

Residential Water Makeover Checklist

Scope & Sequence for Assessment, Design, & Implementation

Developed with support from Santa Barbara [City Water Conservation Program](#)

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What this is

A tool to facilitate best management of water and other resources at home and in the landscape, by helping get the project **context** clear; the **scope** to include all relevant factors, data and applicable best practices; and perform the work in the most efficient **sequence**.

Context —Includes owner/ residents goals and parameters, all the relevant site factors, and key water data.

Scope —Includes metered water efficiency in- and outdoors; management of rooftop rainwater, stormwater runoff, and run-on; greywater reuse; storage in the root zone, groundwater recharge; indoor rainwater reuse; and on-site food production.

Sequence is for optimum work flow: 1) goals 2) measure 3) design 4) implement: a) fixture flows lowered, b)-habits improved, c) plantings made climate appropriate, d) stormwater management optimized....e)then you can tune the first four factors together with greywater plumbing; 5) Repeat/ refine as needed

How to use this

Follow the list, adapting as needed. **Plan on spending much more time the first few times you try this approach.** Do as many of these steps as possible. With experience you can see which corners can be cut on which projects to save costs without sacrificing results.

○ **Critical measures** —denoted by big checkboxes

□ **Possible corners to cut**—denoted by small checkboxes

This checklist is designed to work in conjunction with our **Integrated Water Calculation spreadsheet** (spreadsheet-related items have one line by them)

and a **site plan** (two lines= site plan related)

Items for both spreadsheet and site plan-3 lines

See oasisdesign.net/water/checklist for instructions.

If you would like to outsource some of this work, with the following information we can prepare the following items:

Address-Site map to sketch on for site visits, rough roof area, hardscape area, landscape area, total area; water budget calculations for rainwater

Water use historical info, Number of residents, square feet of irrigated area: Calculations and graphs including estimate of indoor vs outdoor use, indoor use by fixture, outdoor water application rate, potential water savings, areas to focus on.

This is a beta version—Please share your observations and improvements:

oasisdesign.net/about/contact/feedback

Who this is for

Landscape professionals, water resource specialists, permaculture designers, and involved homeowners.

This version is primarily for residences with yards.

Why this was made

The impetus behind this project is 1) to help translate a desire to save water or to be more green into more effective action, 2) to facilitate the workflow of professionals working in this area and get the best cost/ benefit for clients.

These are the objectives used to guide the crafting of this document and the issues they are responding to:

Comprehensive and Integrated —Issue: important things often get overlooked, like the possibility of landslides, or bigger, lower cost conservation opportunities. E.g., installing greywater but not adjusting the irrigation controller...even though that would save 10x as much water.

Efficient sequence —Issue: often things are done piecemeal in a wasteful order. For example, greywater plumbed to a useless water hog plant...which is then removed.

Quantitative —Issue: without an accurate sense of quantities, sometimes effort is misdirected. For example, it's generally true that indoor use= outdoor use. But, on a site where outdoor use = 10 x indoor use, reducing outdoor use 5% would save more water than thousands of dollars of greywater reuse plumbing. *Having amounts of greywater per fixture, rainwater per downspout and hardscape, and water use per plant or area all on a site plan makes it easy to connect the dots and realize goals.*

Context appropriate Issue: game changing client goals or factors like super heavy clay soils often surface late or never in the process. Would your client rather change habits or invest in conserving hardware? Does the clay that is dry now hold standing water for days in the wet season? *Taking all relevant factors into account results in the best outcome.*

When to use this

To guide projects from start to finish, but especially at the very beginning.

Where to use this

In your office during the first contact with the client, on the initial site visits as a place to log site data, and back in your office preparing your proposal.

Initial client intake

Broad goals & site specs interview by email or phone

Name _____

Email _____

Phone _____

Address of property _____

Are you the homeowner? yes no

Who are the decision makers/ stakeholders for this property?

