CASE STUDY #2

"SITE & BUILDING WATER USE"

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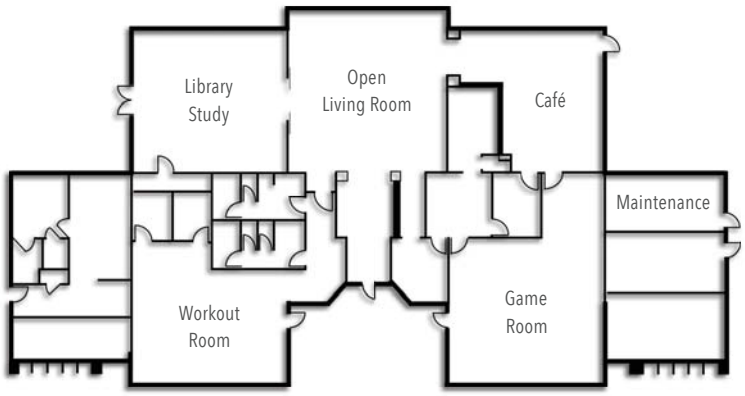


THE GROVE CLUBHOUSE

- Located in **Moscow**, ID
- Program Includes: Café, Game Room, Library Study, Open Living Room, Workout Room, etc.
- **8,500** Square Feet
- Occupancy: **250** (Max)
- Operations Include: Clerical Operations, Community Events for Residents, Studying, Working Out, etc.

MINIMUM NUMBER OF REQUIRED PLUMBING FIXTURES

Number	Classification	Occupancy	Description	Water Closets	Lavatories	Bathtubs / Showers	Drinking Fountains	Other
1	Assembly	A-2[d]	Nightclubs, bars, taverns, dance halls and building for similar purposes	1 per 40	1 per 75	–	1 per 500	1 Service Sink

Source: MEEB Table 18.3 – Pg. 802

EXISTING FIXTURES

FIXTURE	OCCUPANCY	TYPE OF SUPPLY	LOAD VALUES IN WSFU			RECYCLABLE?
			COLD	HOT	TOTAL	
Toilets **(5)**	Public	Flush Tank	5	–	**5**	**No** – Black Water
Urinals **(1)**	Public	1" Flush Valve	10	–	**10**	**No** – Black Water
Lavatory Sinks **(4)**	Public	Faucet	1.5	1.5	**2**	**Yes** – Grey Water
Café Sinks **(2)**	Private	Faucet	1	1	**1.4**	**Yes** – Grey Water
Service Sinks **(1)**	Private	Faucet	2.25	2.25	**3**	**Yes** – Grey Water

Source: MEEB Table 19.15 – Pg. 919

CURRENT WATER USAGE INVENTORY

Estimate of Current Occupants: 250 (Max) People
Estimated GAL/Day: 20
Total GAL/Day: (250)(20) = 5,000 (WU)
GPFU = (WU)/(FU) = 5,000/48.8 = 102.46

(GPF) = GPFU x FU
GPF = GAL/DAY/FIXTURE
GPFU = GAL/DAY/SUPPLY FIXTURE UNIT
FU = WEIGHT IN SUPPLY FIXTURE

FIXTURE	# OF EACH	WSFU	TOTAL (FU)	GALLONS/DAY (GPF)
Toilets	5	5	25	(102.46 GPFU x 25 FU) **2,561.5**
Urinals	1	10	10	(102.46 GPFU x 10 FU) **1,024.6**
Lavatory Sinks	4	2	8	(102.46 GPFU x 8 FU) **819.68**
Café Sink	2	1.4	2.8	(102.46 GPFU x 2.8 FU) **286.89**
Service Sink	1	3	3	(102.46 GPFU x 3 FU) **307.38**
TOTAL	**13**	**21.4**	**48.8**	**~ 5,000**

