)	mg/L	50	70
Ammonia Nitrogen (NH_3-N)	mg/L	35	45
Total Phosphorus (TP)	mg/L	9	15
Oil & Grease (O&G)	mg/L	--	200
Total Alkalinity (as $CacO_3$)	mg/L	100	200
Volatile Suspended Solids (VSS)	mg/L	280	400
VSS / TSS Ratio	**%**	75	85
pH	-	6	8.0
Temp	^oC	20	35

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TREATED EFFLUENT COMPLIANCE

Parameter	Unit	Concession Agreement		** MD 145/93		*** MD 159/ 05
		* Group 1	Group 2	Std. A	Std. B	
Biochemical Oxygen Demand (BOD_5)	mg/L	< 15	< 15	15	20	20
Chemical Oxygen Demand (COD)	mg/L	-	-	150	200	200
Total Suspended Solids (TSS)	mg/L	< 15	< 20	15	30	30
Total Kjeldahl Nitrogen (TKN)	mg/L	-	-	5	10	5
Ammonia Nitrogen (NH_3-N)	mg/L	-	-	5	10	1
Total Nitrogen	mg/L	< 15	< 40	-	-	15
Nitrate (as NO_3)	mg/L	-	-	50	50	15
Total Phosphorus (TP)	mg/L	< 30	< 30	30	30	2
Oil & Grease (O&G)	mg/L	< 5	< 5	0.5	0.5	15
pH		-	-	6 ~ 9	6 ~ 9	6 ~ 9
Fecal Coliform	MPN/100 mL	< 200	< 200	200	1,000	10,000
Nematode Ova	Ova / L	< 1	< 1	< 1	< 1	< 1

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WASTEWATER TREATMENT PLANT

Mechanical process designed to remove wastewater constituents, thereby produce TE in compliance with regulation and permitting to be used safely for other purposes. Total number of the plants in 8 in **Muscat Governorate** and 51 in **Regional Governorate** .

➢ List of Plants in Muscat Governorate

STP Name	Capacity(m^3/d)	Type of Treatment	CA & MECA Standard
A' Seeb STP	60,000	SBR System + Ultra Filtration	Group 1 & Standard A
New Al Ansab	125,000	MBR System	Group 1 & Standard A
New Darsait	37,000	MBR System	Group 1 & Standard A
New Quriyat	1,000	MBR System	Group 1 & Standard A
Al Amerat	18,000	MBR System	Group 1 & Standard A
Bowsher	420	Conventional (Clarifier + Sand Filter)	Group 2 & Standard B
HAG	200	MBR System	Group 1 & Standard A
Jibroo	150	MBR System	Group 1 & Standard A

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WASTEWATER TREATMENT PROESS

- **Primary Treatment**

Mechanical Separation by a physical and/or chemical settlement of suspended solids, in which (BOD5) of the incoming wastewater is reduced by at least 20% before discharge and (TSS) is reduced by at least 50%.

- **Secondary Treatment**

Post-primary treatment of wastewater by a process generally involving biological treatment with a secondary settlement, resulting in (BOD5) removal of at least 70% and (COD) removal of at least 75%.

- **Tertiary Treatment**

Filtration system for further removal and polishing of TE. The treatment removal efficiency is at least 95% for BOD and 85% for COD, 80% for TN, and 99% for microbiological.