Number of people on site: _____

Size of property _____

Goals/issues reason for calling:

- Plans/ drawings of property available?** — obtain copies and review
- Your information/ agreement** with client
- Suggest that client get free water checkup** before site assessment, if available
- Authorization for getting historical water use info**—from water purveyor
- Well drilling logs, soil reports, perk tests, geotec reports etc**— obtain copies and review

Optional client intake questions

Greywater gateway specific questions

Washer is horizontal axis vertical axis

Gallons per load (if known) _____

How many loads per week? _____

Exterior wall? yes no

What kinds of plants do you want to water?

Plants downhill? yes no

Do you have a water softener? yes no uses
 Na K

How do you irrigate?

Lawn removal-specific questions

Area of lawn _____

Grass is cool season warm season

Stormwater specific questions

Area of roof _____

Are there drainage or landslide concerns?

Is there lots of water that runs on or off the property? (*get locations and details when on site*)

Pre-site assessment

Preparation to do in your office before site visit

- Site plan to sketch on** —print copies 50% grayed out for easy sketching, showing structures, property lines at minimum (*can print grayed out satellite image from internet*) irrigated plants, roof lines, topography
- Preliminary calculations** from google earth pro; ft² of roof, hardscape, landscape
- Historical water use**—get historical usage info to excel, create graph, ideally of 5 years+ use
- Estimate indoor vs outdoor use**—from graph above
- Check site against geologic hazard, groundwater recharge maps**
- Results from water checkup**

Bring to site assessment

- Site plan copies to sketch on** four or more 8.5x11 to 11 x 17 copies printed light grey for noting different kinds of information
- Client interview questions** following
- Clipboard, pencil**
- Soil probe, screwdriver**
- Copies of info** collected in pre-site assessment
- Camera**
- Post hole digger** or trenching shovel
- Tape measure(s)**
- Stopwatch, Known volume containers** for volume measurements
- Flashlight, crawlsuit** for checking pipes in crawlspace
- Level device** Transit and/or water level, 4' level, 10" level, handheld sight level
- Means of carrying all this-pack/ toolbelt**
- Confirm that free water checkup has been done**
- Pressure gauge**

On site

Start this as soon as you get to the site before interview...if client is unavailable can do other stuff that comes after interview, below, as well.

- **Dig holes and start water saturating** for perk test, in RW, GW basin possible locations. Note on site plan. How: oasisdesign.net/greywater/createanoasis/perctest

On site client interview

With client/stakeholders in a comfortable place to sit.

□ Verify info from initial client intake

Residents/ Users

- How long on property? _____
- How long are you planning to stay? _____
- Who lives on the property?
- Average population _____
- Minimum population _____
- Peak population _____
- Duration and nature of peak _____
- Max continuous days unoccupied in dry season _____
- Is the system public? yes no

Pending changes in users/ use?

General Goals/Project

Culture/Assumptions/Interests

What are the guiding philosophies and aesthetic (E.g., fancy gated subdivision, shack in hippie commune)?

Check all that apply, or mark the point on the "Low" to "High" scale that is most appropriate, thusly: L . . . (.) . . H

Important to be realistic rather than aspirational in these answers—

- Importance to you of—
- Invest \$ in efficiency to save \$ L H
- Spend time to save \$, resources L H
- Water conservation L H
- Energy conservation L H
- Food production L H
- System resiliency L H
- Work at home L H
- Built debt-free L H
- Outdoor living L H
- Outdoor entertaining L H
- Outdoor play L H
- Outdoor privacy L H
- Legal compliance L H
- Setting legal precedent, policy change L H
- Avoiding legal liability concern L H
- Idiotproof-ness L H
- Hygiene concern L H

- Perfection standard L H
- Fire resistance L H
- To what degree are the users interested in understanding/maintaining the system? L H
- How do the desires of other stakeholders—spouse, children, neighbors—differ from the above?

Specific elements

What's existing, desired

- Lawn? have willing to replace willing to shrink
- Greywater? have want more
- Biocompatible cleaners? yes no
- Remove softener yes no Na to K? yes no
- Rainwater infiltration? have want more
- Rainwater tank? have want more
- Fruit trees have want more
- Climate appropriate plants have want more
- Water feature? have willing to shrink
- Pool have willing to cover want
- Hardscape removal?/ substitution
- Hot tub have want
- Outdoor shower have want
- Chickens have want
- Herb garden have want
- Kitchen garden have want
- Compost have want
- Is there a list of existing plants?
- Other?