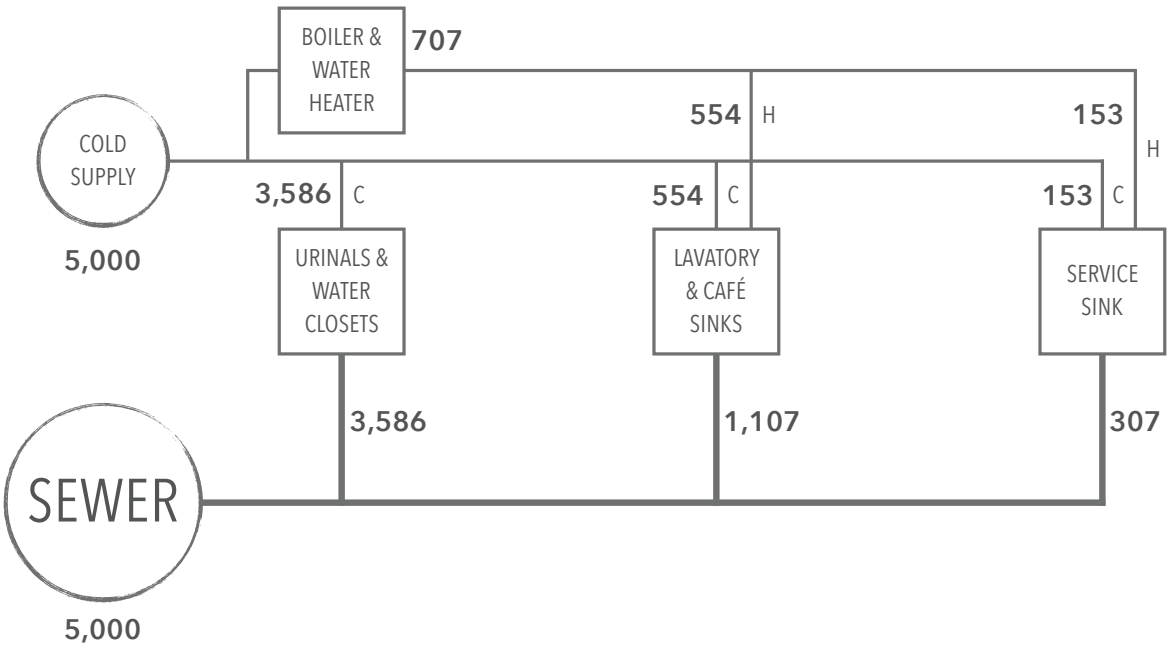
REDESIGNED WATER USAGE INVENTORY

Implementing **Dual-Flush Toilets**, **Waterless Urinals** & **Motion Sensor Lavatory Sinks**

FIXTURE TYPE	# OF EACH	WSFU	TOTAL (FU)	GPF [GPFU(FU)]
Dual-Flush Toilet	**5**	**1.71**	**8.55**	**(102.46 GPFU x 8.55 FU) 876.03**
Waterless Urinal	**1**	**0**	**0**	**(102.46 GPFU x 0 FU) 0**
Motion Sensor Lavatory Sinks	**4**	**0.5**	**2**	**(102.46 GPFU x 2 FU) 204.92**
Café Sink	2	1.4	2.8	(102.46 GPFU x 2.8 FU) **286.89**
Service Sink	1	3	3	(102.46 GPFU x 3 FU) **307.38**
TOTAL	**13**	**6.61**	**16.36**	**~ 1,675**

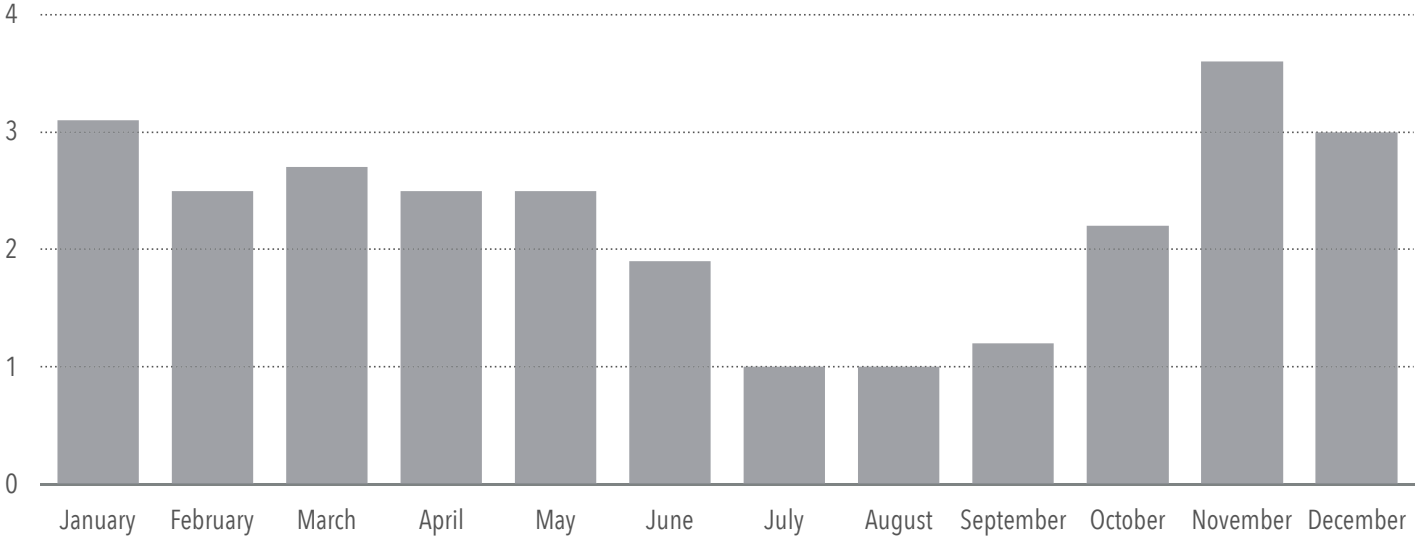
Current vs. Redesign Building Water Usage
5,000 vs. 1,675
Savings of **3,325 GPD**
Reduction by **67%**