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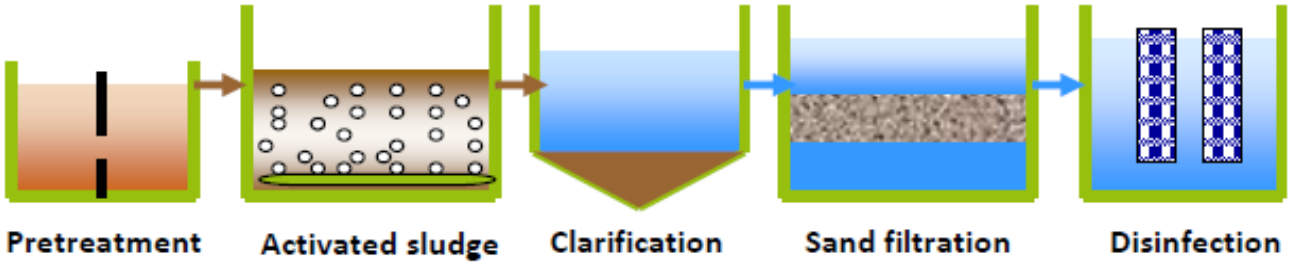
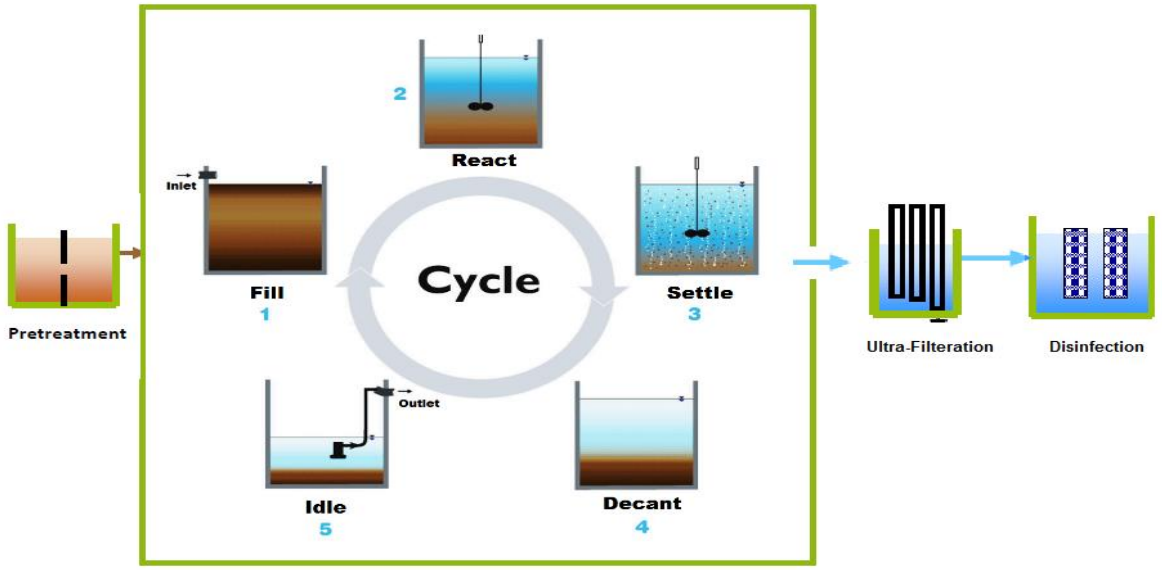
WASTEWATER TREATMENT TECHNOLOGY