Water System Goals

- All potable? yes no
- Fire suppression specs:
- Reserve requirement L H
- Hydrant size L H
- Fire sprinklers L H

Energy Goals

- Energy independence L H
- Passive solar heat L H
- Low transportation use L H

Greywater Goals

Note: For simple, easy greywater systems, performance is lower, but 90% of this list is not necessary. See Create an Oasis with Greywater

- **Irrigate/ Save water** (don't forget conservation before reuse)
- **Improve sanitation**
- **Save septic**
- **Save money** (rare)
- **Feel good**
- **Demonstration** (it should still justify itself ecologically/economically)
- **Other :**

Education Goals

Use the design and construction process and visible systems in the home to educate residents, clients, employees, subcontractors, and the general public about environmental impacts of buildings and how these impacts can be minimized.

Regulatory Climate

Will the project be permitted? yes no
Inspected as part of another project? yes no maybe

Neighborhood appropriateness issues?

Time and Money Parameters

Budget? Implementation, maintenance...

Timeline for implementation *phased implementation often good*

Is resale value a concern? yes no

How much of your own time can/ will you be putting into the project?

Availability of Materials and Skilled Labor

What building materials are available on site/locally? (*Mulch, rock, fill dirt*)

Who is going to do the installation?

Who is/ will be responsible for maintenance?

What are the maintenance goals or constraints? (*Maintenance dialog-what can be offered in way of low maintenance design, who can provide maintenance*)

On site assessment

Walk site with client

Things which only the client may know...make notes on site plan client walk through sheet

Favorite part of the yard/ outdoor living areas existing/ desired

Typical wind direction, intensity patterns

Micro climate (*shading, frost pockets, heat collectors, windy and sheltered areas, etc.*)

Views you want to open/preserve:

New visual/auditory screening you want:

Windbreak desired?

Plant changes desired?

Micro climate modification (*e.g., windbreak, increased cooling via evapotranspiration, shade*)

How do you irrigate? Where?

Location of controller?

Runoff: how much? where does it go? Run on?

Drainage issues?

Where are there erosion and/or slope stability (landslide) issues?

Construction pending?

Where is the sewer line? (Or septic and leachfield?)

Septic: is it failing? yes no

Greywater system: Is it functioning satisfactorily?
yes no sort of; If not, how?

Other:

Location of water meter:

Check for leaks at meter (make sure R/O is off) Take initial reading of water meter and ask client not to use water while measuring...if two people leave one at meter

Greywater possibilities

Make notes on site plan greywater sheet

- Locate greywater sources on site plan**—Shower(s), tub(s), washer, kitchen sink, toilets

Is the irrigated area below greywater sources? Y/N

Slope % _____ Slope aspect (orientation):

(Note: a Branched Drain system on a 2% slope takes four times the labor to build than one on a 4% slope. If the slope is under 2%, it will be very challenging.)

Revisit locations of perk tests if needed.

Rainwater & Runoff

Make notes on site plan rainwater sheet

- Locate downspouts on site plan**, estimate surface of catchment
- Measure downspout catchment area**, input in spreadsheet
- Hardscape catchment Measure or estimate, note direction of drainage on site plan**
- Landscape drainage note direction, flow size, drains on site plan**
- Run on note direction, estimate quantity,**
- Runon catchment size & nature investigate**
- Recheck perk if needed**

Off site Calculations

Water income

- Current metered water income**
- Rain income**
- Rooftop rain to infiltration** current, potential
- Run-on to infiltration** current, potential
- Run on catchment map, measure e.g., in google earth pro**
- Rooftop rainwater by downspout/ drip edge, yearly and peak flow**
- Hardscape, surface runoff by year, peak**
- Run-on watershed, yearly, peak flow**

Outdoor water use

- Lawn water use current, post conversion**
- Rest of landscape water use**
- Outdoor water use by plant, yearly and peak**
- Water supplied by emitter and zone**

Indoor use

- Indoor use by fixture** —estimated from water bill, standard ratios
- Indoor use by fixture** —calculated from on site measurements and owner interview, yearly and peak surge
- Conservation suggestions**
- Calculated savings by fixture**