CURRENT WATER SYSTEM SCHEMATIC DESIGN



MOSCOW, IDAHO STORM WATER

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Average Rainfall (in.)	3.1	2.5	2.7	2.5	2.5	1.9	1.0	1.0	1.2	2.2	3.6	3.0



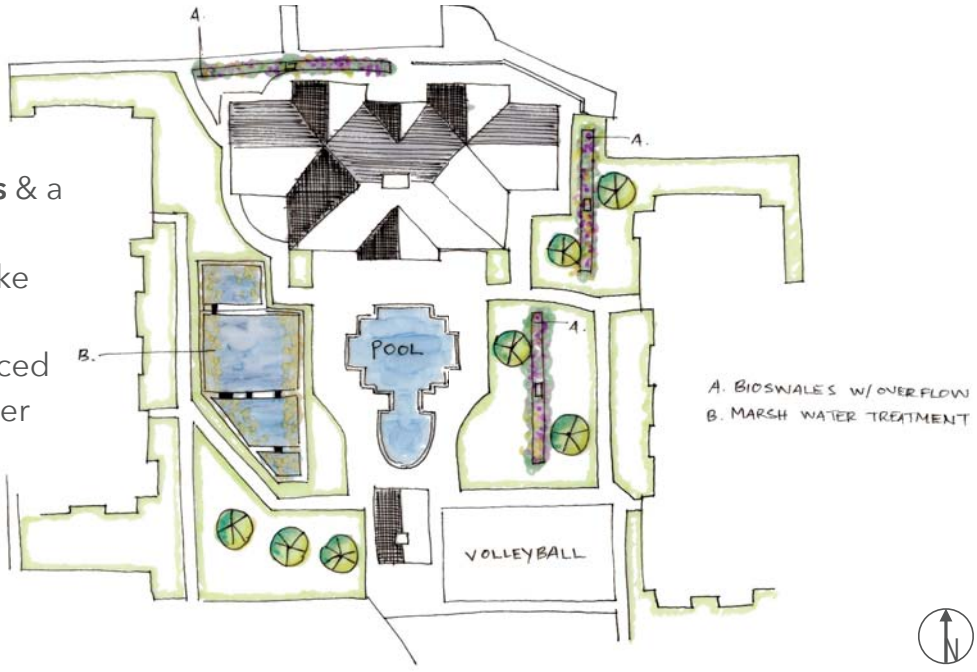
https://weather.com/weather/monthly/l/Moscow+ID+83843:4:US