- **Conventional Activated Sludge**



- **Sequential Batch Reactor**



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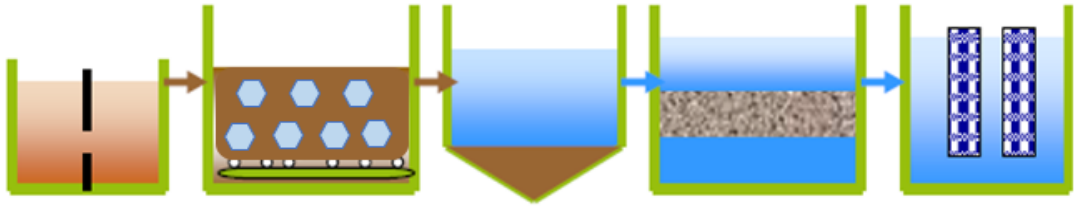
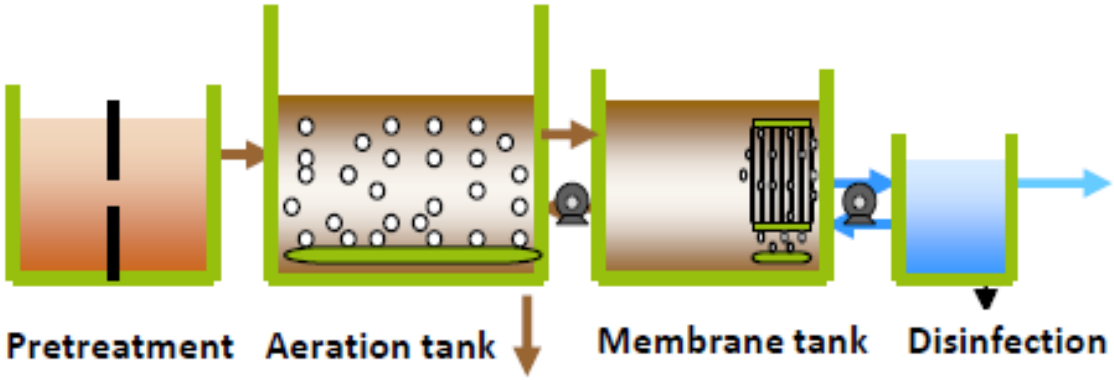
WASTEWATER TREATMENT TECHMOLOGY

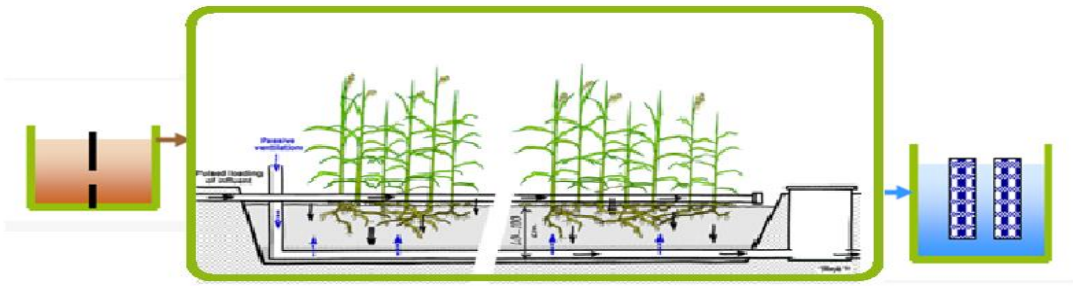
- **Moving Bed Bioreactor**



- **Membrane Bio-Reactor**



- **Constructed Wetland- Reed Bed System**



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Reuse of Treated Effluent

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POTENTIAL REUSE APPLICATIONS OF TREATED EFFLUENT

➢ Industrial Reuse Application

Industrial Systems involve the use of reclaimed water in industrial application such as :

- cooling water
- washing operations.
- dust control,
- washing of aggregate,
- cement mixing.
- Maintenance activities utilizing reclaimed water can include sewer jetting, vehicle washing, and street cleaning.

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➢ Road & Building Construction

The Treated Effluent produced by Haya Water complies with Class-A of EPA-2004 classification shown in Table-7 which allowing human exposure, hence for general construction and site activities could use treated effluent water in following activities:

- Soil compaction
- Dust suppression
- General cleaning
- Core/Drilling works (as a lubricant)
- Testing and commissioning works

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TREATED EFFLUENT MAIN CUSTOMERS

- **Golf Courses and Sport Stadiums**

Nama provide Treated Effluent with high quality (standard A) for all four golf courses in Muscat (The Wave, Muscat Hills, PDO Golf) instead of fresh water. In addition, several of Sport Stadiums such us: Bowsher , A'Seeb and Al Rumais Stadiums.

- **Landscaping**

Also, there is coordination between the Muscat Municipality and Nama Water on utilizing the maximum amount of treated water to increase the green areas in Muscat.