Production

- Food production by plant and zone**
- Fuel production by plant**

Commons effects

- Runoff reduction**
- Groundwater recharge**

Design I

General recommendations and possibilities

Outdoor efficiency

- Adjust controller**
- Submeter irrigation**
- Weather based controller**
- Lawn replacement**
- Plant removal, substitution**
- Mulching**
- Pruning** (fruit trees should be kept reachable)
- Substitute fresh water with rooftop, runoff run on grey or clear water**

Ways to diversify, increase water income

- Rooftop rainwater to infiltration**
- Hardscape to infiltration**
- Run-on water to infiltration**

Indoor efficiency-more efficient fixtures

- Fix leaks**
- Signage/ Habits**
- Showerhead**
- Eco luxury bathing chamber**
- Efficient washer**
- UHE toilet**
- Install waterless earth toilet** for civil emergency
- Sink aerator**
- Reduce whole house pressure**
- Remove softener** or hot h2o only

Alternate water for irrigation

- Choose a percentage of irrigation need to meet with gw** (usually 50%)
- Connect alternate water Sources with Irrigated areas on paper** show gw, rw, cw annual, peak quantities on site plan, connect to irrigation shown
- Clearwater reuse for water feature then irrigation**
- Ban toxic products from drains or house**
- Laundry** (last because most flexible)
- Shower**
- Sinks**
- Kitchen sink**
- Lump flows** or **split**
- Toilet** (green septic)

Rainwater tanks

- Rooftop Rainwater tank to outdoor use**
- Rooftop Rainwater tank to indoor use**

Energy \$ saving

- Washer turn off hot water supply modern detergents do not need hot water; a complete waste of money
- Shower stall sealing door to reduce heat loss saves up to half of water and energy
- Turn down setting on hot water heater

Climate Safety at home

*In descending order of importance. A lot of these will save \$ and make your home nicer, too.
40% of US CO2 emissions are from buildings.*

- Design house for passive comfort facing south, wider than deep, lots of glass on S, E, very little on W, N faces
- Shade west and south side of house with trees to reduce cooling load
- Make your house and yard so nice you don't feel like driving so much
- Reduce hot water use (70% of water carbon footprint)
- Install solar hot water heater
- Replace non-productive plants with food and fuel plants
- Block wind and reflect sun on N side of house to reduce heating load
- Increase soil organic matter sequesters carbon
- Increase biomass sequesters carbon
- Yard waste to mulch basins not landfill reduces climate impact up to 30x by biodegrading to CO2 instead of methane
- Reduce sewer flow saves energy for treatment
- Reduce water consumption saves energy for pumping, treatment

WITH CLIENT—which things to implement in what order?

Meeting on site...to bring

- Site plan
- Drawings
- Calculations
- Design narrative
- Fruit tree list

Review with clients items above and options from design 1, Mark items they are interested in with 1 for phase 1, 2 for phase 2, etc.

Design II

Fully develop designs for items client wants to pursue

- have utilities marked (call or have them call)

Monitoring

- Design, spec water meter for irrigation installation
- Design, spec resource dashboard, installation

Drawings

- Check for existing maps, drawings

- Site plan with—
- location of structures
- location of water elements
- elevation of water elements schematic section or notes on site plan
- property lines
- topography
- land uses, plants
- Schematic elevation/ section with all water elements and their elevations
- Locate valve boxes, shutoffs, etc. on irrigation plan

Design suggestions

- Sunny, warm sheltered outdoor living space
- Shady cool breezy outdoor living space
- Optimized plantings; climate-appropriate, food producing, microclimate improving
- Greywater reuse locate valves, plumbing and basins
- Rooftop rainwater locate infiltration basins
- Hardscape locate infiltration basins
- Run on locate infiltration basins, overflow
- Rooftop rainwater to cistern to washer, toilets, and/or irrigation; locate cistern, spec pump, pipe size, location
- Irrigation lines note locations
- Compost location
- Firewood pile location
- Wildfire resistance design details and narrative