CURRENT STORMWATER TECHNIQUES

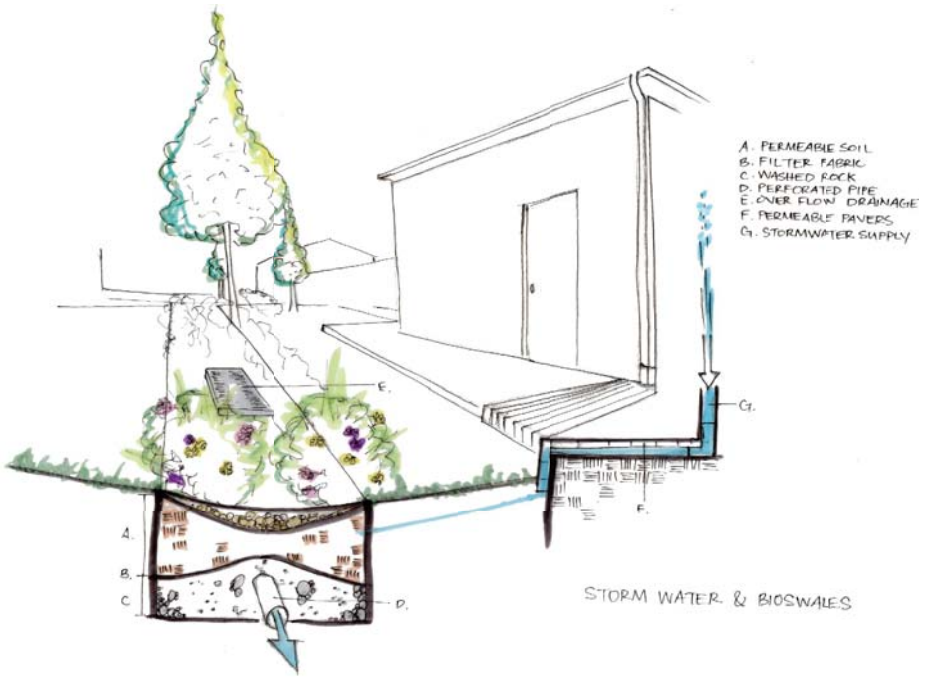
- **Gutters** on building route storm water directly to city sewer
- Landscaped **swales** with grated drains route excess storm water not being absorbed by the landscape directly to city sewer
- …**not** good.

PROPOSED STORM WATER TREATMENT

- Implementing **bioswales** & a series of **constructed wetlands** in order to make Grove Clubhouse **independent** of outsourced waste water & storm water treatment systems



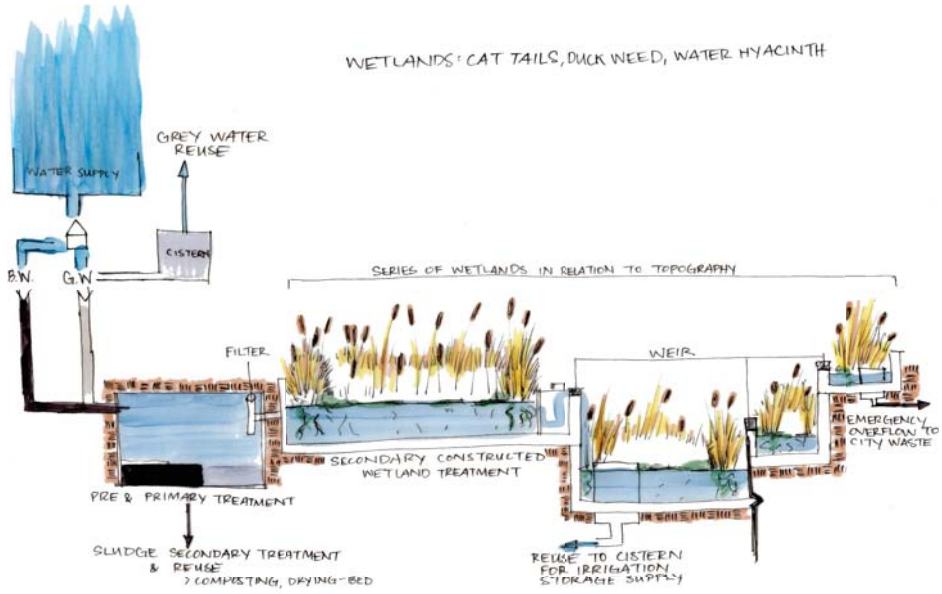
PROPOSED BIOSWALE



- Storm water treatment improved by being **recycled** on-site for water closets & lavatory sink use, instead of being sent directly back to city treatment center
- Storm water filtered through **bioswale** with natural grasses, wild flowers, & soil where it is collected by a perforated pipe that leads to on-site **cisterns**

PROPOSED MARSH AREA

- Diagram illustrates how black water is **filtered & recycled** for both grey water use, & sludge is collected for **composting** with the use of a series of **constructed wetlands**



BLACKWATER TREATMENT

PROPOSED LEACH FIELD

- Leach field **not** necessary for just **Grove Clubhouse**
- If we were considering the Grove Clubhouse – **AND** – the surrounding apartment buildings, a leach field would have a substantial impact on decreasing the **entire complex's black water output**
- Proposed location **slopes down** from the Grove area