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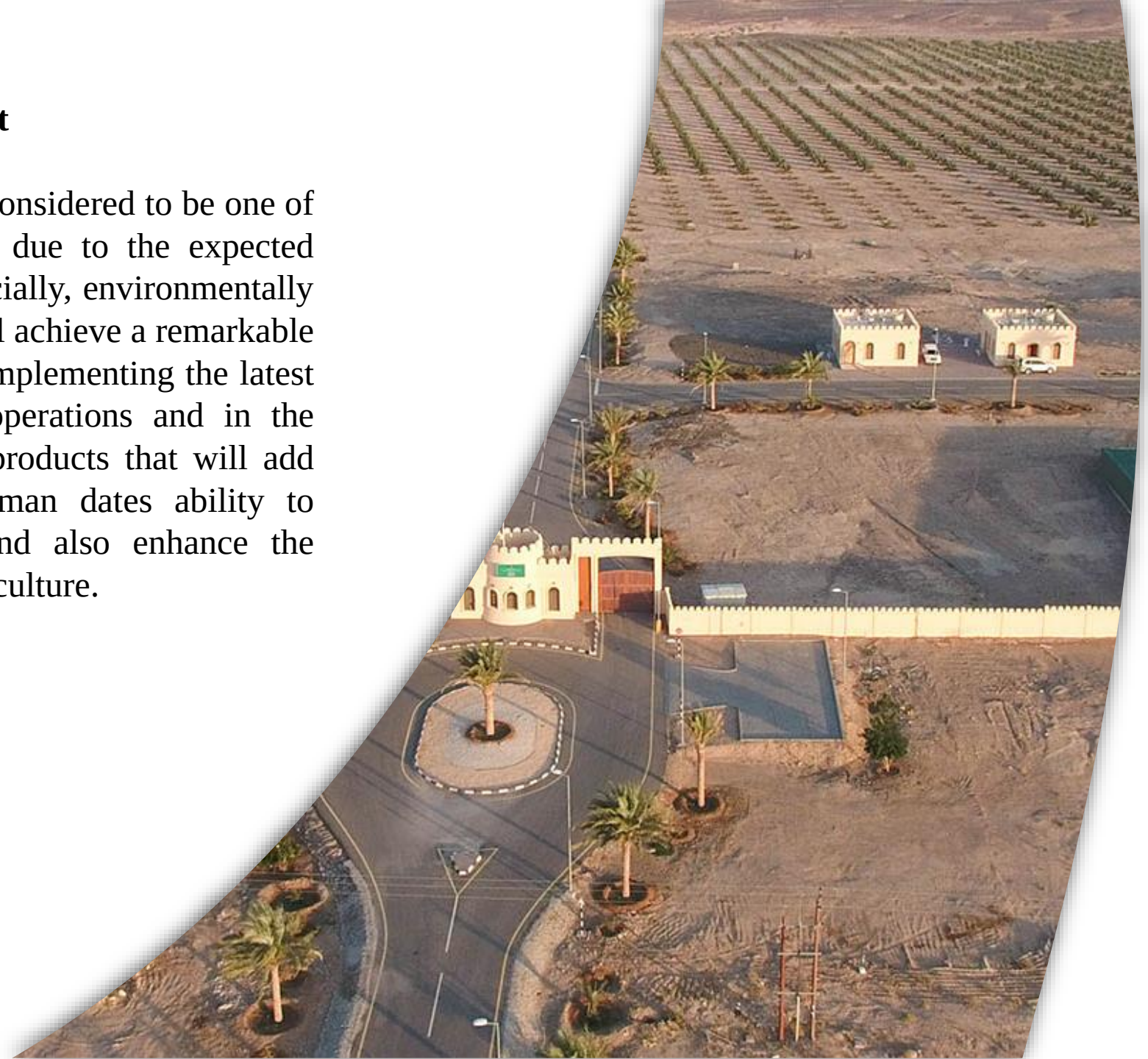
➢ One Million Date Palm Trees Project

Million Date Palm Plantation Projects is considered to be one of the pioneering projects in the sultanate due to the expected outcome it will achieve economically, socially, environmentally and on nutrition level. And the project will achieve a remarkable quality shift in the Date Palm sector by implementing the latest scientific developments in agriculture operations and in the productions of dates and its secondary products that will add high value which will enhance the Oman dates ability to compete in the international market and also enhance the economical capabilities of the Omani agriculture.