Re-design landscape

- Locate uses, structures
- Sunny warm sheltered outdoor living space
- Shady cool green evaporatively cooled living space
- New plants; fruit trees that provide food eaten by residents
- Microclimate modification for structures
- Fire resistant, wind-slowing plants by structures
- Go over [list of fruit trees](#) with client (now/ later/ never)
- Select fruit trees from the *intersection* of the following sets, Fruit which: A) residents will eat, B) can grow in this climate, C) have space for growing, D) for which there is energy to maintain and harvest E) available See oasisdesign.net/landscaping/fruittrees.htm

Fire safety

- Passive Fire resistance
- Removal of hazardous plants
- Addition of beneficial plants
- Active fire resistance
- Rooftop fire sprinklers
- Fire shutters

Implementation sequence

- Post conservation signage**
- Remove/ prune non-useful lawn, plants** high water ornamentals, fruit trees not eaten, etc.
- Install irrigation, water meters**
- New controller**
- Install adjustable pressure regulator** 40 psi is normal min, 25 will still work toilet, washer, demand heater
- Install Clearwater reuse**
- Switch out indoor fixtures** for more efficient ones
- Foot/ hand actuation**
- Convert shower/ bath to eco-luxury bathing chamber**
- Earthworks**
- Laundry greywater**
- Branched drain greywater**
- Plant useful plants** If drought, wait until rain. For natives, can water with stormwater only
- Apply Compost, Clippings, mulch,**
- Install/ modify drip irrigation/ hose bibs**
- Toilet water, nutrients to irrigation**

[Checklist DEVELOPMENT NOTES]

Best name?

For checklist, for process

Residential water efficiency checklist

Water Optimization checklist

Water Wise Home and Landscape Makeover

Checklist and Sequence'

Integrated Water Design

Integrated Design for Water Design Sequence and
Checklist

Resource optimization

Water Wealth Management

Ways of sorting info:

1) In time, first to last

2) With client, w/o client

3) Indoors/ outdoors

4) Amount of water savings

5) Stuff to note on site plan

6) Stuff to input in spreadsheet

Other factors

SB specific

Water checkup, rebates pre-inspection

Non-SB

Off grid...

Water conveyance and treatment savings

Water heating savings

Sewage treatment savings

Carbon sequestration in soil

Carbon sequestration in biomass

Transportation reduction

Add section for recording irrigation controller setting?

[Spreadsheet DEVELOPMENT NOTES]

Organization of info

1. **Front matter** title, date, summary, instructions, errors, omissions
2. **Main variables to input**
3. **Summary and graphs**
4. **Summary for subsections, as needed**
5. **Detailed calcs for each factor**

SPREADSHEET SEQUENCE

1. Historical water use
2. Indoor estimate
3. Water checkup
4. Population
5. Fixture flow rates
6. R/O
7. Irrigation controller settings/ irrigation applied
8. Runoff, run on
9. Lawn
10. Food production
11. Climate effects
12. Smart controller
13. Lawn replacement
14. Efficient fixtures
15. Reduce house pressure
16. Remove softener
17. GW reuse
18. Toilet reuse
19. Rooftop rainwater indoor, outdoor

Boneyard/ homeless material

Off site only

Latitude _____ Elevation _____ Yr rainfall _____

Evapotranspiration (in/week) Min _____ Max _____

Typical max duration w/o significant rain _____

Growing season (frost to frost) _____

Minimum temperatures _____

Outside SB only

Applicable greywater code? Other legalities?

Duration of snow cover _____

Conventional or radical plumbing?

Pipe size?

Diverter valve locations, if any

Shutoff valves?

Surge tank, if any

Flexibility for the future

Greywater distribution plumbing

Choose a greywater distribution system

Diverter valves, if any

Pipe size?

Flow splitters

Dosing devices, if any

Cleanouts

Laundry drum, if any

Greywater Receiving Landscape and Plants

Choose a greywater receiving system and make sure it is
adequately sized

Construction

Collection Plumbing

Maintenance?

Where are plumbing parts and plants coming from?

Are biocompatible cleaners available? Y / N *(See oasisdesign.net/*

[?] for list of plant-friendly cleaners)