Proposed Leach Field Grove Clubhouse

SITE PICTURES FOR PROPOSALS

(1) Proposed Bioswale Area

Proposed Marsh Area

Proposed Leach Field Area

SIZING THE CISTERN

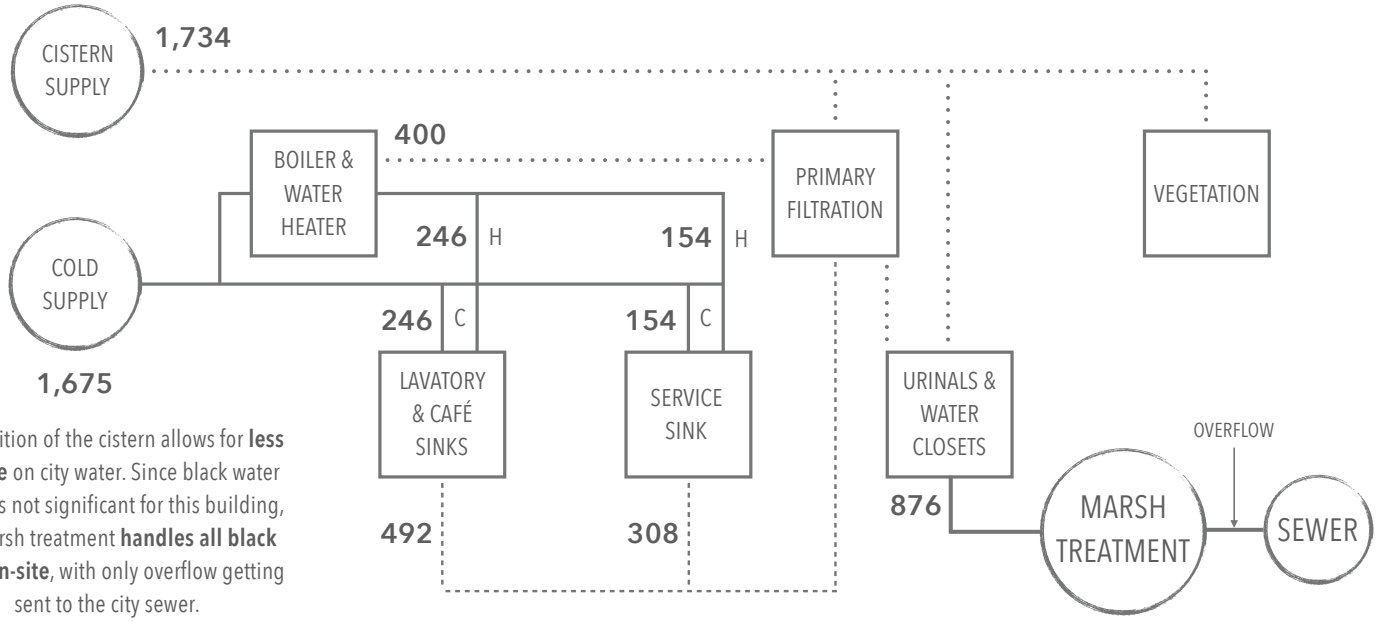
G = (P x A) / 2.15 = **107,535 gal**
G = Rainfall Collected
P = Total Precipitation [(2/3) x 27.2] =18.13 in
A = Total Catchment Area 8,500 sq. ft.

G = 2C 107,535 = 2C C = 53,767.5 gal
C = Average Monthly Catchment

V = G / 7.48 = **14,376 cubic ft**
V = Cistern Volume

3 cisterns (20 x 20 x 12) – one that handles immediate storm water, one that collects gray water from the sinks to be filtered & recycled for later use, & one that is used for back up & irrigating surrounding vegetation

PROPOSED CONVENTIONAL WATER SYSTEM SCHEMATIC DESIGN



The addition of the cistern allows for **less reliance** on city water. Since black water output is not significant for this building, the marsh treatment **handles all black water on-site**, with only overflow getting sent to the city sewer.

CONCLUSION

Savings of **3,325 GPD – 67%**

Cistern reduces reliance on city water sources & sewer system

Toilets can function without using any city water

Black water handled completely on site – reduced output by **2,984,751 GAL/YR**

$3,164 annual water bill savings
Moscow: $1.95 per 100 Cubic Feet of Water
(3,325 GPD / 748.052) x $1.95 x 365)