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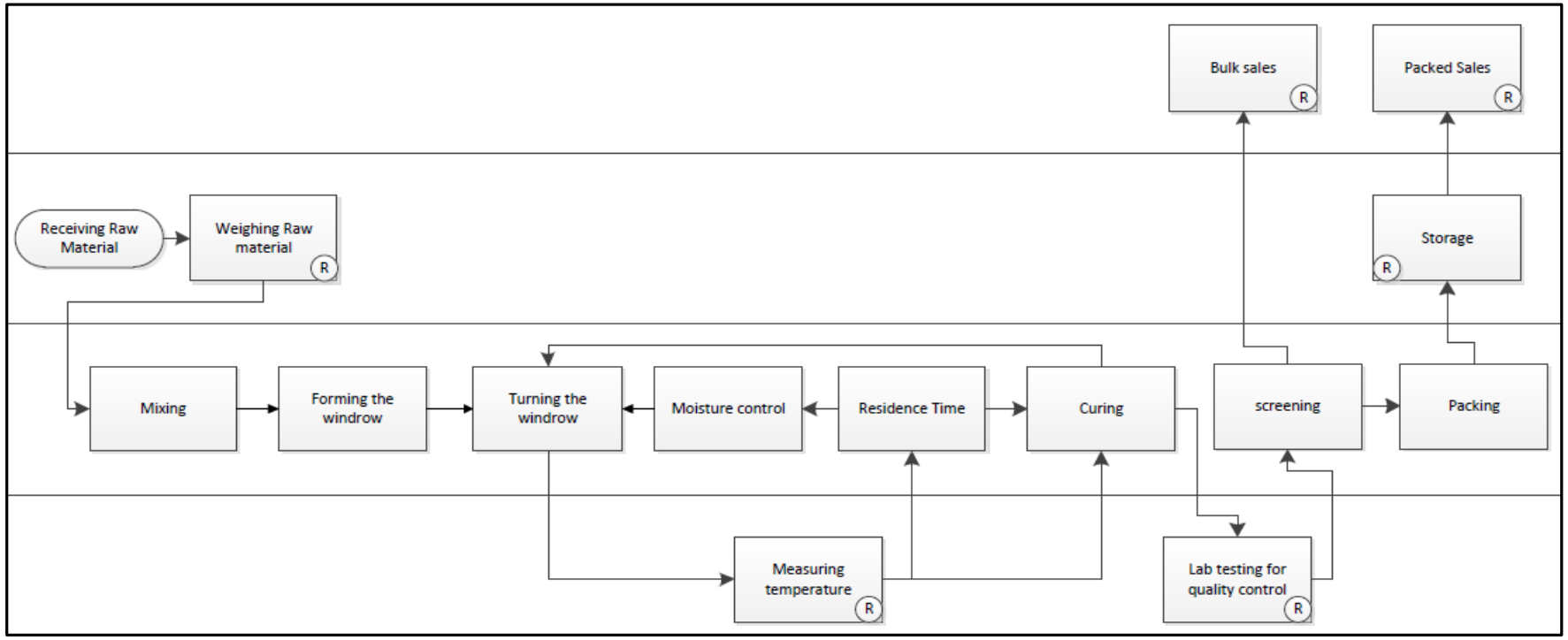
NWS SLUDGE TRETMENT

- NWS treat all the quantities of Sludge in Kala Composting plant as organic fertilizer by Windrow Technology. Kala Plant received daily of dry sludge 150-ton (120 MCT STP and 30 RG) average as per latest data.



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